

# SDL Side Door Elevator **Type Series** [VES] SDL 150-H

Hydraulically Operated

Type	P/N	Rated Capacity
SDL 150-2	651520-Y-BC-H	150 tons
SDL 150-3	651530-Y-BC-H	150 tons
VES SDL 150-3	651530-Y-VES-H	150 tons

## OMM

### Original Operating Instructions



## Revision history

Version	Date	Author	Changes
00	2007-08	B+V OT,ROK	Initial Release SDL Side Door Elevator
01	2008-03	B+V OT,ROK	Update Release
02	2008-04	B+V OT,ROK	Update Release
03	2009-09	B+V OT,ROK	Update Release
04	2010-02	B+V OT,ROK	Update Release
05	2011-02	B+V OT,ROK	Update Release
06	2015-02	B+V OT,ROK	Update Release
07	2015-02	B+VOT, ROK	Update Release
08	2016-07	FORUM Handling Tools, ROK	Company Name Change, Layout Change, Update
09	2018-02	FORUM Handling Tools, ROK	Update

## Document Approval

Version	Author	Eng. Check	Approval Check
09	FORUM Handling Tools SS 02 / 18	FORUM Handling Tools RR 02 / 18	FORUM Handling Tools as per Revision 07

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

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

All data in this manual takes place using best knowledge. This manual is based on the latest product information that was available at the time of printing. Depending on ongoing technical improvements (ISO 9001), FORUM Handling Tools reserves the right to make alterations to the design and specifications without notice. The values specified in this manual represent the nominal value of a unit produced in series. The values in individual units may have slight differences. Only with written consent from FORUM Handling Tools may the contents of this instruction manual be passed on to third persons. Procedure descriptions and explanations are not to be passed on to third persons. Copying or multiplying for internal use is permitted.

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

# Table of contents

<b>A.</b>	<b>GENERAL</b>	<b>5</b>	<b>3</b>	<b>TRANSPORT / SETUP</b>	<b>30</b>
<b>I</b>	<b>BASIC INFORMATION</b>	<b>5</b>	<b>3.1</b>	<b>DELIVERY</b>	<b>30</b>
<b>II</b>	<b>INTENDED USE</b>	<b>5</b>	3.1.1	SCOPE OF DELIVERY	30
<b>III</b>	<b>IMPROPER USE</b>	<b>5</b>	3.1.2	UNPACKING AND DISPOSAL OF PACKING MATERIAL	30
<b>IV</b>	<b>POTENTIAL MISUSE</b>	<b>6</b>	3.1.3	INTERMEDIATE STORAGE	30
<b>V</b>	<b>WARRANTY AND LIABILITY</b>	<b>6</b>	<b>3.2</b>	<b>TRANSPORT</b>	<b>31</b>
<b>VI</b>	<b>OBLIGATIONS OF THE OPERATING COMPANY</b>	<b>7</b>	<b>3.3</b>	<b>LIFTING ARRANGEMENTS</b>	<b>32</b>
<b>VII</b>	<b>USER GROUPS</b>	<b>8</b>	<b>3.4</b>	<b>MOUNTING THE SDL 150-H TO THE ELEVATOR LINKS</b>	<b>33</b>
<b>VIII</b>	<b>SAFETY SYMBOLS</b>	<b>9</b>	<b>3.5</b>	<b>CONNECTING THE HYDRAULIC SYSTEM</b>	<b>34</b>
<b>IX</b>	<b>PERSONAL PROTECTIVE EQUIPMENT (PPE)</b>	<b>10</b>	<b>3.6</b>	<b>INSTALLATION-CHECKLIST</b>	<b>35</b>
<b>X</b>	<b>CONFORMITY</b>	<b>11</b>	<b>4</b>	<b>COMMISSIONING AND OPERATION</b>	<b>38</b>
<b>XI</b>	<b>CONTACT FORUM HANDLING TOOLS WORLDWIDE</b>	<b>11</b>	<b>4.1</b>	<b>COMMISSIONING</b>	<b>38</b>
<b>XII</b>	<b>INFORMATION ON THE FORUM HANDLING TOOLS HOMEPAGE</b>	<b>12</b>	4.1.1	SAFETY CONSIDERATIONS	38
<b>1</b>	<b>DESCRIPTION</b>	<b>14</b>	4.1.2	SAFETY CHECKS BEFORE INITIAL OPERATION	39
1.1	EQUIPMENT MARKINGS	14	4.1.3	COMMISSIONING-CHECKLIST	40
1.2	MAIN ASSEMBLIES	14	<b>4.2</b>	<b>OPERATION</b>	<b>41</b>
1.3	TECHNICAL DATA	15	<b>4.3</b>	<b>OPENING / CLOSING THE DOOR</b>	<b>41</b>
1.3.1	RECOMMENDED HYDRAULIC FLUID	15	4.3.1	OPENING	41
1.3.2	RECOMMENDED LUBRICANTS	15	4.3.2	CLOSING	41
1.3.3	MAIN DIMENSIONS SDL 150-2	16	4.3.3	FEEDBACK VALVES	41
1.3.4	MAIN DIMENSIONS SDL 150-3	17	<b>4.4</b>	<b>INSTALLATION AND REMOVAL OF WEAR-BUSHINGS</b>	<b>42</b>
1.3.5	MAIN DIMENSIONS VES SDL 150-3	18	<b>4.5</b>	<b>ADJUSTMENTS AT THE VALVE BLOCK</b>	<b>43</b>
1.3.6	MAIN DIMENSIONS VES-SDL WEAR BUSHING	18	<b>4.6</b>	<b>TROUBLESHOOTING</b>	<b>44</b>
1.4	RFID-CHIP EQUIPPED HANDLING TOOL EQUIPMENT	20	<b>5</b>	<b>SERVICE</b>	<b>46</b>
<b>2</b>	<b>SAFETY</b>	<b>22</b>	<b>5.1</b>	<b>MALFUNCTION</b>	<b>46</b>
2.1	GENERAL SAFETY PRECAUTIONS	22	<b>5.2</b>	<b>REPAIR</b>	<b>46</b>
2.2	SAFETY EQUIPMENT	22	5.2.1	REPAIR BY CUSTOMER	46
2.3	SAFETY PRECAUTIONS	22	5.2.2	REPAIR BY MANUFACTURER	46
2.4	OPERATING MANUAL AND EQUIPMENT	23	5.2.3	SECURING SCREWS WITH WEDGE-LOCKING WASHERS	46
2.5	SAFETY PRECAUTIONS FOR PROTECTION AGAINST REMAINING HAZARDS	23	<b>5.3</b>	<b>DRAWING, PARTS BREAK DOWN AND SPARE PARTS</b>	<b>47</b>
2.5.1	WARNING AND SAFETY INSTRUCTIONS ON SDL 150-H	24	5.3.1	651520-Y-BC-H SDL 150-2-H, 651530-Y-BC-H SDL 150-3-H	48
2.5.2	INCORRECT HANDLING OF HYDRAULIC EQUIPMENT	26	5.3.2	651530-Y-VES-H, VES SDL 150-3-H	51
2.5.3	RISK OF STUMBLING/TRIPPING	27	5.3.3	651537-1 HYDRAULIC ASSEMBLY	54
2.5.4	DANGER OF PINCHING/CRUSHING	27	5.3.4	651506 HYDRAULIC ASSEMBLY	56
2.5.5	HUMAN ERROR	27	5.3.5	RECOMMENDED SPARE PARTS	58
2.6	ORGANISATIONAL MEASURES	28	5.3.5.1	SPARE PARTS FOR SDL 150-2-H	58
2.7	ACCIDENTS, FIRE	28	5.3.5.2	SPARE PARTS FOR SDL 150-3-H	58

DESCRIPTION

SAFETY

TRANSPORT

COMMISSIONING / OPERATION

SERVICE

INSPECTION / MAINTENANCE

STORAGE

APPENDIX

DESCRIPTION  
SAFETY  
TRANSPORT  
COMMISSIONING / OPERATION  
SERVICE  
INSPECTION / MAINTENANCE  
STORAGE  
APPENDIX

<b>6</b>	<b>INSPECTION / MAINTENANCE</b>	<b>60</b>
<b>6.1</b>	<b>LUBRICATION</b>	<b>61</b>
<b>6.2</b>	<b>INSPECTIONS</b>	<b>62</b>
6.2.1	INSPECTION OF HYDRAULIC EQUIPMENT	62
6.2.2	INSPECTION FOLLOWING CRITICAL LOADS	62
6.2.3	INSPECTION FOLLOWING REMOVAL	62
<b>6.3</b>	<b>INSPECTION CATEGORIES</b>	<b>63</b>
6.3.1	INSPECTION CATEGORY I	63
6.3.2	INSPECTION CATEGORY II	63
6.3.3	INSPECTION CATEGORY III	63
6.3.4	INSPECTION CATEGORY IV	63
6.3.5	INSPECTION INTERVALS UND INSPECTION TASKS - SDL 150-H ELEVATOR	63
6.3.6	INSPECTION CHECKLIST	64
<b>6.4</b>	<b>DISMANTLING AND MOUNTING OF THE SDL 150-H</b>	<b>65</b>
6.4.1	DISMANTLING	65
6.4.2	MOUNTING	65
6.4.3	WEAR DATA FOR COMPONENTS	66
6.4.4	MINIMUM EAR DIMENSION	66
<b>6.5</b>	<b>MEASURING OF WEAR</b>	<b>67</b>
6.5.1	WEAR AT THE TOOL-JOINT OF A DRILL-PIPE	67
6.5.2	CRITICAL AREAS	69
<b>6.6</b>	<b>CLEANING</b>	<b>70</b>
<b>7</b>	<b>STORAGE / DISPOSAL</b>	<b>72</b>
<b>7.1</b>	<b>STORAGE</b>	<b>72</b>
<b>7.2</b>	<b>DISPOSAL</b>	<b>73</b>
<b>8</b>	<b>APPENDIX</b>	<b>76</b>
<b>A.</b>	<b>SAMPLE OF EC DECLARATION</b>	<b>77</b>
<b>B.</b>	<b>THIRD PARTY DOCUMENTS</b>	<b>78</b>
I	SAFETY DATA-SHEET	78
II	COMPONENTS	79



## A. General

### I Basic Information

This OMM (hereinafter called OMM) refers to the hydraulically operated SDL Side Door Elevator (hereinafter called SDL 150-H) Type Series from FORUM Handling Tools for use on oil drilling platforms and rigs. This OMM covers several different FORUM Handling Tools models from the SDL 150-H Type Series that are all common in use and operation. Most assembly, disassembly, and inspection procedures are the same for all models. If there are differences, they are called out separately within this OMM. 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 OMM is intended for the operator of the SDL 150-H. It is intended to ensure safe operation and must be read carefully and kept where it is accessible for SDL 150-H users at all times. This OMM contains all information on safe and proper operation of the SDL 150-H. Observance of these instructions is required for safe operation. In addition, it is necessary to observe all applicable national and local regulations [e.g. accident prevention regulations and environmental regulations] as well as the company's own internal safety regulations. For installation, maintenance and repair work and proper training of the operating personnel, Forum recommends requesting service from FORUM Handling Tools itself.

### II Intended Use

The FORUM Handling Tools SDL 150-H is designed to be used vertically in hanging Elevator Links. The SDL 150-H conduces as an association between the Top Drive, the Elevator Links and the drill tubes. The load capacity of the SDL 150-H is designated by the Type Series model and is limited in vertical direction only. The SDL 150-H is available for hydraulic power operation only.

This OMM contains all information on safe and proper operation of the FORUM Handling Tools SDL 150-H. In addition to observing all instructions in this OMM, intended use also includes observing all prescribed assembly, disassembly, startup, operating, repair and maintenance work at the specified intervals as well as all safety precautions. The operation of the SDL 150-H is allowed for the intended use only. All FORUM Handling Tools SDL Side Door Elevators are designed in accordance with the latest API 8C.

### INFO



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

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

### III Improper Use

#### INFO



Improper use of the machine releases FORUM Handling Tools from any liability for personal injury or property damage resulting therefrom.

The SDL Side Door Elevator may only be used to be used vertical in hanging links. The information in chapter 1.4 „Technical Data“ must be observed.

The following is specifically prohibited:

- Use of bushings with pipe sizes for which use is not specified.
- Holding pipe with diameter for which use is not specified.
- Holding pipe taper for which use is not specified.
- Increasing the load limit of the SDL 150-H
- Every use of the SDL 150-H which is not intended.

Moreover operation of the SDL 150-H is prohibited under the following conditions:

- When the machine is used for applications other than intended.
- When the hydraulic equipment is not installed properly.
- When the SDL 150-H 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 SDL 150-H is not operating properly.
- When humans or foreign objects are located in the working area of the SDL 150-H.
- When conversions or modifications have been performed without previous, written approval by FORUM Handling Tools.
- When tools not approved by FORUM Handling Tools are used.
- When the prescribed maintenance intervals have been exceeded.
- When replacement parts not approved by FORUM Handling Tools are used.
- When repair or service work has been performed on the machine by companies not authorized by FORUM Handling Tools.

Observe also the chapter „V Warranty and Liability“.

#### IV Potential Misuse

This OMM contains information and warnings on procedures that address hazardous conditions and could cause personal injury but cannot reflect all fashions in which hazardous consequences may occur due to service and/or operation. All personnel using the SDL 150-H or service procedures contained within this OMM must be completely satisfied that personal and/or SDL 150-H safety will not be compromised.

**Common methods of MISUSE include but are not limited to:**

1. Use without ALL warning and identification labels present. This can cause operating personnel to misunderstand the areas of the equipment that can cause serious injury.
2. Use with insufficient and/or worn assemblies and parts. This can cause failure causing a suspended hazard which can result in serious injury or death.
3. Use of the SDL Side Door Elevator in methods not intended. The SDL 150-H should be used ONLY in the methods described in this manual.

#### V Warranty and Liability

##### Liability

The technical information, data and instructions for operation contained in this OMM 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 SDL Side Door Elevator treated in this OMM. Claims or entitlements cannot be deduced or derived from information, illustrations and /or descriptions in this operating manual.

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

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

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

##### Warranty

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

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

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

##### Info



Any structural or functional modification to the equipment by the operating company requires previous written approval by FORUM Handling Tools . Failure to obtain such approval voids the warranty as well as the declaration of conformity and releases FORUM Handling Tools from any product liability. Following modifications or installation of optional equipment, all safety equipment must be reinstalled and checked by the operator for proper function.

## VI Obligations of the Operating Company

### Planning and Checking Safety Measures

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

All personnel performing work on and with the SDL 150-H must be trained by the operating company for the work performed on and with the SDL 150-H.

All personnel must have read and understood the operating manual.

### Minimizing Risk of Injury

The following principles apply to minimize the risk of injury:

- Ensure that work on the SDL 150-H 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 SDL 150-H. Proper behavior in the event of a malfunction must be clear for everyone. The personnel must be given regular training.
- All WARNING signs and information on the SDL 150-H 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 OMM at the location where the SDL 150-H is in operation and where it is easily accessible for everyone.
- Use the SDL 150-H exclusively for its intended purpose.
- Use the SDL 150-H 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 SDL 150-H includes knowledge of the general safety precautions. Ensure that the SDL 150-H 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 SDL 150-H is familiar with the required procedures and safety precautions.

### Minimum Qualifications

All work on the equipment requires special knowledge and qualifications on the part of the operating personnel. All personnel working on SDL 150-H must have the following qualifications:

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

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

- Technical training for independent work on the SDL 150-H.
- Sufficient qualifications for working on the SDL 150-H under supervision and at the instructions of a trained specialist.

## VII User Groups

This OMM is subdivided into the following user groups:

Personnel	Qualifications
Operating personnel	<p>Sufficiently trained in:</p> <ul style="list-style-type: none"> <li>• Functional procedures on the equipment.</li> <li>• Operating procedures.</li> </ul> <p>Knowledge:</p> <ul style="list-style-type: none"> <li>• Competency and responsibility in regard to the work to be performed.</li> <li>• Behavior in emergencies.</li> </ul>
Service personnel	<p>Basic knowledge of:</p> <ul style="list-style-type: none"> <li>• Mechanics.</li> <li>• Hydraulic.</li> </ul> <p>Authorizations (according to standards of safety engineering):</p> <ul style="list-style-type: none"> <li>• Starting up equipment</li> <li>• Grounding equipment</li> <li>• Marking of equipment</li> <li>• Basic knowledge of installation and operation of the SDL 150-H.</li> </ul>

### Special Technical Knowledge

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

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

### VIII Safety Symbols

The safety precautions in this document contain standardized depictions and symbols. Four hazard classes are distinguished depending on the probability of occurrence and severity of the consequences. Selection of the WARNING category depends on the probability of occurrence and the possible extent of damage.

#### NOTE

Situations which could result in damage to the Equipment or its surroundings 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 sections or sections. They apply for the entire section 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** 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 with a 17 mm box wrench.

### Instructions for Safe Procedure

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

#### Safe Procedure

1. Shut off Equipment.
2. Disconnect supply lines.
3. Attach Equipment 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 Equipment feet.
2. Lift Equipment.

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 SDL 150-H

**IX Personal Protective Equipment (PPE)**

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



WEAR PROTECTIVE GLOVES!



WEAR EYE PROTECTION!



WEAR SAFETY SHOES!



WEAR PROTECTIVE HELMET!



WEAR EAR PROTECTION!

**INFO**



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

**X Conformity**

The SDL 150-H satisfies all requirements in applicable directives and standards. A sample of the EC Declaration of Conformity is given in the appendix.

**INFO**

**i** This OMM is part of the technical documentation for the SDL 150-H. The EC Declaration of Conformity is delivered together with the SDL 150-H. Keep these instructions and the associated documents for later use.

**XI Contact FORUM Handling Tools worldwide**

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

FORUM B + V Oil Tools GmbH	FORUM Handling Tools
Hermann-Blohm-Straße 2 20457 Hamburg Germany Tel: + 49.40.37022.6855 Fax: + 49.40.37022.6899 E-Mail: <a href="mailto:oiltools@f-e-t.com">oiltools@f-e-t.com</a> web: <a href="http://www.f-e-t.com">www.f-e-t.com</a> <a href="http://www.blohmvooss-oiltools.com">www.blohmvooss-oiltools.com</a>	1023 FORUM Drive Broussard, LA 70518 USA Tel: +1.337.373.1800 Fax: +1.337.369.6893

**FORUM ENERGY TECHNOLOGIES Drilling-Service-Standorte**  
Email: [ForumDP.Sales@f-e-t.com](mailto:ForumDP.Sales@f-e-t.com)

Canada	Mexico	Scotland
Nr. 106, 3903 - 75 Ave Leduc, Alberta T9E 0K3 Tel: + 1 780.980.0345 Fax: + 1 780.986.3278	Avenida Avante Monterrey N 300 Parque Industrialxico Tel: + 52.81.8245.6800	Peregrine Road, Westhill Aberdeenshire, AB32 6JL Tel: + 44,1224.744000

United Arab Emirates	Singapore
Oilfields Supply Center Building B-45 Jebel Ali Free Zone Dubai UAE Tel: + 971.4.883.5266	No 51 Benoi Road #06-00 Liang Huat Industrial Complex 629908 Tel: + 65.6465.4850 Fax: + 65.6465.4851 Out of hours + 65.913.898.12



**XII Information on the FORUM Handling Tools homepage**

**INFO**

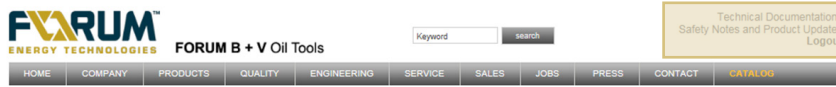


For further and actual information you can also visit our homepage in the internet.

A digital version of the operation instructions for this product as well as the operation instructions, safety- and update notes for other FORUM Handling Tools products can be reached via the FORUM Handling 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 ❶ on [www.blohmvooss-oiltools.com](http://www.blohmvooss-oiltools.com).



Technical Documentations  
Safety Notes and Product Updates



**TECHNICAL DOCUMENTATIONS FOR FORUM B + V EQUIPMENT**

The latest Technical Documentation for our Equipment is available for download.

- ▶ Elevator / Spiders
- ▶ Elevators
- ▶ Elevator Systems
- ▶ Bushings
- ▶ Elevator Links
- ▶ Manual Tongs
- ▶ Manual Slips
- ▶ Power Slips
- ▶ Slip Lifter
- ▶ Safety Clamps
- ▶ Wrench , Pipe Spinner and Floorhands
- ▶ Control Units

Technical Documentations
Safety Notes and Product Updates
Logout
Newsletter Settings
<input checked="" type="checkbox"/> Product Updates
<input checked="" type="checkbox"/> Safety Notes
<input type="button" value="save"/>
Change Password
Old Password <input type="text"/>
New Password <input type="text"/>
Repeat New Password <input type="text"/>
<input type="button" value="save"/>



**EXHIBITIONS**

Sep.08 – Sep.11, 2015 Offshore Europe / Aberdeen, UK

Copyright by FORUM B + V Oil Tools GmbH © 2015 | Imprint/Disclaimer | As of: Jul.21, 2015

Quality Engineering Service Sales	Products Links Elevators Elevator / Spiders	Slip Lifter Floorhand Pipe Spinner Power Slips Manual Tongs	Bushings Manual Slips Safety Clamps Dual Elevator System Spare Parts	Company Jobs Contact Imprint
--	--	---	--	---------------------------------------



# DESCRIPTION

DESCRIPTION

## 1 Description

The FORUM Handling Tools hydraulic operated Side Door Elevator is designed for hoisting, installing and transporting pipe constructions, drill rods and drill pipes in accordance with the latest API Section 8C. The SDL 150-H is weight-optimised and load rated (150 t). The locking system is easy to operate, robust and very safe and reliable.

The layout of the SDL 150-H covers two feedbacks ("LATCH CLOSED" and "CATCH PIN SET") to ensure safe operation and reduce possible misuse. The SDL 150-H is available for hydraulic operation only. A pedestal ensures a safe stand on level ground.

### 1.1 Equipment Markings

The markings are generally used for traceability and provide general information about the component/equipment. All markings are in compliance with the latest API 8C and at least include the following information:

#### General Markings according to API 8C

- API Stamp (API monogram, spec, license)
- Manufacturer's specifications (FORUM logo)
- Production Date (Month / Year)
- Part number (marking P/N before the part number)
- Serial number (marking S/N before the serial number)
- Load Rating
- Equipment weight
- CE-ATEX marking (CE Ex II 2G IIB T5 / T6)
- Country of manufacture

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



Fig. 2: Technical Support Sticker

## 1.2 Main Assemblies

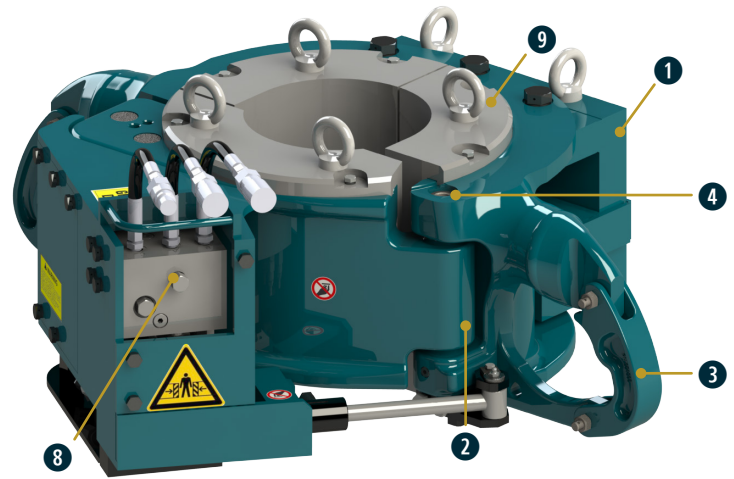


Fig. 3: SDL 150-H Main Assemblies I

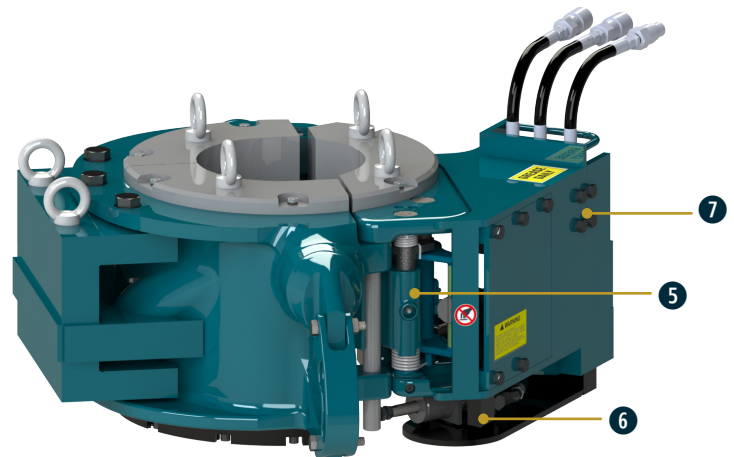


Fig. 4: SDL 150-H Main Assemblies II

Pos.	Description	Pos.	Description
1	SDL 150-H Frame	2	Door
3	Link Block	4	Hinge Pin
5	Latch	6	Feedback
7	Hydraulic Box	8	Hydraulik Valve-Block
9	Wear Bushing		

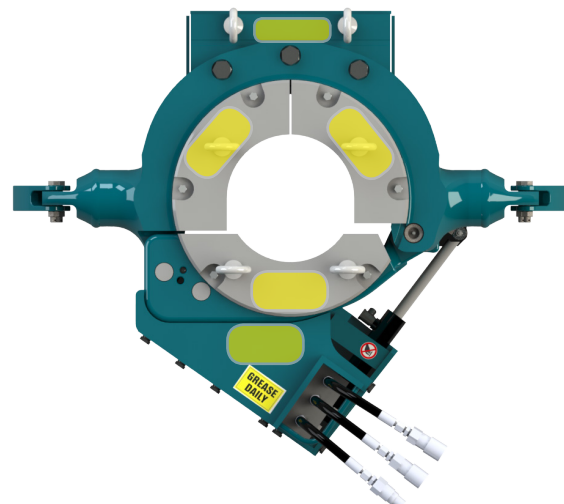


Fig. 5: Markings on SDL 150-H

### 1.3 Technical Data

Elevator Type	SDL 150-2-H	SDL 150-3-H	VES SDL 150-3-H
Partnumber	651520-Y-BC-H	651530-Y-BC-H	651530-Y-VES-H
Temperature working range ambient	- 20° C to + 80° C - 4° F to 176° F		
Load Capacity	150 sh tons		
Pipe Size	8" - 11"	11" - 14"	8.5/8" - 12.3/4"
Elevator links	1.3/4" - 3.1/2"		
Weight	551 lb / 250 kg	595 lb / 270 kg	827 lb / 375 kg
Recommended operating pressure	80 - 160 bar (1160 - 2320 psi)		
Maximum pressure	210 bar (3096 psi)		
Volumetric flow	8 - 12 l/min (2.1 - 3.1 GPM)		

#### **⚠ Note**

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

#### 1.3.1 Recommended Hydraulic Fluid

FORUM Handling 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

#### 1.3.2 Recommended Lubricants

FORUM Handling 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°C to + 29°C (- 4°C to + 84.2°F)	NLGI 0
Fuchs	NESSOS SFO EP grease for non-oil tight gear trains	- 20°C to + 29°C (- 4°F to + 84.2°F)	NLGI 0 DIN 51826 GPOF-25 DIN 51502 GPOF-25

\* For temperatures above + 30°C (+ 86°F) FORUM Handling Tools recommends using lubricants in consistency class NLGI 2.

#### **INFO**



The specified lubricants can be obtained through FORUM Handling Tools Contact your local representative.

1.3.3 Main Dimensions SDL 150-2

DESCRIPTION

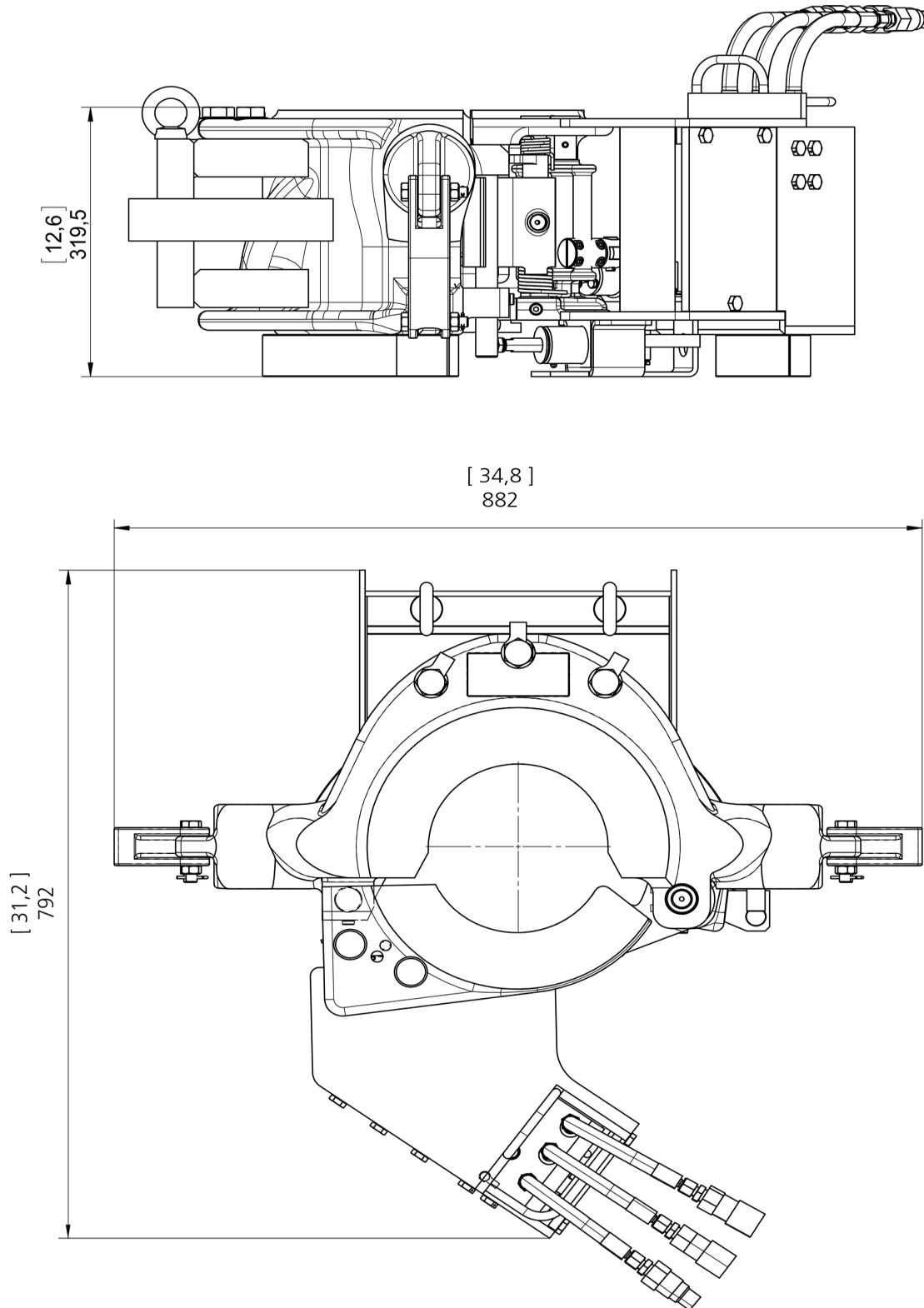


Fig. 6: SDL 150-2 Main Dimension

1.3.4 Main Dimensions SDL 150-3

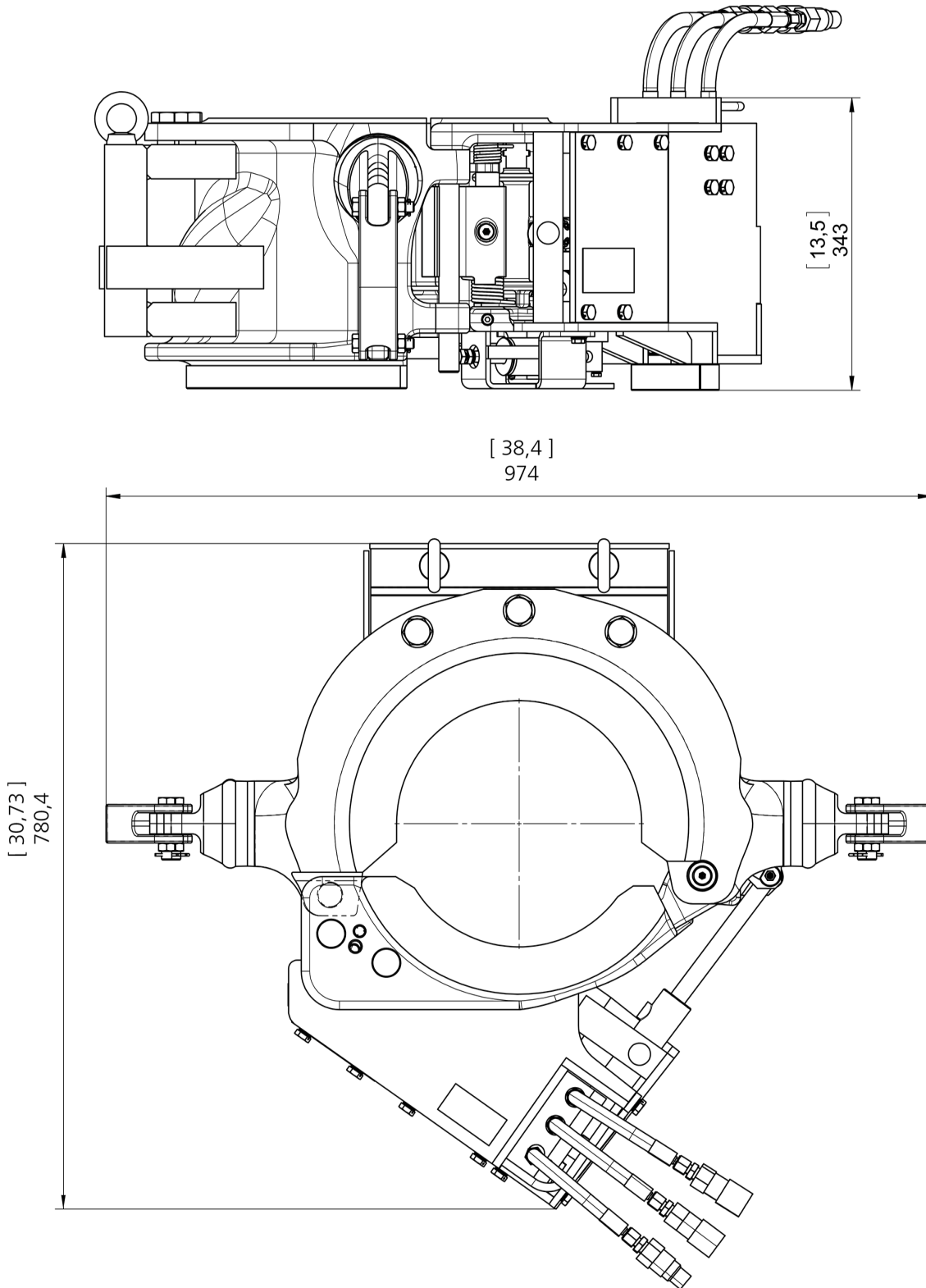


Fig. 7: SDL 150-3 Main Dimension

### 1.3.5 Main Dimensions VES SDL 150-3

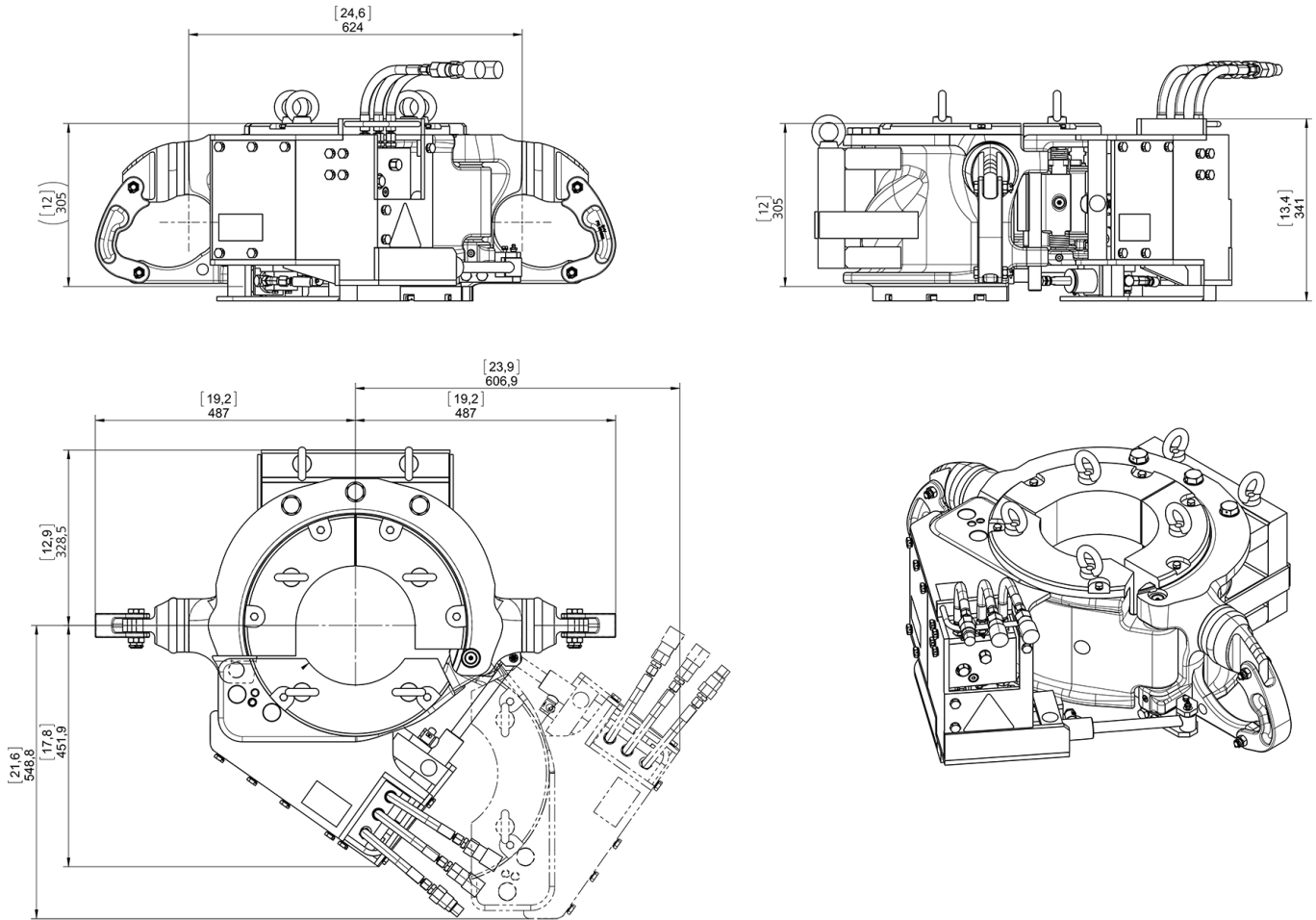


Fig. 8: SDL 150-3 Main Dimension

### 1.3.6 Main Dimensions VES-SDL Wear Bushing

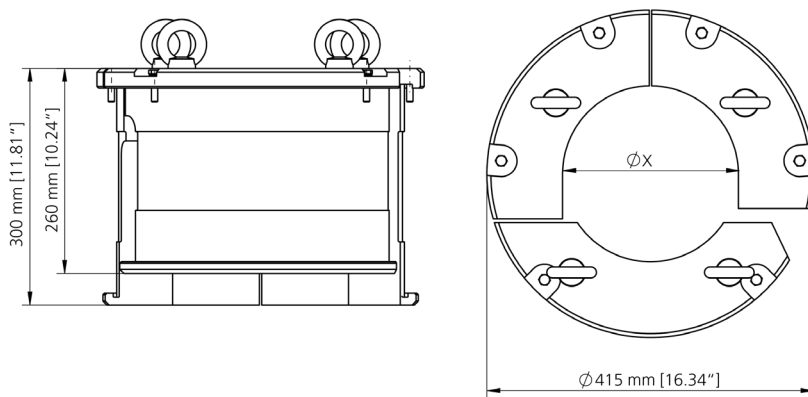


Fig. 9: Wear Bushing Main Dimension

**Component Size - 90° CSG (Casing)**

Size	Bore Code Dimension „X“
3.1/2"	219
4"	220
4.1/2"	221
4.3/4"	222
5"	223
5.1/2"	224
5.3/4"	225
6"	226
6.1/4"	227
6.5/8"	228
7"	229
7.1/4"	230
7.5/8"	231
8"	232
8.1/4"	233
8.5/8"	234
9"	235
9.5/8"	236
10"	237
10.3/4"	238
11.3/4"	239
12"	240
12.3/4"	241
13"	242
13.3/4"	243
14.3/4"	244
16"	245
16.3/4"	246
18"	247
18.5/8"	248
20"	249
21.1/2"	250
24.1/2"	251
26"	252
30"	253
24"	254
14"	255
28"	256
36"	257
32"	258
13.5/8"	259
12.7/8"	260
22"	261
11.7/8"	262
8.3/4"	263
15"	264
9.7/8"	265
8.1/8"	266
17"	267

5.5/7"	268
7.3/4"	269
13.1/2"	270
16.1/3"	311
9.3/8"	312
27"	313
3.3/4"	400
29"	403
18.3/4"	404
17.7/8"	405
13.7/8"	406
14.7/8"	407
42"	408
10.3/8"	409
16.5/8"	410
11"	412
16.7/9"	413
17.1/5"	414
7.1/2"	415

The diameters of the bore codes can be calculated using following formulas:

Size	Formula	Unit
$D < 4.1/2"$	$1.001 \times (D \times 25.4) + 1.88 \text{ mm}$	mm
	$1.001 \times D + 0.074"$	in.
$4.1/2" \leq D < 9.5/8"$	$1.0125 \times (D \times 25.4) + 1.22 \text{ mm}$	mm
	$1.0125 \times D + 0.048"$	in.
$9.5/8" \leq D < 12.7/8"$	$1.0125 \times (D \times 25.4) + 0.89 \text{ mm}$	mm
	$1.0125 \times D + 0.035"$	in.
$12.7/8" \leq D \leq 20"$	$1.0125 \times (D \times 25.4) + 0.56 \text{ mm}$	mm
	$1.0125 \times D + 0.022"$	in.
$20" < D < 42"$	$1.010 \times (D \times 25.4) + 1.90 \text{ mm}$	mm
	$1.010 \times D + 0.075"$	in.
$42" \leq D$	$1.010 \times (D \times 25.4) + 3.18 \text{ mm}$	mm
	$1.010 \times D + 0.125"$	in.

## 1.4 RFID-Chip Equipped Handling Tool Equipment

### INFO



For further information, you may access the Forum/IC Database from the FET Website or at [www.infochip.com](http://www.infochip.com).

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

#### Tier I Access – General Access

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

#### Tier II Access – User Access

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

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

### INFO



For detailed RFID instruction, please refer to Forum Document 1155081, FORUM RFID User Manual („XI Contact worldwide“ on page 11).

#### Frequently Asked Questions (FAQ)

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



# SAFETY

SAFETY

## 2 Safety

### **SAFETY IS EVERYONES RESPONSIBILITY BUT IT STARTS WITH YOU!**

The SDL 150-H is designed and produced with consideration of all required safety precautions. Failure to observe the safety precautions and operating instructions specified in this OMM can lead to hazardous situations when operating the SDL 150-H. While it is not possible to eliminate all hazardous situations with awareness and instruction from this manual, good judgement should be used at all times surrounding the use of this equipment. This equipment should only be used for its intended purpose. Rectify all faults immediately which could have a negative effect on the equipment safety.

### 2.1 General Safety Precautions

Ensure that work on the SDL 150-H, particularly installation, maintenance and repair work, is performed only by personnel with the necessary qualifications and who are familiar with the associated risks („refer to „VI Obligations of the Operating Company“ on page 7).

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

Before switching on and before working on the SDL 150-H always ensure that no one is put in a hazardous situation. All safety features must be installed completely before switching on the SDL 150-H.

Safety features may be released only when:

1. The entire SDL 150-H is switched off and
2. switching back on unintentionally is not possible.

The SDL 150-H contains components subject to wear. After longer periods of operation the safety can be reduced due to wear. Service the SDL 150-H regularly in compliance with the maintenance chart (refer to „6.2 Inspektionen“ on page 62) 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 SDL 150-H 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 SDL 150-H is equipped with various safety features for protection of the operating personnel:

- During operation all moving parts are secured against reaching in by screwed covers.
- The hydraulic lines are connected with safety quick-release couplings.
- Hazard points on the Equipment are marked with signs (refer to „2.3 Safety Precautions“ on page 22), indicating the type and consequences of a hazard as well as measures to prevent it.
- All components, particularly parts requiring replacement during conversion work when changing pipe sizes, are equipped with threaded holes for screwing in load bolts or with fixed load bolts.
- External hoses are provided with a chafe guard.
- Never open the SDL 150-H when load is still suspended by the SDL 150-H.
- » Never remove the safety equipment or replace it with safety equipment not approved by FORUM Handling Tools. Failure to observe this instruction can lead to hazardous situations for which FORUM Handling Tools cannot be held responsible.
- » Always keep all safety equipment in working condition and check integrity regularly.

#### **⚠ DANGER**



All SDL Side Door Elevators are not equipped with a load sensor and can be accidentally opened under load. Please provide a suitable Interlock-query.

### 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.



#### **⚠ Note**

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 Equipment

The safety precautions in this operation manual are indicated using standardized depictions and symbols. Chapter 1 describes general depiction of safety precautions. Concrete examples of the symbols and terms used in this manual are explained below. These are used in the form shown wherever possible hazards are present.



### ⚠ DANGER

#### Suspended load!

This indicates injury risks from transporting heavy components.



### ⚠ DANGER

#### Tipping hazard for components!

This indicates injury risks from tipping components.



### ⚠ WARNING

#### Danger of pinching/crushing hands!

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



### ⚠ WARNING

#### Danger of pinching/crushing feet!

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



### ⚠ WARNING

#### Danger of pinching/crushing body!

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



### ⚠ WARNING

#### Separated hydraulic lines pose an injury hazard!

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



### ⚠ WARNING

#### Defective hydraulic lines pose an injury hazard!

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



### ⚠ WARNING

#### Health hazards from service products!

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



### ⚠ Caution

#### Risk of stumbling/tripping!

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

## 2.5 Safety Precautions for Protection against Remaining Hazards

The SDL 150-H was designed and produced in consideration of the safety precautions specified in EC Directive 2006 / 42 / EU on Machinery.

The SDL 150-H may be used only for:

- Its intended purpose (refer to „Intended Use“ on page 5).
- When it is in a technically safe state.

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

### ⚠ WARNING

#### Mechanically generated sparks

During some troubleshooting tasks, like such as clamping components, the use of metal equipment like hammers can generate sparks.

- The use of metallic equipment like hammers in hazardous areas must 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

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

### 2.5.1 Warning and Safety Instructions on SDL 150-H

Hazard points are indicated by special stickers on the SDL 150-H.

#### INFO

**i** Ensure that warning and safety sign are always present and readable. They must be in an easily legible state and replaced as required. Refer to our Service department with the part numbers given on this page.

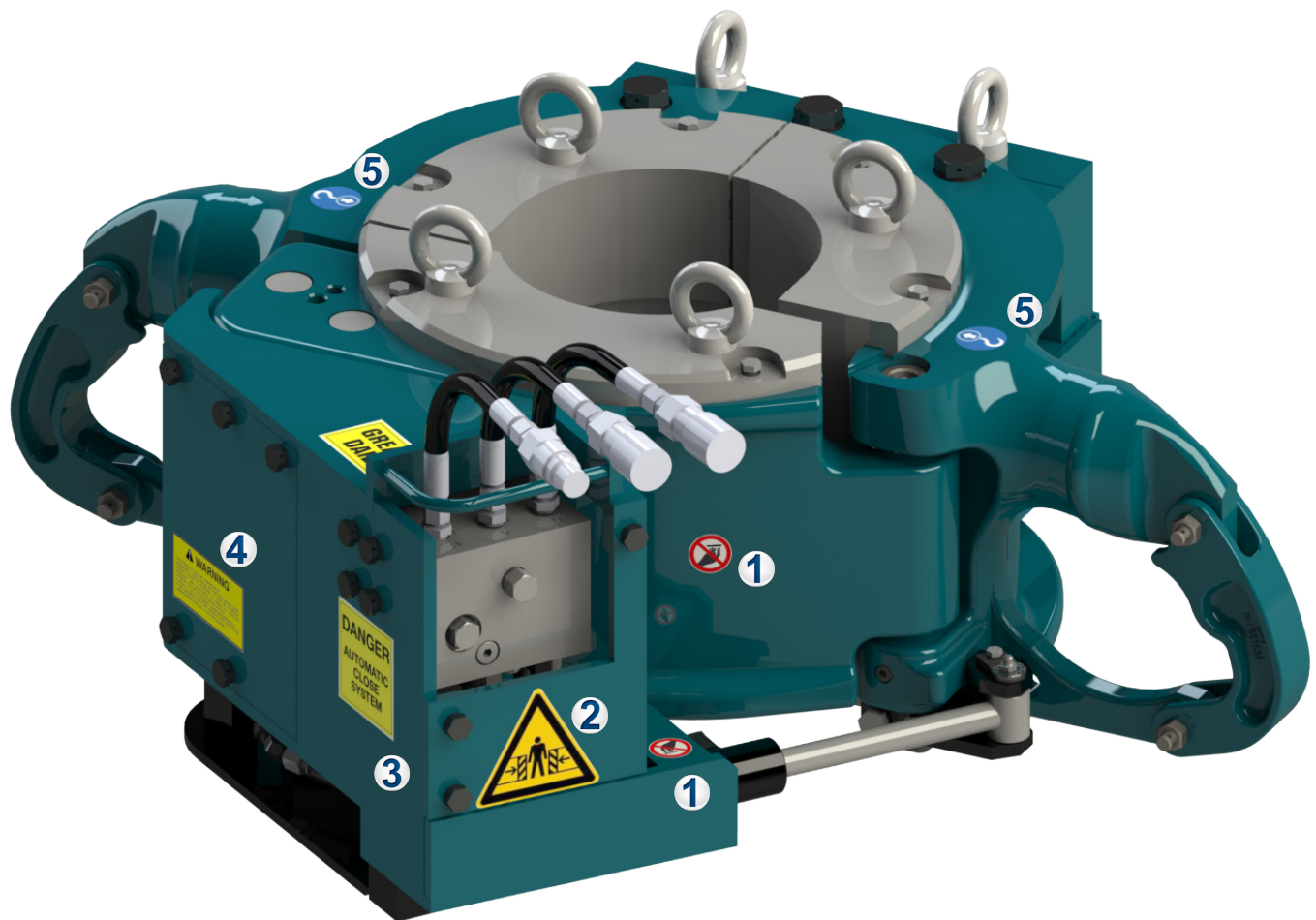


Fig. 10: Warning- and Safety Sign on SDL 150-H

1



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

2



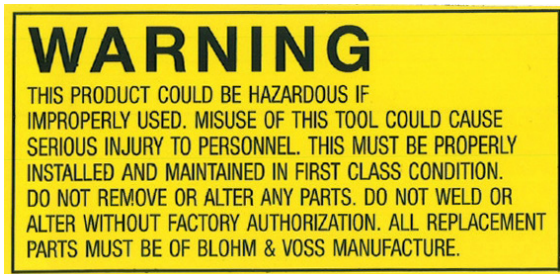
WARNING sign  
 "Body crushing"  
 ANSI Z535.4  
 PN 671641

3



WARNING sign  
 "Closing"  
 ANSI Z535.4  
 P/N 671639

4



WARNING sign  
 General WARNING  
 PN 671638

5



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

## 2.5.2 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 equipment.
- » 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.



### 2.5.3 Risk of Stumbling/Tripping



#### ⚠ Caution

##### **Risk of stumbling/tripping!**

When SDL 150-H is installed and lines are routed openly.  
 » DO NOT run.

The SDL 150-H 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.

### 2.5.4 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.

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

### 2.5.5 Human Error

Ignorance of hazards, inattentiveness and limited reactions can lead to hazard situations while working with the SDL 150-H.

#### Safe Work

1. All personnel working with the SDL 150-H are responsible for paying attention to their colleagues.
2. Consumption of alcohol and drugs is prohibited.
3. Work on the SDL 150-H 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 SDL 150-H, 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 SDL 150-H, must be familiar with and observe the safety precautions in this instruction manual and on the equipment.
7. The instructions for handling and maintenance intervals specified in this OMM must be observed.
8. Keep a copy of this operating manual in the vicinity of the equipment, where it is accessible at all times.

## 2.6 Organisational Measures

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

The required personal protective equipment (refer to „IX Personal Protective Equipment (PPE)“ on page 10) must be provided by the company operating the equipment.

### Personal Protective Equipment

The required Personal Protective Equipment (PPE) must be used when operating the SDL 150-H. 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 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 equipment immediately.
2. Administer first-aid.
3. Alarm rescue services and fire department immediately and inform supervisor.

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



# TRANSPORT/ SETUP

TRANSPORT/  
SETUP

### 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 SDL 150-H and putting it into service.

#### 3.1 Delivery

The SDL 150-H and all accessory parts are shipped in a transport crate/pallet. Instructions for safe transport are attached to the transport crate/pallet. Transport the packed /stored SDL 150-H as specified in this OMM.

##### 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 Handling Tools representative („XI Contact worldwide“ on page 11).

The scope of delivery includes all components required for the intended operation of the SDL 150-H.

#### 3.1.2 Unpacking and Disposal of Packing Material

1. Remove the transport packaging and transport aids before lifting the SDL 150-H.
2. If damages have appeared during the transport or in the event of an incomplete delivery, please contact FORUM Handling Tools or one of its representations („XI Contact worldwide“ on page 11).
3. Dispose the packaging material in an environmentally friendly manner according to applicable regulations.

#### 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.

#### 3.1.3 Intermediate Storage

If intermediate storage of the SDL 150-H is necessary, observe the following:

- Leave the SDL 150-H in the transport packaging or on the transport pallet. This provides sufficient protection against external influences.
- Secure the SDL 150-H to prevent it from Slipping or falling due to motion.

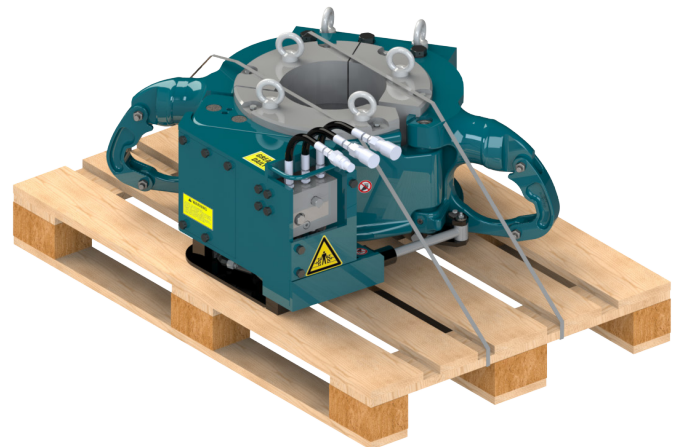


Fig. 11: Secured SDL 150-H

### 3.2 Transport

#### **⚠ DANGER**



#### **Suspended load!**

The falling load can cause severe, even lethal injuries.

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



WEAR PROTECTIVE HELMET!



WEAR PROTECTIVE GLOVES!



WEAR SAFETY SHOES!

#### **⚠ NOTE**

#### **Safe Lifting Points!**



- Lifting point locations, especially bores for load hooks are marked on the SDL 150-H.
- Make Sure all load hooks are fully installed in the lifting point
  - » Thus, the safe transport of FORUM Handling Tools equipment is ensured.

#### **⚠ NOTE**



#### **Internal transport on site!**

- » Use a pallet for transport.

### Principles for Transport

1. Ensure that transport routes are sufficiently dimensioned.
    - » All personnel must be aware that a transport is taking place.
  2. Always use pallets for longer transport distances.
  3. The total weight (object to be transported + means of transport, e.g. forklift) may not exceed the supporting capacity of the subsurface.
  4. Ensure that such work is performed only by sufficiently qualified personnel.
  5. Before any transport, put the SDL 150-H out of operation and secure it against unintentional operation.
  6. Ensure that visual and audio contact exists between the crane operator and operating personnel.
  7. Secure the area against unauthorized entry.
    - » If necessary mark the area with information signs to warn of maintenance and repair work.
  8. Secure moving parts in suitable manner.
  9. Use only approved slinging and transport equipment, which is in perfect condition and suitable for the intended purpose. Observe specified load limits.
  10. Secure equipment against slipping/sliding.
    - » Observe equipment weight.
    - » Observe center of gravity.
  11. Never stand under suspended loads.
  12. Transport the equipment carefully.
    - » Do not fasten, lift or pull equipment on parts, that could be damaged.
    - » Avoid sudden stops.
  13. Always use hoisting equipment (slings, hoisting cables, shackles, etc.), which has been inspected and is sufficiently dimensioned.
  14. Ensure that all installation and hoisting procedures are accomplished in compliance with recognized rules of practice and industrial standards.
- 
- Please refer to „1.3 Technical Data“ on page 15, for detailed weight specifications.

### 3.3 Lifting arrangements

This chapter is indicated to show save lifting arrangements for the main assemblies. It may show the SDL 150-H in different assembled states, refer to the suitable set-up chapter for assemble tasks.

#### Hoist the equipment safely

1. Attach the SDL 150-H only at the attachment points provided for transport.
  - » FORUM Handling Tools recommends to use slings („Fig. 11: Lifting points of the SDL 150-H“ on page 32).
2. Only use appropate lifting material with a load carrying capacity suitable for the necessary weight.
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 SDL 150-H where slings can be securely fastened. Thus, the safe transport of FORUM Handling Tools equipment is ensured.

#### DANGER

##### Safe Lifting!

- » Always Make sure that the load hooks are fully installed in the lifting points before lifting the SDL 150-H.

#### DANGER

##### Suspended load!

The falling load can cause severe, even lethal injuries.

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

#### Procedure

1. Attach hoisting equipment to the attachment points of the SDL 150-H. Lifting points on all SDL Side Door Elevators are the Elevator-Ears.
2. Lift the SDL 150-H slowly until the hoisting ropes are tensioned.

**WARNING** Risk of injuries due to swinging loads! Make sure that nobody is in the swinging area of the SDL 150-H.

3. Lift the SDL 150-H.
4. Transport the SDL 150-H to the installation area.
5. Place the SDL 150-H on the ground securely and remove all hoisting equipment.

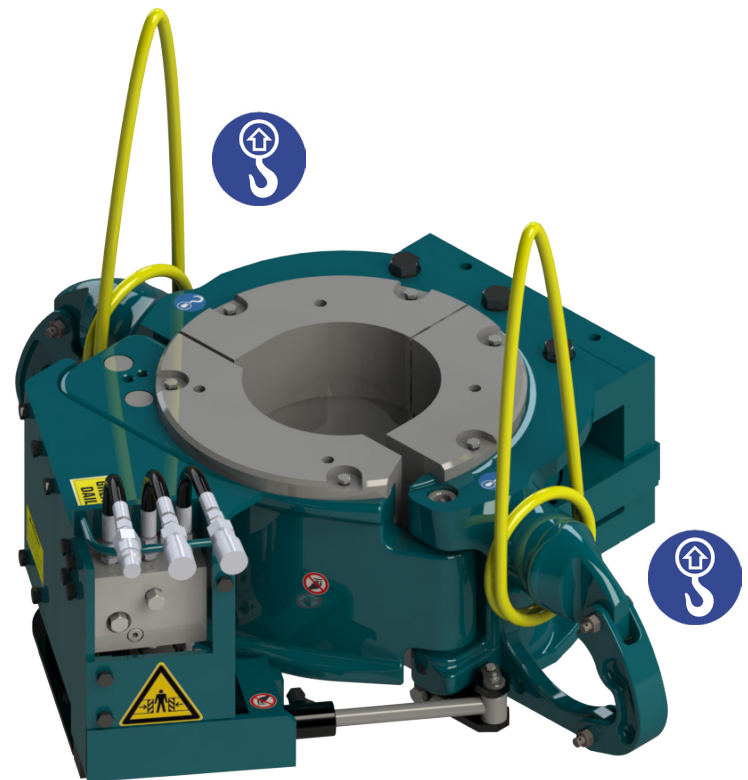


Fig. 12: Attachment points of the SDL 150-H



### 3.4 Mounting the SDL 150-H to the Elevator Links

The SDL 150-H is completely assembled and can be installed directly at the installation site after unpacking.

#### Preparation

1. Remove the transport packaging and transport aids before lifting the SDL 150-H.
2. Position the SDL 150-H next to the Elevator Links.

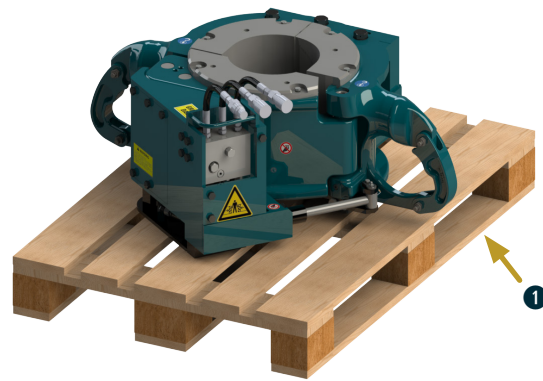


Fig. 13: Installation step I

#### Process

1. Place the SDL 150-H on a flat surface (pallet) ①.
2. Open the Link Adapter. Remove the cotter pins and loosen the top screws of the Link Blocks ②.

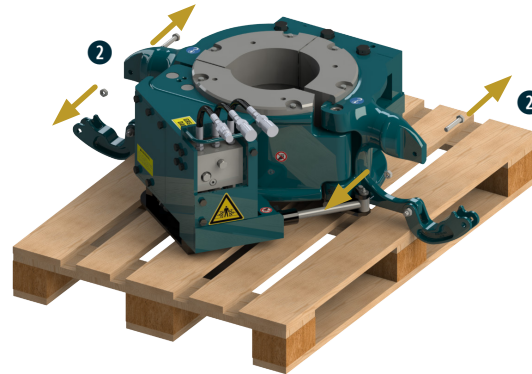


Fig. 14: Installation step II

3. Open the Link Blocks with a downward movement ③.
4. Carefully guide the link to the elevator ④. Make sure, the Elevator Link is mounted and placed correctly.



Fig. 15: Installation step III

5. Move up the Link Blocks ⑤ and mount the Link Block screws ⑥.
6. Tighten the screws slightly and secure them with a new cotter pin.

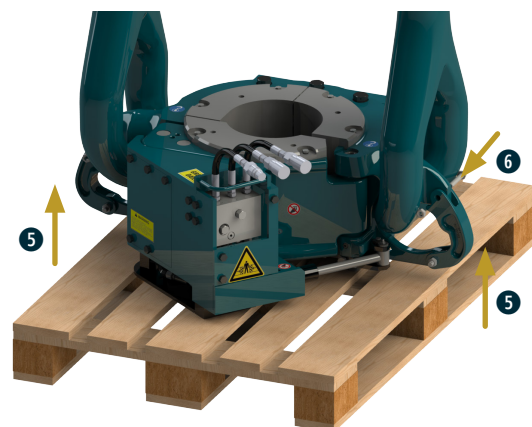


Fig. 16: Installation step IV

#### **⚠ WARNING** Pinching and crushing!

The Elevator Links must be handled and guided from the outside of the lifting ear opening of the SDL 150-H. Use ropes to adjust the Elevator Links.

### 3.5 Connecting the Hydraulic System



Ensure that work on hydraulic equipment is accomplished only by sufficiently qualified and trained personnel.



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

#### **⚠ 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!

#### **INFO**



#### **Bleeding**

The hydraulic system in the SDL 150-H is bled at the factory. Ensure that the rig's own supply connections are bled before connecting the SDL 150-H.

#### **Characteristics**

<b>Operating Pressure</b>	80 - 160 bar (1160 - 2320 psi)
<b>Volume Flow</b>	8 l/min (2,1 gpm) bis 12 l/min (3,1 gpm)

#### **Connections:**

<b>Connection A:</b>	The hydraulic pressure at port <b>A</b> closes the elevator.
<b>Connection B:</b>	The hydraulic pressure at port <b>B</b> opens the elevator.
<b>Connection C:</b>	When the SDL 150-H is fully closed by port <b>A</b> , port <b>C</b> will be affected by a hydraulic pressure (feedback signal) at approximately the working pressure.

#### **Working speed adjustment**

The opening / closing speed can be adjusted with the two throttle valves on the top of the hydraulic block.

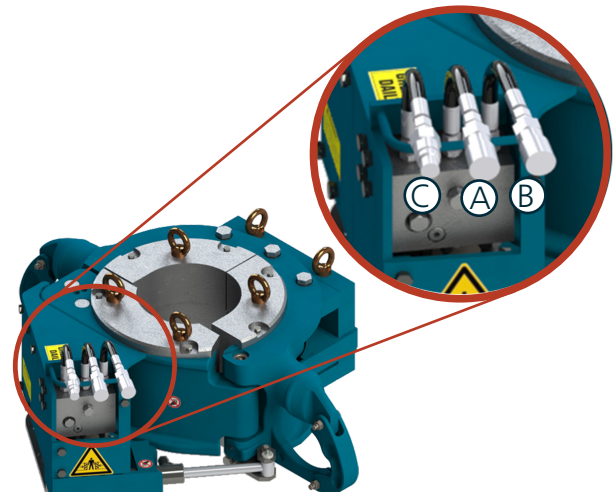


Fig. 17: Hydraulic Connections on SDL 150-H

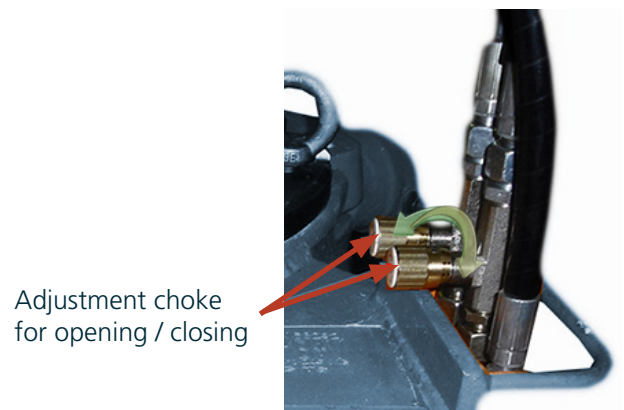


Fig. 18: Adjustment location SDL 150-H

TRANSPORT/  
SETUP



### 3.6 Installation-Checklist

**⚠ WARNING** The SDL 150-H may only be lifted at the intended attachment points.

**⚠ WARNING** Always wear your complete personal protective equipment.

#### General

OK  All screws, bolts and nuts are secured and tightened.

OK  No visual damages can be detected.

OK  The correct Wear-Bushing size is used.

OK  [All cylinders are secured and tightened.]

OK  [The correct working pressure has been set.]

#### [Connections]

OK  All supply lines are connected to the SDL 150-H.

OK  All connections are mounted correctly.

OK  No leaks on hoses and hydraulic components.

#### Function test

The function test can be done in two ways :

1. SDL 150-H placed on the ground.
2. SDL 150-H mounted to Elevator Links.

OK  Close the SDL 150-H.

OK  Open the SDL 150-H.

OK  SDL 150-H closes and locks properly.

OK  Full feedback signal after closing the SDL 150-H.

OK  All Tools/objects have been removed from SDL 150-H.

**[This] page [is] intentionally left blank**



# COMMISSIONING/ OPERATION

COMMISSIONING/  
OPERATION

## 4 Commissioning and Operation



Ensure that operation and commissioning work are accomplished only by sufficiently qualified and trained personnel.



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

### INFO



FORUM Handling Tools recommends having the SDL 150-H put into service by FORUM Handling Tools.

### 4.1 Commissioning

#### **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**

##### **Separated hydraulic lines pose an injury hazard!**

- » Do not fix any disconnected hydraulic lines without depressurizing the complete hydraulic system and all hydraulic lines and couplings.

#### **WARNING**

##### **Defective hydraulic lines pose an injury hazard!**

- » Protect yourself from leaks.

#### **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.

#### **DANGER**

##### **Suspended load!**

The falling load can cause severe, even lethal injuries.

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

#### **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.

#### **DANGER**

All SDL Side Door Elevators are not equipped with a load sensor and can be accidentally opened under load. Please provide a suitable Interlock-query.



### 4.1.1 Safety Considerations

#### **Safety considerations for operation**

1. Do not touch the SDL 150-H while in operation.
2. During operation keep a safe distance from the SDL 150-H.
3. Before initial start-up and before every start of operation, check for the proper function of the Feedback signals (if applicable) in order to avoid accidents during operation!

### 4.1.2 Safety Checks before Initial Operation

#### Safety checks before initial operation

1. All covers are attached and completely screwed down.
2. All screw connections tightened properly.
3. All screw retainers are present.
4. Serial numbers of bushings are identical (matching 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 (siehe „6.1 Lubrication“ auf Seite 61).



WEAR EYE PROTECTION!



WEAR PROTECTIVE HELMET!



WEAR PROTECTIVE GLOVES!



WEAR SAFETY SHOES!

#### Safety Check Procedure

- Ensure that required operating data has been 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 SDL 150-H opens and closes by hydraulic pressure.
2. Check feedback signal indicates SDL 150-H is 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. Pick up a pipe and check for correct seat of the pipe.

#### Hydraulic Characteristics

**Working Pressure** 80 bar to 160 bar (1160 psi to 2320 psi)

**Required Flow rate** 8 l/min (2,1 gpm) to 12 l/min (3,1 gpm)

#### Couplings:

Opening line - 3/8" coupling

Closing line - 3/8" coupling

Feedback line - 1/4" coupling

### 4.1.3 Commissioning-Checklist

FORUM Handling Tools recommends to accomplish the SDL 150-H commissioning with the FORUM Handling Tools Commissioning Service.

OK  Crew is aware of all dangers, regarding handling the FORUM Handling Tools SDL 150-H.

OK  Went through OMM with crew.

Prior to use of the FORUM Handling Tools SDL 150-H following checks must be carried out :

#### Scope of supply

OK  Cross check all delivered parts.

#### Hydraulic Characteristics

OK  Operating pressure. [80 (1160 psi) to 160 bar (2320 psi)]

OK  Volumetric flow. [8 l/min (2,1 gpm) to 12 l/min (3,1 gpm)]

OK  All Hydraulic Supply lines are connected.

#### General Check and Lubrication

OK  Installation Checklist filled out completely and signed.

OK  SDL 150-H is lubricated as recommended by FORUM Handling Tools.

OK  Check if SDL 150-H is installed as outlined in OMM.

#### Function Test

OK  SDL 150-H opens and closes by hydraulic pressure.

OK  Feedback signal indicates SDL 150-H is closed and latched.

OK  Required Wear-Bushings are installed before first use.

OK  All Wear-Bushing segments are of the same size and serial number.

OK  Bushings are fixed correctly.

OK  Pick up a pipe.

OK  Feedback signal is given when the SDL 150-H is closed and latched.

## 4.2 Operation



Ensure that operation and commissioning work are accomplished only by sufficiently qualified and trained personnel.



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



WEAR EYE PROTECTION!



WEAR PROTECTIVE HELMET!



WEAR PROTECTIVE GLOVES!



WEAR SAFETY SHOES!

## 4.3 Opening / Closing the door

The SDL 150-H is controlled by hydraulic cylinders (interlock and door cylinders) and sequence valves.

### 4.3.1 Opening

#### Pressure at port B

1. The Latch is opened by the Latch-Cylinder.
2. The Sequence-Valves guarantee the correct opening sequence. The Latch opens before the door.
3. The Door-Cylinder opens the door.

### 4.3.2 Closing

#### Pressure at port A.

1. The door cylinder closes the door.
2. The Sequence-Valves guarantee the correct closing sequence. The Door closes before the Latch.
3. The Latch-Cylinder closes the Latch.
4. A Feedback signal (110 bar to 210 bar) will indicate, that the SDL 150-H has been closed and latched

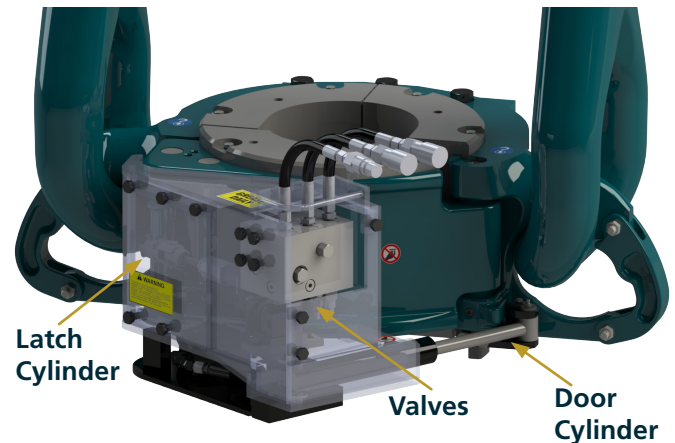


Abb. 19: SDL 150-H with hydraulic components (closed)



Abb. 20: SDL 150-H opened

### 4.3.3 Feedback Valves

Dependencies of the Feedback signals

„LATCH PIN SET“ (Secured)	Activated, when the door (Ground Valve) collides with the locking pin.
„LATCH CLOSED“ (Closed)	Activated, when the Latch collides with the Latch Actuation (Upper Valve).

#### 4.4 Installation and removal of Wear-Bushings

The installation of the Wear-Bushings is described by way of example on a selected Bushing segment.

##### Installation - Preparation

1. Open the SDL-150 H.
2. Turn off the hydraulic supply.
3. Disconnect the SDL 150-H from all hydraulic supply lines.

##### Installation - Procedure

1. Clean installation area of the Wear-Bushings (Interior of the SDL-150 H) ① ②.
2. Lubricate all supporting- and sliding surfaces, carefully ① ②.

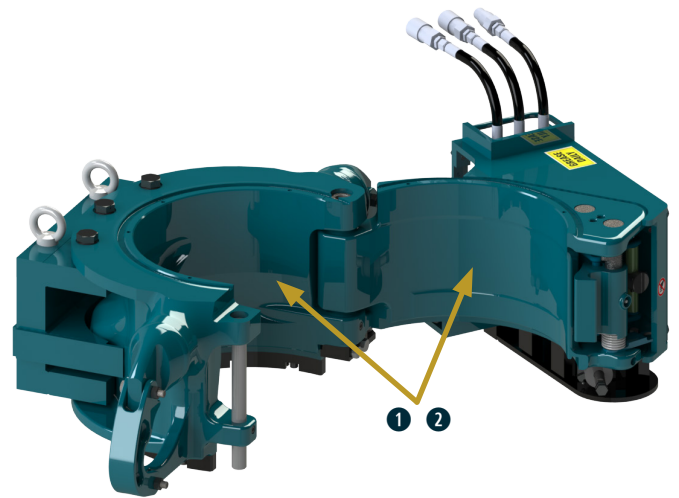


Abb. 21: Installation step I

3. Screw both eye bolts into the attachment points of the Wear-Bushing segment ③.
4. Lift the Wear-Bushing segment slightly and position it next to the SDL 150-H.
5. Make sure the Wear-Bushing segment is in balance.



Abb. 22: Installation step II

6. Gently push the segment onto the sliding surface ④.
7. Make sure that the segment is not wedged up or down.
8. Make sure that the segment is held and fixed by the top and bottom guides.

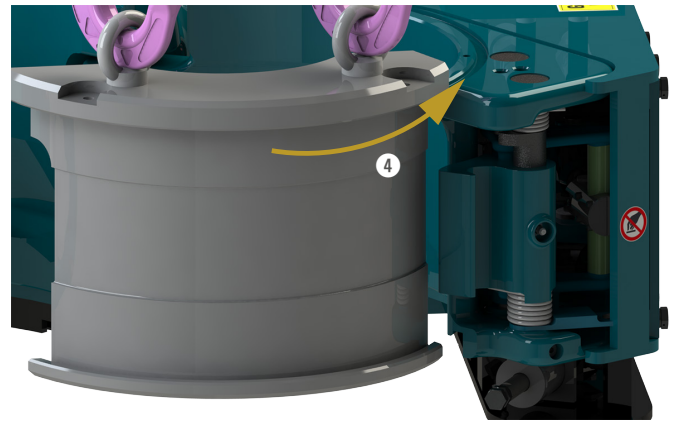


Abb. 23: Installation step III

9. Push the segment onto the segment holder until the respective holes of the Wear-Bushing segment and the SDL 150-H overlap.
10. Secure the Wear-Bushing segment with wedge lock washers and screws ⑤.
11. Remove the slings and eyebolts.

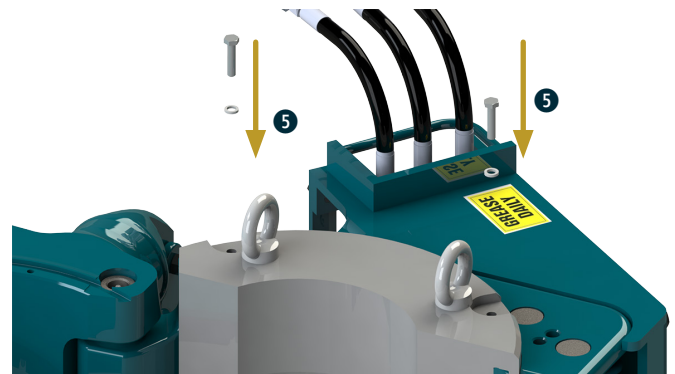


Abb. 24: Installation step IV

### Removal - Preparation

1. Open the SDL-150 H.
2. Turn off the hydraulic supply.
3. Disconnect the SDL 150-H from all hydraulic supply lines.

### Removal - Procedure

1. Repeat steps 1 to 11 in reverse order.

## 4.5 Adjustments at the Valve block

### Valve ① - Sequence Valve „Open“

- ☞ Reduces necessary pressure to switch the valve. Latch will open earlier.
- ☞ Increases necessary pressure to switch the valve. Latch will open later.

### Valve ② - Sequence Valve „Close“

- ☞ Reduces necessary pressure to switch the valve. Latch will close earlier.
- ☞ Increases necessary pressure to switch the valve. Latch will close later.



Abb. 25: Valve block



## 4.6 Troubleshooting

Common symptoms	Useful steps for troubleshooting										Further Help		
	Has the correct working pressure set?	All sequence valves are adjusted correctly?	Are damages recognizable to hydraulic lines?	There is dirt or other objects in the working area?	Signs of wear to Hinge pins, Latch pins or bores?	SDL 150-H is not closed completely?	Worn Wear-Bushings?	Are there loose or damaged valves, cylinders or fittings?	The correct pipe size is in use?	Damages to mechanical assemblies?		All lubrication points are lubricated?	Blocked lubrication nipples?
SDL 150-H does not open.	✔	✔	✔	✔				✔		✔			!
SDL 150-H does not close.	✔	✔	✔	✔				✔		✔			!
No Feedback Signal.			✔	✔		✔		✔					!
Wrong opening sequence.	✔	✔											!
Wrong closing sequence.	✔	✔											!
Elevator opens/ closes not gently.	✔	✔	✔	✔	✔			✔		✔			!
Latch opens/ closes not gently.	✔	✔	✔	✔	✔			✔		✔			!
Lubrication not possible.											✔		!
Hinge and Latch pin can not be drawn.					✔					✔	✔		!
The SDL 150-H holds the drill pipe irregular.					✔		✔		✔				!



FORUM Handling Tools recommends to follow this step in case of unsolvable problems!



FORUM Handling Tools recommends to follow this shown step.

**NOTE** Due to the complexity of the SDL 150-H, this table does not show all possible fault symptoms. As different symptoms may occur in combination, it is necessary to go through troubleshooting in a useful order.

**WARNING** Due to the complexity of this type of equipment, FORUM Handling Tools recommends that the operator contact FORUM Technical Support prior to lengthy troubleshooting activity. Contact technical support, even if there are only single components or assemblies which have to be replaced!

**WARNING** Always follow the recommend safety notes while troubleshooting.

- Do not perform any troubleshooting while the equipment is under load.
- Do not forget to switch off and relieve pressure before installing new components or manometer.
- Do not make any form of reparation, expansion or changes which are not recommend and supported by FORUM Handling Tools.

# SERVICE

SERVICE

## 5 Service

### INFO



Operational safety and readiness of the SDL 150-H does not only depend on your personal skills, but also on maintenance and servicing of the SDL 150-H. Insist on using original spare parts when carrying out maintenance and repair work. This ensures operational safety and readiness of your equipment, and maintains its value.

### 5.1 Malfunction

If a malfunction occurs or the SDL 150-H does not operate as expected, trouble shoot as follows:

If the cause of the malfunction cannot be determined and remedied, contact FORUM Handling Tools Technical Support.

1. Check hydraulic connections and hydraulic lines.
2. Check whether the hydraulic unit is switched on.
3. Check whether the correct Wear-Bushing size has been installed for the size/type of pipe used.
4. Check for proper lubrication of the SDL 150-H.
5. Check feedback for proper function.
6. Collect all information on the malfunction and define the problem.
7. Attempt to find a quick solution to the problem.
8. Check the last changes/modifications.
9. Isolate the problem.
10. Replace any defective components.

### INFO



In the event of problems, which cannot be remedied with the aid of this OMM, please contact the FORUM Handling Tools Technical Support or one of the authorized service companies (refer to „XI Contact worldwide“ on page 11).

## 5.2 Repair

### 5.2.1 Repair by Customer

It is only permissible for the customer/company operating the equipment to replace defective parts with OEM (Original Equipment Manufacturer) parts approved by FORUM Handling Tools in conformance with the present operating instructions. Use of parts not approved by FORUM Handling Tools voids the guarantee.

### 5.2.2 Repair by Manufacturer

Ensure that any repair work required on the SDL 150-H is performed only by FORUM Handling Tools or an authorized service company.

### INFO



Please contact the FORUM Handling Tools Technical Support or one of the authorized service companies (refer to „XI Contact worldwide“ on page 11) to perform repair or maintenance work.

### 5.2.3 Securing Screws with Wedge-Locking washers

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

When the pushed movements of the equipment 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.

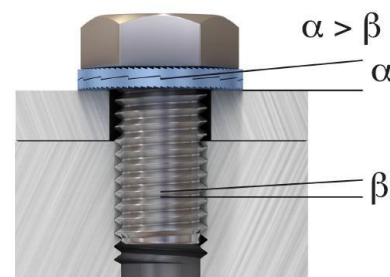


Fig. 26: Wedge-Locking Washer principle illustration

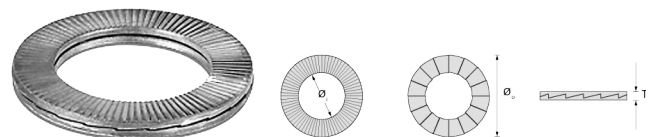


Fig. 27: Wedge-Locking Washer detailed illustration

### Wedge-Locking Washer specified torques

Several Wedge-Locking style bolt securing systems are used on the SDL 150-H to generate safely locked bolted joints. Regarding the fact that different sizes and grades are used detailed information is given in the annex (refer to „B. Third Party Documents“ on page 78) to generate safe maintenance by the user. If the tightening torque needed to fasten a screw/nut is not explicitly written in this manual, please check the screw/nut head and refer to the annex in order to find the required fastening torque:

The grade and make of the bolt can be seen on top or on the side of the bolt / nut. The tightening torques can be found via third party document in the annex.

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

### INFO



As a result from tests, the Wedge-Locking style washers were safely secured even after reuse 30 times. Make visual inspection of the washers during every maintenance. Make sure that the cams (cam tops) are not damaged or rounded and that the teeth are not worn off. Lubricate the joint and the mating surfaces if possible so that the friction conditions do not change. When reassembling, care should be taken that the two washer halves are mated correctly. If all these criteria are met, the washers can be safely reused.

## 5.3 Drawing, Parts Break Down and Spare Parts

### INFO



Please contact the FORUM Handling Tools Technical Support or one of the authorized service companies (refer to „XI Contact worldwide“ on page 11) to order replacement parts or in the event of any questions.

5.3.1 651520-Y-BC-H SDL 150-2-H, 651530-Y-BC-H SDL 150-3-H

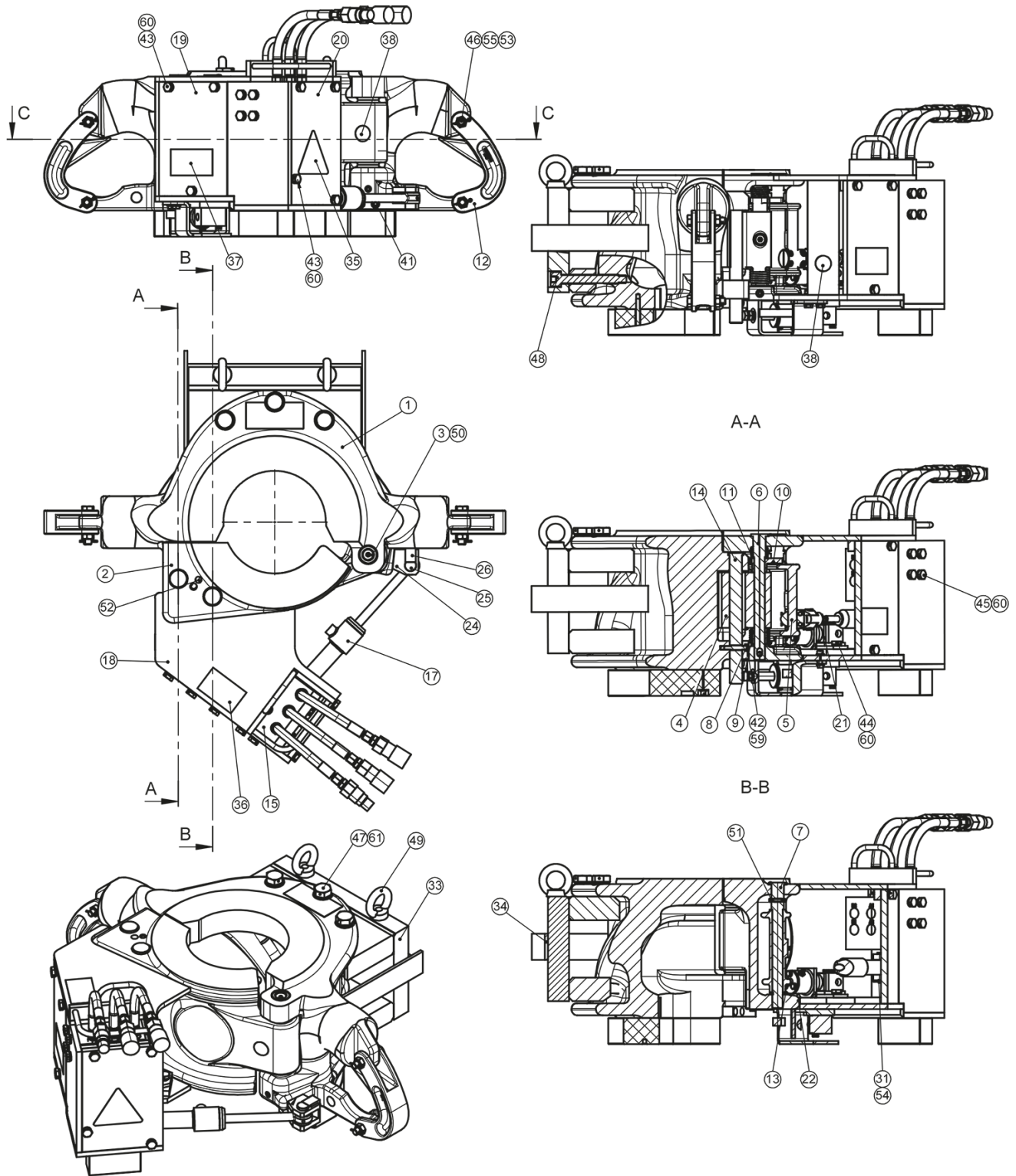


Fig. 28: Drawing I

SERVICE

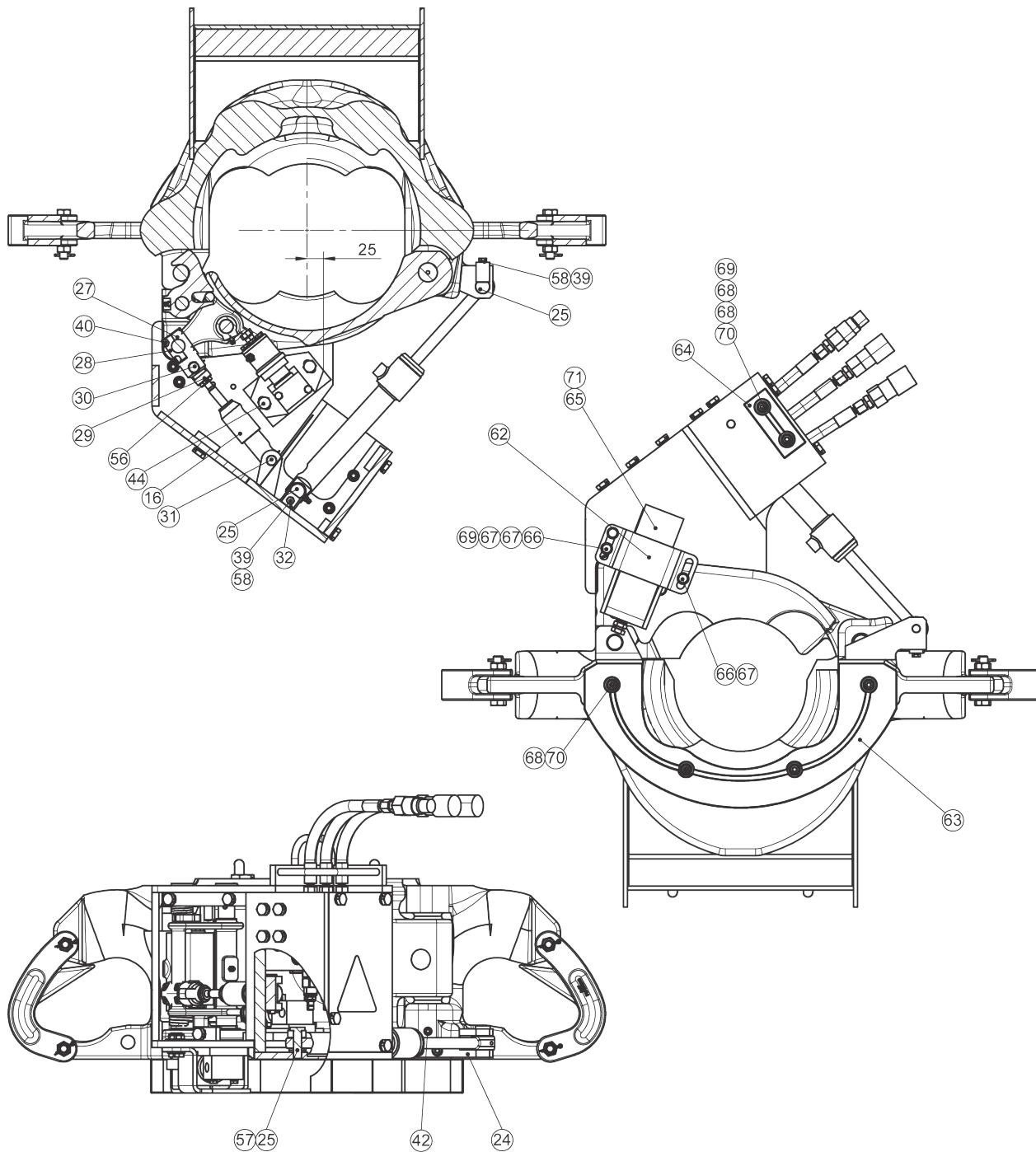


Fig. 29: Drawing II

**Parts list**

Pos.	Qty.	P/N	Description
1+2	2	651520	Body And Door
3	1	651523	Hinge Pin
4	1	651524	Latch
5	1	651525-H	Latch Handle
6	1	651527	Latch Pin
7	1	651527-1	Latch Handle Pin
8	1	651528	Latch Spring
9	1	651534	Latch Spring Bushing
10	1	651526	Latch Handle Plate
11	1	651529	Handle Plate Spring
12	2	651513	Link Block
13	1	651527-2	Stopper Plate
14	1	651521-2	Catch Pin

Pos.	Qty.	P/N	Description
15	1	651537	Hydraulic Block
16	1	651502	Hydraulic Cylinder
17	1	651503	Hydraulic Cylinder
18	1	651504	Hydraulic Box
19	1	651504-1	Sheet 1
20	1	651504-2	Sheet 2
21	1	651505	Pestle Assembly
22	1	651505-6	Distance Sheet
23	1	651506	Hydraulic Assembly
24	1	651508	Flange 1
25	2	651507	Bolt 1
26	1	651509	Securing Angle
27	1	651539-1	Flange 1
28	1	651539-2	Flange 2
29	1	651539-3	Flange 3
30	1	651539-6	Bolt 2
31	1	651539-7	Bolt 3
32	1	642509-5	Securing Sheet 1
33	1	651529-8	Counterweight
34	1	651529-9	Securing Welding Plate
35	1	671641	Warning Sign "Squeeze Danger"
36	1	671642	Warning Sign "Grease Daily"
37	1	671638	Warning Sign
38	2	611524	Warning Sign "Don'T Touch"
39	2	612671	Screw
40	4	651539-10	Screw
41	2	613905-7	Screw
42	3	651517	Screw
43	7	613899	Screw
44	2	645198	Screw
45	4	725461	Screw
46	4	651530-1	Screw
47	3	613854-1	Screw
48	2	756731	Screw
49	2	755402	Lifting Eye Bolt
50	3	756790	Lubricating Nipples
51	1	70123	Spring-Type Straight Pin
52	1	651529-1	Grooved Pin
53	4	80340-1	Split Pin
54	2	620609	Split Pin
55	4	612690	Nut
56	1	645675	Nut
57	2	651505-7	Washer
58	2	792111	Washer
59	3	792112	Washer
60	13	792103	Washer
61	3	792108	Washer
62	1	651584	Cover Plate
63	1	651580	Pedestal
64	1	651582	Pedestal
65	2	642518	Pestle Assembly
66	3	645671	Screw
67	5	792112-1	Washer
68	9	651585	Washer
69	5	675057	Nut
70	6	755327-2	Screw
71	2	645054	Screw



5.3.2 651530-Y-VES-H, VES SDL 150-3-H

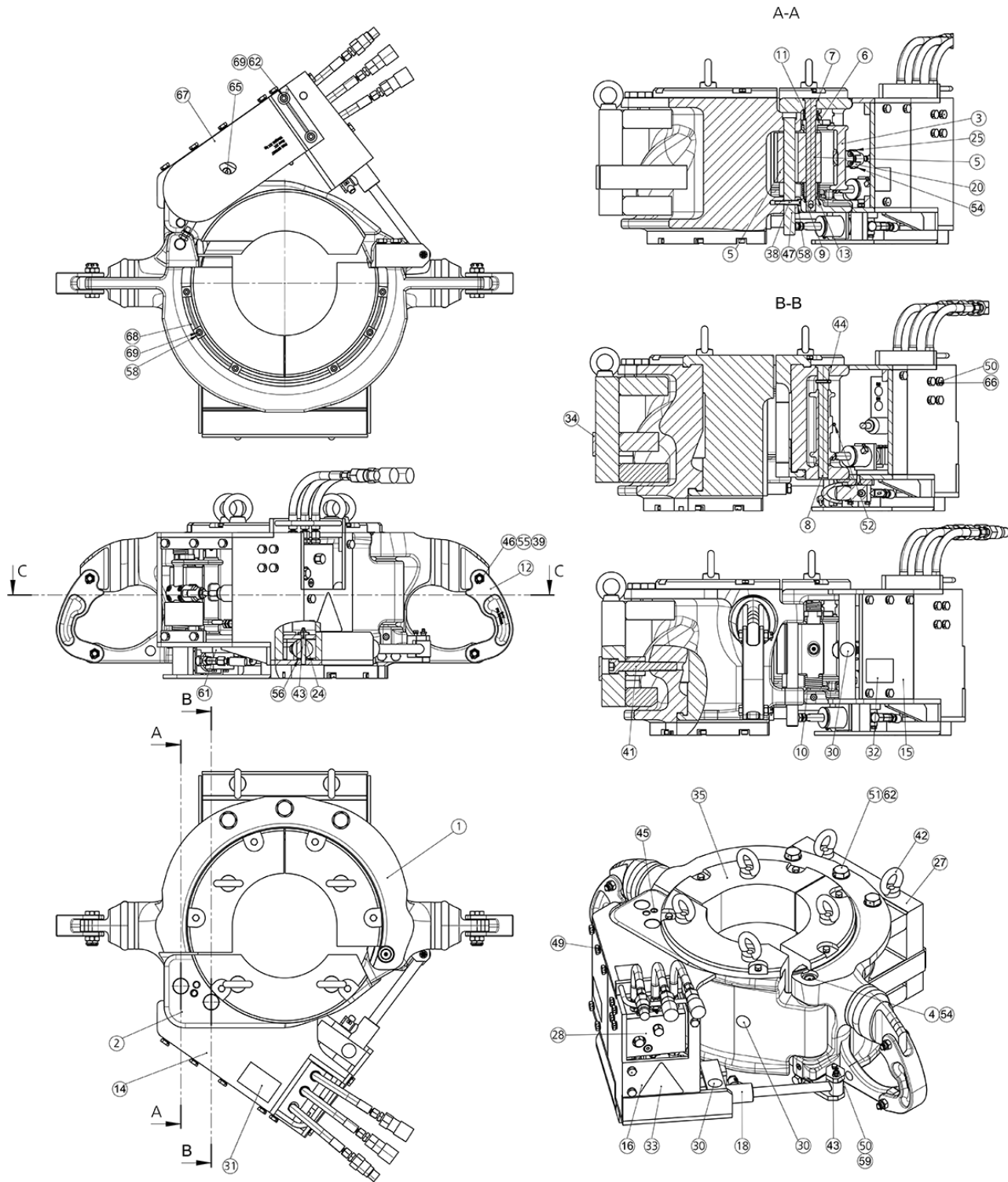


Fig. 30: Drawing I

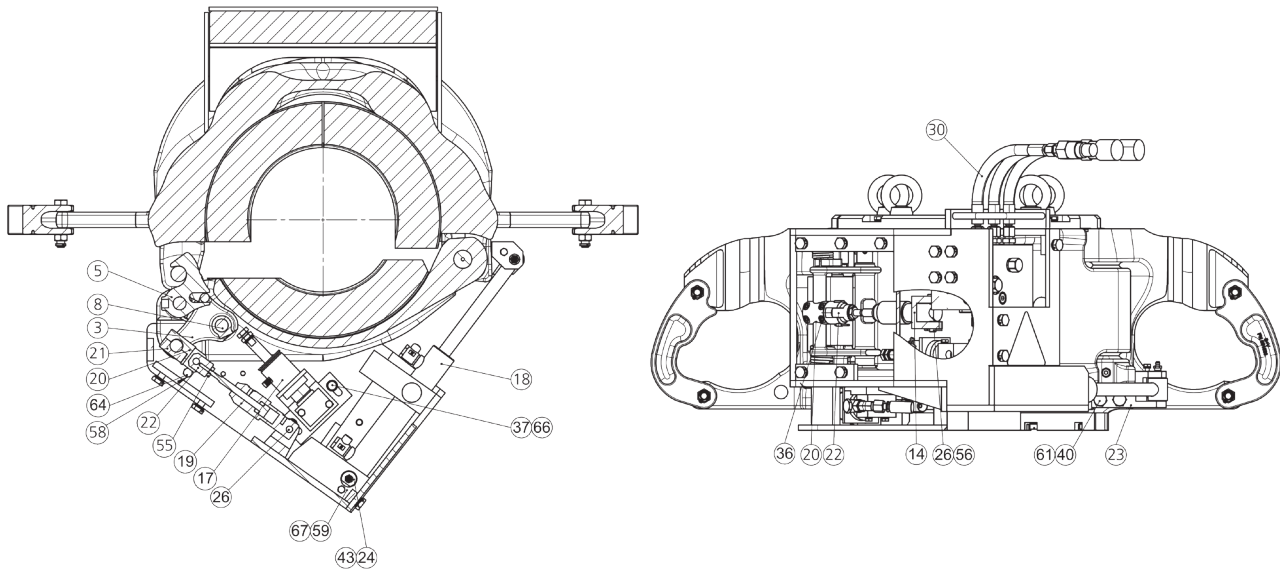


Fig. 31: Drawing II

**Parts list**

Pos.	Qty.	P/N	Description
1	1	651531-VES-H	Body
2	1	651532-VES-H	Door
3	1	651525	Latch
4	1	651523	Hinge Pin
5	1	651524	Latch
6	1	651526	Latch Handle Plate
7	1	651527	Latch Pin
8	1	651527-1	Latch Handle Pin
9	1	651528	Latch Spring
10	1	651534	Latch Spring Bushing
11	1	651529	Handle Plate Spring
12	2	651533	Link Block
13	1	651527-2	Stopper Plate
14	1	651535-1	Hydraulic Box Assembly
15	1	651535-2	Sheet 1
16	1	651535-3	Sheet 2
17	1	651538	Pestle Assembly
18	1	651501	Hydraulic Cylinder
19	1	651502	Micro Cylinder
20	1	651539-1	Flange 1
21	1	651539-2	Flange 2
22	1	651539-3	Flange 3
23	1	651539-4	Flange 4
24	1	651539-5	Bolt 1
25	1	651539-6	Bolt 2
26	1	651539-7	Bolt 3
27	1	651539-8	Counterweight
28	1	651537	Hydraulic Block
29	1	651537-1	Hydraulic Assembly
30	3	611524	"Warning sign ""don't touch"""
31	1	671642	"Warning sign Grease Daily"
32	1	671638	"Warning sign FORUM"
33	1	671641	Warning sign "squeeze danger"
34	1	651539-12	Securing weld plate
35	1	651536-234	Bushing for SDL 150-3
36	4	651539-10	Screw
37	2	735852	Screw
38	3	651517	Screw
39	4	651530-1	Screw
40	2	645029	Screw

SERVICE

Pos.	Qty.	P/N	Description
41	2	756731	Screw
42	2	755402	Ring Bolt
43	2	70064	Grease Fitting
44	1	70123	Clamping pin
45	1	651529-1	Grooved Pin
46	4	612690	Nut
47	1	651521-2	Catch Pin
48	2	612671	Screw
49	8	613899	Screw
50	4	725461	Screw
51	3	613854-1	Screw
52	3	756790	Grease Fitting
53	4	80340-1	Split pins
54	2	620609	Cotter Pin
55	1	645675	Nut
56	1	621432	Washer
57	2	792111	Washer
58	10	792112	Washer
59	2	792104	Washer
60	3	792108	Washer
61	1	642518	Pestle Assembly
62	2	651588	Screw
63	3	792112-1	Washer
64	1	645671	Screw
65	2	645054	Screw
66	14	792103	Washer
67	1	651587	Pedestal with cover
68	1	651586	Pedestal
69	6	774518-4	Screw

5.3.3 651537-1 Hydraulic Assembly

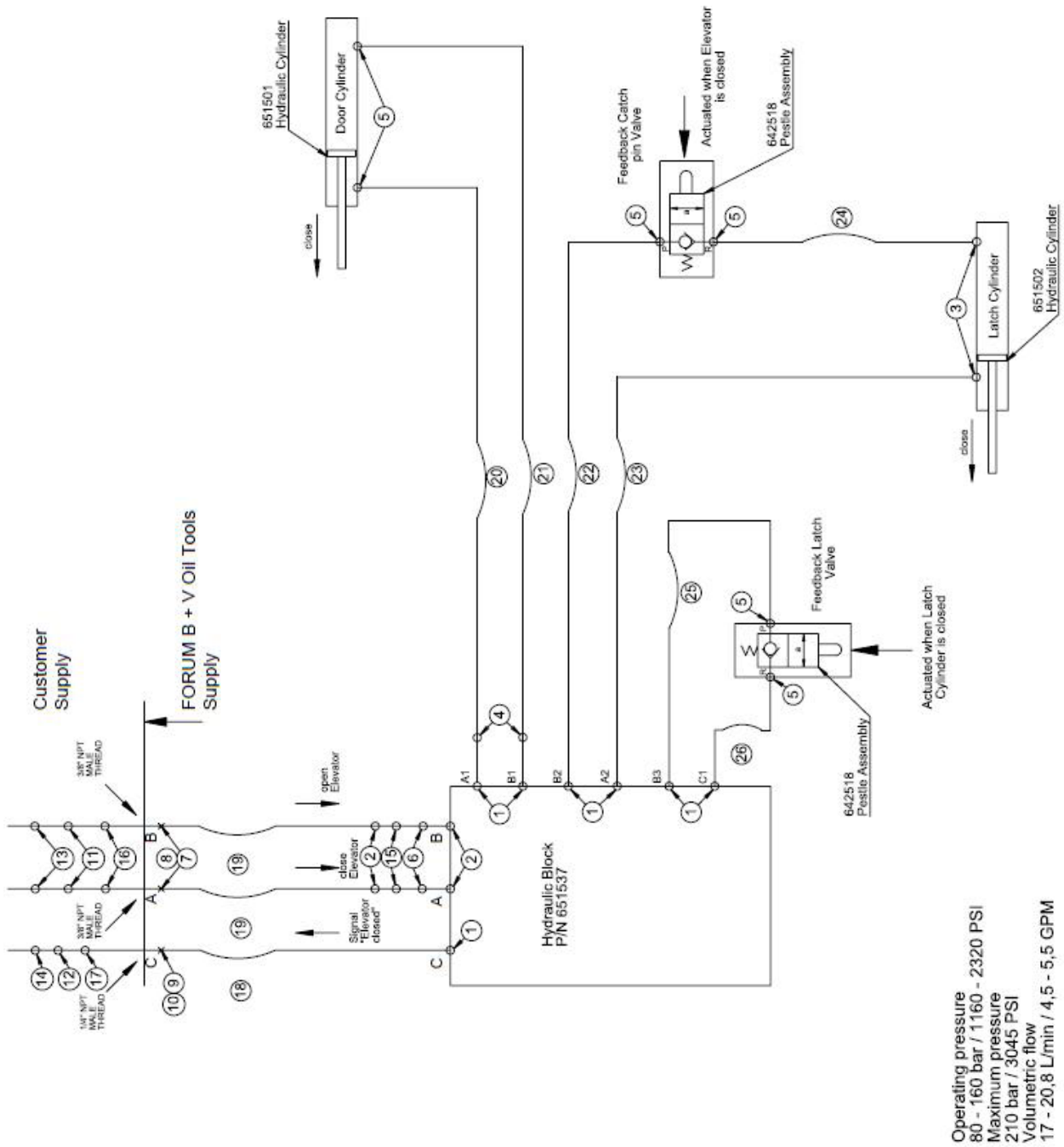


Fig. 32: Hydraulic schematics

SERVICE

### Parts list

Pos.	Qty.	P/N	Description
1	7	612944	Straight Connection 8L-1/4"
2	4	755373	Straight Male Stud Coupling
3	2	710653	Straight Male Stud Coupling
4	2	645096	L-Adapter
5	6	613945	Swivelling Screw Fitting 90°
6	2	2138-14	Straight Male Stud Coupling
7	2	612936	Coupling male
8	2	612937	Coupling female
8	1	612965	Coupling male
10	1	612966	Coupling female
11	2	755364	Swivel Reducer
12	1	612945	Straight Connection 8L-8L
13	2	645116	Direct Pipe Fitting
14	1	645117	Direct Pipe Fitting
15	2	612934	Throttle
16	2	755375	Sequence valve OIL Control
17	1	612944	Straight Connection 8L-1/4"
18	1	651537-11	Hydraulic Hose Assembly C
19	2	651537-12	Hydraulic Hose Assembly
20	1	651537-13	Hydraulic Hose Assembly
21	1	651537-14	Hydraulic Hose Assembly
22	1	651537-15	Hydraulic Hose Assembly
23	1	651537-16	Hydraulic Hose Assembly
24	1	651537-17	Hydraulic Hose Assembly
25	1	651537-18	Hydraulic Hose Assembly
26	1	651537-19	Hydraulic Hose Assembly

5.3.4 651506 Hydraulic Assembly

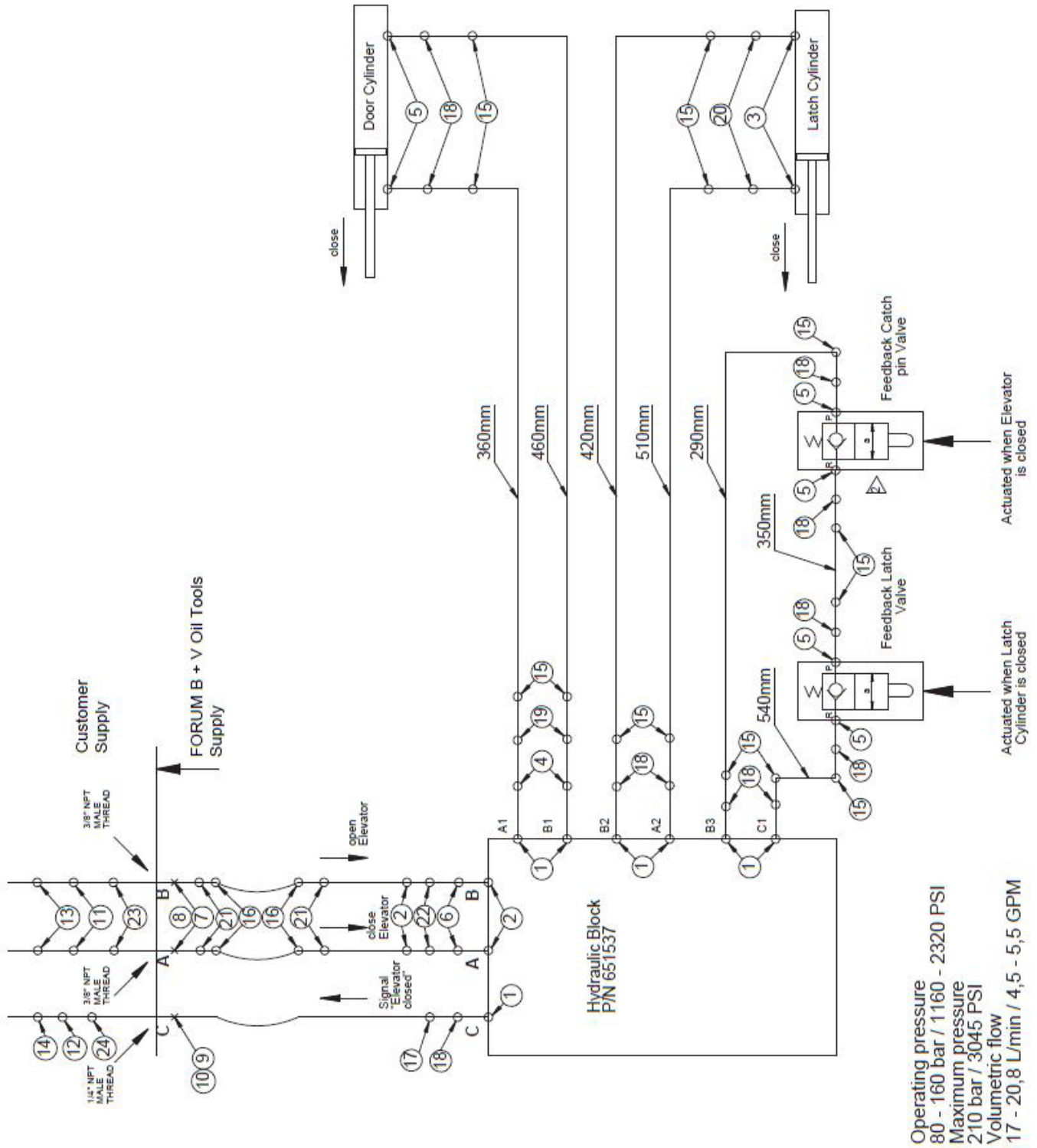


Fig. 33: Hydraulic schematics

SERVICE

### Parts list

Pos.	Qty.	P/N	Description
1	10	612944	Straight Connection 8L-1/4"
2	8	755373	Straight Male Stud Coupling
3	2	710653	Straight Male Stud Coupling
4	4	645096	L-Adapter
5	6	613945	Swivelling Screw Fitting 90°
6	4	2138-14	Straight Male Stud Coupling
7	2	612936	Coupling Male
8	2	612937	Coupling Female
9	1	612965	Coupling Male
10	1	612966	Coupling, Flat Face, female
11	2	755364	Swivel Reducer
12	1	612945	Straight Connection 8L-8L
13	2	645116	Direct Pipe Fitting
14	1	645117	Direct Pipe Fitting
15	14	756341	Hose Fitting
16	4	617551	Swaged fitting
17	2	612955	Swaged Fitting
18	12	612951	Hose Connection, straight 8L
19	2	612953	Hose Connection 45 degree
20	2	612954	Hose Connection, 90 degree 8L
21	4	617552	Tapered nipple
22	2	612934	Throttle
23	2	755373	Straight Male Stud Coupling
24	1	612944	Straight Connection 8L-1/4"



### 5.3.5 Recommended Spare Parts

#### 5.3.5.1 Spare Parts for SDL 150-2-H

Pos.	Qty.	P/N	Description
50	2	756790	Lubricating Nipples
8	1	651528	Latch Spring
	2	651527-11	Set Screw
11	1	651529	Handle Plate Spring
46	4	651530-1	Screw
55	4	612690	Nut
	1	643900-5	Pin Assembly
	1	643801-1	Rope Clamp
	1	643801-11	Wire Line Clamp
53	6	80340-1	Split Pin

#### 5.3.5.2 Spare Parts for SDL 150-3-H

Pos.	Qty.	P/N	Description
49	2	756790	Lubricating Nipples
9	1	651528	Latch Spring
	2	651527-11	Set Screw
11	1	651529	Handle Plate Spring
44	4	651530-1	Screw
53	6	80340-1	Split Pin
	1	643900-5	Pin Assembly
	1	643801-1	Rope Clamp
	1	643801-11	Wire Line Clamp
56	4	612690	Nut

# INSPECTION / MAINTENANCE

INSPECTION /  
MAINTENANCE

## 6 Inspection / Maintenance

This chapter contains important information on how to service your SDL 150-H 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 SDL 150-H 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 equipment and putting it into service.



**WEAR EYE PROTECTION!**



**WEAR PROTECTIVE HELMET!**



**WEAR PROTECTIVE GLOVES!**



**WEAR SAFETY SHOES!**

### Instructions for inspection and maintenance

1. In the event of visible damage or excessive wear contact the FORUM Handling Tools Service Department or an authorized repair company.
2. Ensure that welding work on cast parts is performed exclusively by the FORUM Handling Tools Service Department or an authorized repair company observing the FORUM Handling 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 equipment.
4. Ensure that all repair work not performed by FORUM Handling 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 SDL 150-H can be removed by grinding (Refer to Critical Areas).
6. After repair always check the repaired part in a suitable manner to ensure that the defect has been remedied.

### Prerequisites for maintenance work

1. Ensure that the SDL 150-H is set down on a good supporting surface so that it could not tip.
2. Provide for sufficient lighting at the workplace.
3. The SDL 150-H must be removed from the Elevator Links.
4. Ensure that SDL 150-H is disconnected from hydraulic system.

## 6.1 Lubrication



### ⚠ WARNING

**Lubricants can pose a health hazard!**  
Lubricants irritate skin and eyes.  
» Avoid contact with lubricants.



WEAR EYE PROTECTION!



WEAR PROTECTIVE GLOVES!

### INFO



The specified lubricants can be obtained through FORUM Handling Tools. Contact your local representative.

### Lubrication Points

The SDL 150-H is supplied with grease via lubrication nipples by a manual or pneumatic grease gun.

- ① Latch pin
- ② Latch spring
- ③ Elevator ears
- ④ Hinge pin
- ⑤ Hydraulic cylinder
- ⑥ All contact surfaces for Wear-Bushings



Fig. 34: Lubrication points I

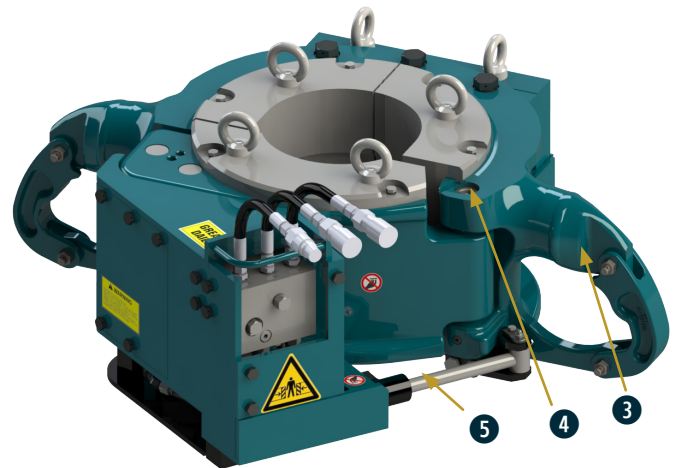


Fig. 35: Lubrication points II

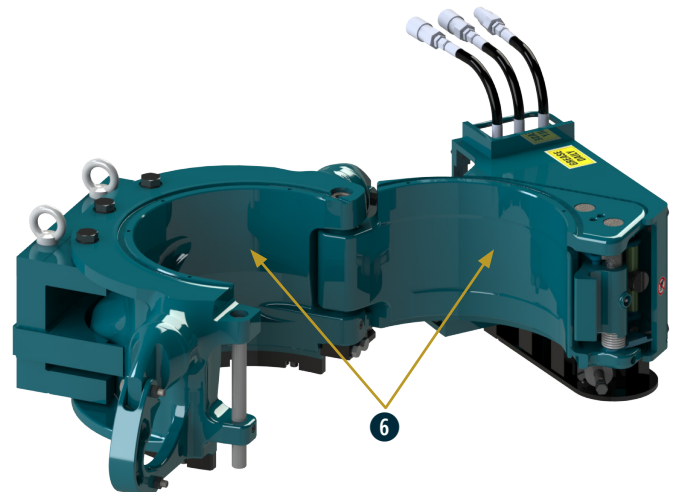


Fig. 36: Lubrication points III

## 6.2 Inspections

FORUM Handling Tools recommends to perform inspections in compliance with API RP 8B at specified intervals and in inspection categories. Otherwise the frequency of required inspections depends on the conditions of use of the SDL 150-H

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

After an inspection the scope and results of the tests performed has to 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 Handling Tools or an authorized service company.

### INFO

The specified maintenance intervals are recommended for the FORUM Handling Tools SDL Side Door Elevatorss 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

### Inspection intervals

Category	Intervals	Preparatory measures
I	Daily	SDL 150-H mounted to Elevator Links.
II	Weekly	SDL 150-H mounted to Elevator Links.
III	Semiannually	SDL 150-H removed from Elevator Links. SDL 150-H partly dismantled.
IV	Annualy	SDL 150-H removed from Elevator Links. SDL 150-H completely dismantled.

### INFO



The above-mentioned inspection intervals refer to a 100% use of the SDL 150-H on each day of a week (24 / 7). Personal inspection intervals may vary according to the type and extent of use and may need to be adjusted. All inspection categories are in accordance with the latest API RP 8B.



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

### 6.2.1 Inspection of Hydraulic Equipment

Check the hydraulic equipment daily for leakages. If unacceptably high leakages occur internally or externally contact FORUM Handling Tools or an authorized service company.

### 6.2.2 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 to - 4°F).

### 6.2.3 Inspection Following Removal

Generally the SDL 150-H 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 SDL 150-H 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 Handling Tools.
- Ensure that welding work on cast parts is accomplished only by FORUM Handling Tools or an authorized service company in compliance with the welding specifications issued by FORUM Handling Tools.
- If the field inspection indicates that further inspection work is required, remove the SDL 150-H and have it inspected in an appropriately equipped workshop.
- Springs must be carefully checked visually for wear and material weakening.

### 6.3 Inspection Categories

#### 6.3.1 Inspection Category I

The SDL 150-H has to be observed during operation. Recognizing inadequate performance and apparent defects is the goal of this category.

**Scope/Prerequisites/Procedure:**

- Daily visual inspection of the SDL 150-H for damages and defects during operation. Repair them if necessary.
- Functional test.
- The test must be carried out by a person with appropriate expertise.

#### 6.3.2 Inspection Category II

The inspection of category II includes all inspections of inspection category I and additional tests.

**Scope/Prerequisites/Procedure:**

- Checking the state of lubrication, the condition of the entire SDL 150-H and the settings of all valves.
- The test must be carried out by a person with appropriate expertise.

#### 6.3.3 Inspection Category III

The inspection of category III includes all inspections of inspection category II and additional tests.

**Scope/Prerequisites/Procedure:**

- Non-Destructive Testing (NDT) of selected critical areas and verification of all wear limits.
- Before carrying out an NDT test, remove all foreign material such as dirt, paint, lubricants, oil, abrasion from the affected parts. Use suitable methods such as pickling, steam cleaning and sandblasting.

#### 6.3.4 Inspection Category IV

The inspection of category IV includes all inspections of inspection category III and additional tests.

**Scope/Prerequisites/Procedure:**

- Before carrying out an NDT test, remove all foreign material such as dirt, paint, lubricants, oil, abrasion from the affected parts. Use suitable methods such as pickling, steam cleaning and sandblasting.
- Non-destructive material testing (NDT) of all critical areas and replacement of selected consumables and hydraulic components.

#### 6.3.5 Inspection intervals und Inspection tasks - SDL 150-H Elevator

Pos.	Task	Daily	Weekly	Semiannually	Annually
1	Function test.	✓	✓	✓	✓
2	Functionality of Feedback.	✓	✓	✓	✓
3	Checks for cracks and loose fittings/hoses.	✓	✓	✓	✓
4	Checks for signs of deformations and leakages.	✓	✓	✓	✓
5	Check for signs of wear and corrosion.	✓	✓	✓	✓
6	Check for no loose components and presence of all warning signs.	✗	✓	✓	✓
7	Check for state of lubrication and conservation.	✗	✓	✓	✓
8	Check all possible settings (eg. valves) on the SDL 150-H.	✗	✓	✓	✓
9	Checking the condition of the overall structure (Elevator Links, hydraulic system) and the interaction of all components and possible attachments with the SDL 150-H.	✗	✓	✓	✓
10	Checking wear limits (component measurement).	✗	✗	✓	✓
11	NDT tests of selected components (SDL 150-H is largely assembled).	✗	✗	✓	✓
12	Complete NDT test of all critical areas (SDL 150-H is completely disassembled).	✗	✗	✗	✓
13	Exchange of selected hydraulic components.	✗	✗	✗	✓
14	Replacement of wear-intensive components (recommended spare parts).	✗	✗	✗	✓

✓ Necessary 
 ✗ Unnecessary

### INFO

**NDT Non-destructive testing**



- Magnetic Particle Inspection (MPI)
- Ultrasonic Measurement Methods (UT)
- Eddy Current Testing (ET)
- Dye Penetrant Inspection (DPI)

### 6.3.6 Inspection Checklist

#### INFO

**i** The following check list serve as a copy templates for inspections to be performed in compliance with API 8B. Performed inspections must always be documented and stored safely.



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

**SDL Model:** \_\_\_\_\_

**Serial number:** \_\_\_\_\_

#### Inspection Category I

<b>Date / Place of Inspection:</b>	<b>Result</b>		<b>Name of Inspection Operator / Supervisor:</b>	<b>Sign:</b>
	OK	NOK		
	<input type="checkbox"/>	<input type="checkbox"/>		

**Remarks:** \_\_\_\_\_

#### Inspection Category II

<b>Date / Place of Inspection:</b>	<b>Result</b>		<b>Name of Inspection Operator / Supervisor:</b>	<b>Sign:</b>
	OK	NOK		
	<input type="checkbox"/>	<input type="checkbox"/>		

**Remarks:** \_\_\_\_\_

#### Inspection Category III

<b>Date / Place of Inspection:</b>	<b>Result</b>		<b>Name of Inspection Operator / Supervisor:</b>	<b>Sign:</b>
	OK	NOK		
	<input type="checkbox"/>	<input type="checkbox"/>		

**Remarks:** \_\_\_\_\_

#### Inspection Category IV

<b>Date / Place of Inspection:</b>	<b>Result</b>		<b>Name of Inspection Operator / Supervisor:</b>	<b>Sign:</b>
	OK	NOK		
	<input type="checkbox"/>	<input type="checkbox"/>		

**Remarks:** \_\_\_\_\_



## 6.4 Dismantling and Mounting of the SDL 150-H

### 6.4.1 Dismantling

Some inspections require a partly dismantling of the SDL 150-H.

**Procedure:**

1. Disconnect the SDL 150-H from the hydraulic system.
2. Remove the SDL 150-H from the Elevator Links and position it on a firm and stable surface.
3. Clean all surfaces of dirt and foreign objects.
4. Disassemble the side plates of the hydraulic box.
5. Remove the door by removing the allen screw of the door hinge pin and pulling the hinge pin. If it is difficult to move the door hinge pin simply by pushing it, you have to drive it out with light hammer blows.
6. Remove the latch by removing and pulling the allen screw of the latch pin. If it is difficult to move the locking bolt simply by pushing it, you must drive it out with light hammer blows. Pay attention to the springs when removing. Wrap these around so that they do not fly around during removal.
7. All other small parts can be easily dismantled.

### 6.4.2 Mounting

When assembling the SDL 150-H, proceed as follows:

1. First mount the door. To do this, secure the lock by driving in the bolt of the locking system, paying attention to the exact position of the springs of the locking system. Fix the bolt of the locking system with the locking screw.
2. Lift the door and place it in the door hinge of the body so that the holes are aligned. Drive the door hinge pin and fix it with the locking screw.
3. Screw in the grub screws and tighten them hand-tight.

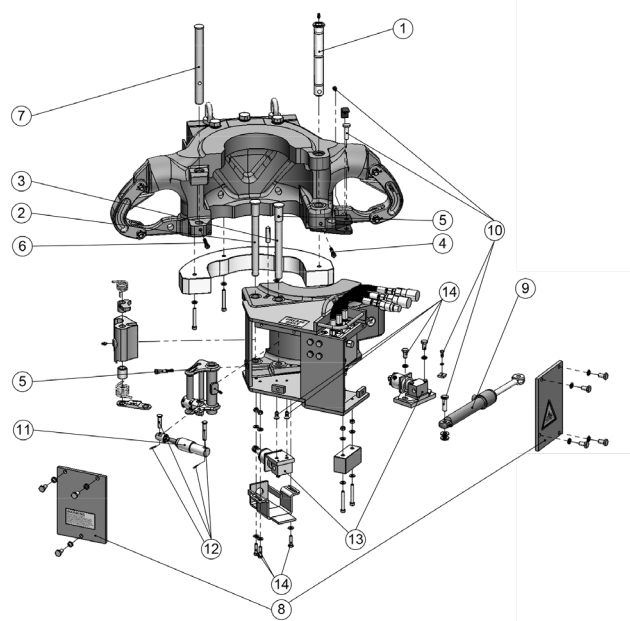


Fig. 37: SDL 150-H Frame 2

Pos.	Description	Pos.	Description
1	Hinge Pin	2	Latch Pin
3	Latch Handle	4	Screw for Hinge Pin
5	Screw for Latch Pin	6	Screw for Catching Pin
7	Catching Pin	8	Hydraulic Box Cover
9	Door Cylinder	10	Screws for Door Cylinder
11	Latch Cylinder	12	Screws for Latch Cylinder
13	Feedback Valve	14	Screws for Feedback Valve

### 6.4.3 Wear data for components

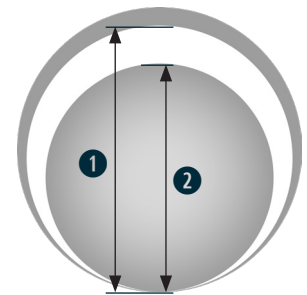
Check the wear limits as specified in the inspection check lists.

### 6.4.4 Minimum Ear Dimension

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.

#### Wear Dimension

Components	Dimension	
	min in [mm]	max in [mm]
① Bore Hinge Pin	1,11 [28,13]	1,13 [28,59]
① Bore Latch Pin I (P/N 651527-1)	0,79 [20,02]	0,80 [20,38]
① Bore Latch Pin II (P/N 651527)	0,95 [24,02]	0,96 [24,48]
① Bore Catching Pin	0,95 [24,02]	0,96 [24,48]
② Hinge Pin	1,09 [27,79]	1,07 [27,25]
② Latch Pin I (P/N 651527-1)	0,78 [19,93]	0,77 [19,50]
② Latch Pin II (P/N 651527)	0,94 [23,88]	0,93 [23,50]
② Catching Pin	0,94 [23,96]	0,93 [23,50]



#### Ear-Dimensionen

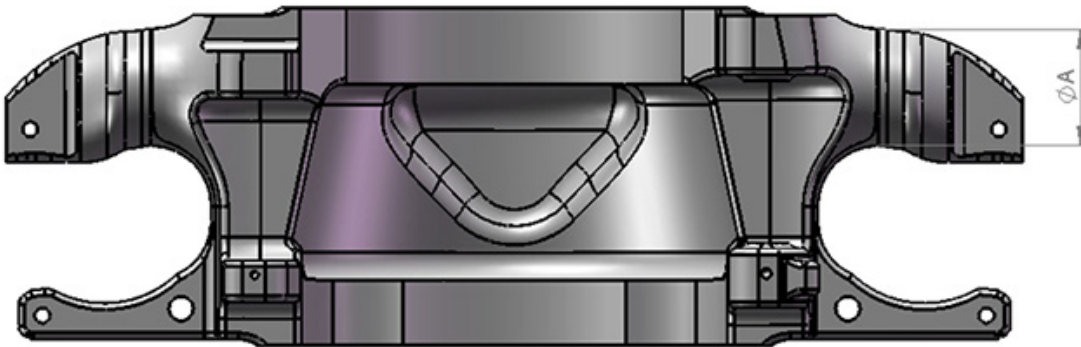
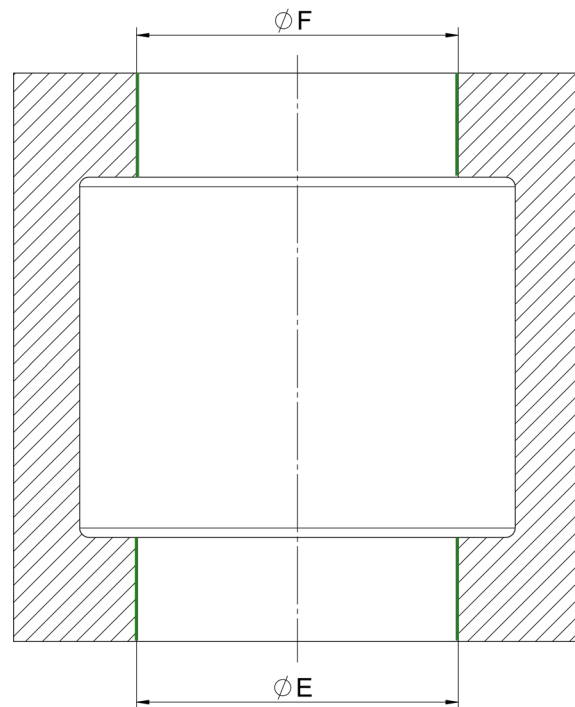


Fig. 38: Minimum Dimension "A" for SDL 150-H

Type	SDL 150	
	mm	inch
<b>Minimum Dimension A</b>	94,1	3,70

### 6.5.1 Wear at the Tool-Joint of a Drill-Pipe

The elevator wear is measured directly at the pipe inlet of the elevator (dimension F and E).



The maximal wear at the bore is:

- Max. Wear for BC < 10": 0.137" [3.48 mm].
- Max. Wear for BC > 10": 0,25" [6.35 mm].

The following table shows the minimum required Tool Joint diameter, depending on the Centre Bore. As soon as the Tool Joint diameter falls below the rating line, the bushing/Elevator or the pipe has to be changed (Contact FORUM Handling Tools or a FORUM Handling Tools authorized Service Centre).

## 6.5 Measuring of Wear

It is obvious that a visual inspection is not enough to check lifting equipment like the SDL 150-H. To measure Elevator 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. The following table shows the minimum required Tool Joint diameter, depending on the Centre Bore. As soon as the Tool Joint diameter falls below the rating line, the bushing/Elevator or the pipe has to be changed (Contact FORUM Handling Tools or a FORUM Handling Tools authorized Repair Centre).

Min Tool Joint / Coupling OD												
"Minimum Required Tubing Coupling OD in [mm]"												
Tubing Size/ Type	API Bore	Load (tons)										
		100	150	175	250	350	500	750	1000	1250	1500	
1.050	PLAIN	1.125	2,35 [0,06]	2,76 [0,07]	2,95 [0,07]	3,45 [0,09]	4,02 [0,1]	4,74 [0,12]	5,75 [0,15]	6,61 [0,17]	7,37 [0,19]	8,06 [0,2]
1.050	UPSET	1.422	2,5 [0,06]	2,9 [0,07]	3,07 [0,08]	3,55 [0,09]	4,11 [0,1]	4,82 [0,12]	5,82 [0,15]	6,67 [0,17]	7,42 [0,19]	8,11 [0,21]
1.315	PLAIN	1.390	2,49 [0,06]	2,88 [0,07]	3,06 [0,08]	3,54 [0,09]	4,1 [0,1]	4,81 [0,12]	5,81 [0,15]	6,66 [0,17]	7,42 [0,19]	8,1 [0,21]
1.315	UPSET	1.578	2,6 [0,07]	2,98 [0,08]	3,15 [0,08]	3,62 [0,09]	4,17 [0,11]	4,87 [0,12]	5,86 [0,15]	6,7 [0,17]	7,45 [0,19]	8,13 [0,21]
1.660	PLAIN	1.736	2,69 [0,07]	3,06 [0,08]	3,23 [0,08]	3,69 [0,09]	4,23 [0,11]	4,92 [0,13]	5,9 [0,15]	6,74 [0,17]	7,49 [0,19]	8,17 [0,21]
1.660	UPSET	1.922	2,82 [0,07]	3,17 [0,08]	3,34 [0,08]	3,78 [0,1]	4,31 [0,11]	4,99 [0,13]	5,96 [0,15]	6,79 [0,17]	7,53 [0,19]	8,21 [0,21]
1.900	PLAIN	1.976	2,86 [0,07]	3,21 [0,08]	3,37 [0,09]	3,81 [0,1]	4,33 [0,11]	5,01 [0,13]	5,98 [0,15]	6,81 [0,17]	7,55 [0,19]	8,22 [0,21]
1.900	UPSET	2.203	3,02 [0,08]	3,35 [0,09]	3,5 [0,09]	3,93 [0,1]	4,44 [0,11]	5,11 [0,13]	6,06 [0,15]	6,88 [0,17]	7,61 [0,19]	8,28 [0,21]
2.375	PLAIN	2.451	3,2 [0,08]	3,52 [0,09]	3,67 [0,09]	4,08 [0,1]	4,57 [0,12]	5,22 [0,13]	6,15 [0,16]	6,96 [0,18]	7,69 [0,2]	8,35 [0,21]
2.375	UPSET	2.703	3,4 [0,09]	3,7 [0,09]	3,84 [0,1]	4,23 [0,11]	4,71 [0,12]	5,34 [0,14]	6,26 [0,16]	7,05 [0,18]	7,77 [0,2]	8,42 [0,21]
2.875	PLAIN	2.952	3,6 [0,09]	3,88 [0,1]	4,02 [0,1]	4,4 [0,11]	4,86 [0,12]	5,47 [0,14]	6,37 [0,16]	7,15 [0,18]	7,86 [0,2]	8,51 [0,22]
2.875	UPSET	3.203	3,81 [0,1]	4,08 [0,1]	4,21 [0,11]	4,57 [0,12]	5,01 [0,13]	5,61 [0,14]	6,49 [0,16]	7,26 [0,18]	7,96 [0,2]	8,6 [0,22]
3.500	PLAIN	3.578	4,13 [0,1]	4,38 [0,11]	4,5 [0,11]	4,84 [0,12]	5,26 [0,13]	5,83 [0,15]	6,68 [0,17]	7,43 [0,19]	8,12 [0,21]	8,74 [0,22]
3.500	UPSET	3.859	4,37 [0,11]	4,61 [0,12]	4,72 [0,12]	5,05 [0,13]	5,45 [0,14]	6,01 [0,15]	6,84 [0,17]	7,57 [0,19]	8,24 [0,21]	8,86 [0,23]
4.000	PLAIN	4.078	4,58 [0,12]	4,8 [0,12]	4,91 [0,12]	5,22 [0,13]	5,61 [0,14]	6,15 [0,16]	6,96 [0,18]	7,69 [0,2]	8,35 [0,21]	8,96 [0,23]
4.000	UPSET	4.359	4,86 [0,12]	5,04 [0,13]	5,14 [0,13]	5,44 [0,14]	5,82 [0,15]	6,34 [0,16]	7,13 [0,18]	7,84 [0,2]	8,49 [0,22]	9,09 [0,23]
4.500	PLAIN	4.604	5,1 [0,13]	5,25 [0,13]	5,35 [0,14]	5,64 [0,14]	6 [0,15]	6,51 [0,17]	7,28 [0,18]	7,98 [0,2]	8,62 [0,22]	9,21 [0,23]

4.500	UPSET	4.859	5,36 [0,14]	5,48 [0,14]	5,57 [0,14]	5,85 [0,15]	6,2 [0,16]	6,7 [0,17]	7,45 [0,19]	8,13 [0,21]	8,76 [0,22]	9,34 [0,24]
4.500	PLAIN	4.604	5,1 [0,13]	5,25 [0,13]	5,35 [0,14]	5,64 [0,14]	6 [0,15]	6,51 [0,17]	7,28 [0,18]	7,98 [0,2]	8,62 [0,22]	9,21 [0,23]
4.750	UPSET	4.857	5,36 [0,14]	5,47 [0,14]	5,57 [0,14]	5,85 [0,15]	6,2 [0,16]	6,69 [0,17]	7,45 [0,19]	8,13 [0,21]	8,76 [0,22]	9,34 [0,24]
5.000	PLAIN	5.111	5,61 [0,14]	5,7 [0,14]	5,79 [0,15]	6,06 [0,15]	6,4 [0,16]	6,88 [0,17]	7,61 [0,19]	8,28 [0,21]	8,9 [0,23]	9,48 [0,24]
5.500	UPSET	5.617	6,12 [0,16]	6,16 [0,16]	6,24 [0,16]	6,49 [0,16]	6,81 [0,17]	7,26 [0,18]	7,96 [0,2]	8,6 [0,22]	9,2 [0,23]	9,76 [0,25]
5.750	PLAIN	5.870	6,37 [0,16]	6,39 [0,16]	6,47 [0,16]	6,71 [0,17]	7,02 [0,18]	7,46 [0,19]	8,14 [0,21]	8,77 [0,22]	9,36 [0,24]	9,91 [0,25]
6.000	UPSET	6.123	6,62 [0,17]	6,62 [0,17]	6,7 [0,17]	6,94 [0,18]	7,24 [0,18]	7,66 [0,19]	8,33 [0,21]	8,94 [0,23]	9,52 [0,24]	10,06 [0,26]
6.625	PLAIN	6.756	7,26 [0,18]	7,26 [0,18]	7,29 [0,19]	7,5 [0,19]	7,78 [0,2]	8,18 [0,21]	8,8 [0,22]	9,39 [0,24]	9,93 [0,25]	10,46 [0,27]
7.000	UPSET	7.136	7,64 [0,19]	7,64 [0,19]	7,64 [0,19]	7,84 [0,2]	8,11 [0,21]	8,49 [0,22]	9,1 [0,23]	9,66 [0,25]	10,2 [0,26]	10,7 [0,27]
7.625	PLAIN	7.768	8,27 [0,21]	8,27 [0,21]	8,27 [0,21]	8,42 [0,21]	8,67 [0,22]	9,03 [0,23]	9,6 [0,24]	10,14 [0,26]	10,65 [0,27]	11,14 [0,28]
7.750	UPSET	7.895	8,4 [0,21]	8,4 [0,21]	8,4 [0,21]	8,54 [0,22]	8,79 [0,22]	9,14 [0,23]	9,7 [0,25]	10,24 [0,26]	10,74 [0,27]	11,23 [0,29]
7.799	PLAIN	7.850	8,35 [0,21]	8,35 [0,21]	8,35 [0,21]	8,5 [0,22]	8,75 [0,22]	9,1 [0,23]	9,67 [0,25]	10,2 [0,26]	10,71 [0,27]	11,19 [0,28]
8.313	UPSET	8.464	8,96 [0,23]	8,96 [0,23]	8,96 [0,23]	9,07 [0,23]	9,3 [0,24]	9,64 [0,24]	10,17 [0,26]	10,68 [0,27]	11,17 [0,28]	11,63 [0,3]
8.625	PLAIN	8.781	9,28 [0,24]	9,28 [0,24]	9,28 [0,24]	9,37 [0,24]	9,59 [0,24]	9,92 [0,25]	10,44 [0,27]	10,93 [0,28]	11,41 [0,29]	11,86 [0,3]
9.000	UPSET	9.161	9,66 [0,25]	9,66 [0,25]	9,66 [0,25]	9,72 [0,25]	9,94 [0,25]	10,25 [0,26]	10,76 [0,27]	11,24 [0,29]	11,7 [0,3]	12,15 [0,31]
9.375	PLAIN	9.540	10,04 [0,26]	10,04 [0,26]	10,04 [0,26]	10,08 [0,26]	10,29 [0,26]	10,59 [0,27]	11,08 [0,28]	11,55 [0,29]	12 [0,3]	12,44 [0,32]
9.625	UPSET	9.780	10,28 [0,26]	10,28 [0,26]	10,28 [0,26]	10,31 [0,26]	10,51 [0,27]	10,81 [0,27]	11,29 [0,29]	11,75 [0,3]	12,2 [0,31]	12,62 [0,32]
9.875	PLAIN	10.033	10,53 [0,27]	10,53 [0,27]	10,53 [0,27]	10,55 [0,27]	10,75 [0,27]	11,04 [0,28]	11,51 [0,29]	11,96 [0,3]	12,4 [0,31]	12,82 [0,33]
10.000	UPSET	10.160	10,66 [0,27]	10,66 [0,27]	10,66 [0,27]	10,67 [0,27]	10,87 [0,28]	11,16 [0,28]	11,62 [0,3]	12,07 [0,31]	12,5 [0,32]	12,92 [0,33]
10.250	PLAIN	10.413	10,91 [0,28]	10,91 [0,28]	10,91 [0,28]	10,91 [0,28]	11,1 [0,28]	11,39 [0,29]	11,84 [0,3]	12,28 [0,31]	12,71 [0,32]	13,12 [0,33]
10.625	UPSET	10.793	11,29 [0,29]	11,29 [0,29]	11,29 [0,29]	11,29 [0,29]	11,46 [0,29]	11,74 [0,3]	12,18 [0,31]	12,61 [0,32]	13,02 [0,33]	13,42 [0,34]
10.750	PLAIN	10.919	11,42 [0,29]	11,42 [0,29]	11,42 [0,29]	11,42 [0,29]	11,58 [0,29]	11,85 [0,3]	12,29 [0,31]	12,72 [0,32]	13,13 [0,33]	13,52 [0,34]
11.000	UPSET	11.173	11,67 [0,3]	11,67 [0,3]	11,67 [0,3]	11,67 [0,3]	11,82 [0,3]	12,09 [0,31]	12,52 [0,32]	12,93 [0,33]	13,34 [0,34]	13,73 [0,35]
11.750	PLAIN	11.932	12,43 [0,32]	12,43 [0,32]	12,43 [0,32]	12,43 [0,32]	12,54 [0,32]	12,79 [0,32]	13,2 [0,34]	13,6 [0,35]	13,98 [0,36]	14,35 [0,36]
11.875	UPSET	12.058	12,56 [0,32]	12,56 [0,32]	12,56 [0,32]	12,56 [0,32]	12,66 [0,32]	12,91 [0,33]	13,31 [0,34]	13,71 [0,35]	14,09 [0,36]	14,46 [0,37]
12.750	PLAIN	12.944	13,44 [0,34]	13,44 [0,34]	13,44 [0,34]	13,44 [0,34]	13,51 [0,34]	13,74 [0,35]	14,12 [0,36]	14,49 [0,37]	14,85 [0,38]	15,21 [0,39]
12.875	UPSET	13.058	13,56 [0,34]	13,56 [0,34]	13,56 [0,34]	13,56 [0,34]	13,62 [0,35]	13,85 [0,35]	14,23 [0,36]	14,59 [0,37]	14,95 [0,38]	15,3 [0,39]
13.375	PLAIN	13.564	14,06 [0,36]	14,06 [0,36]	14,06 [0,36]	14,06 [0,36]	14,1 [0,36]	14,33 [0,36]	14,69 [0,37]	15,05 [0,38]	15,4 [0,39]	15,74 [0,4]
13.500	UPSET	13.691	14,19 [0,36]	14,19 [0,36]	14,19 [0,36]	14,19 [0,36]	14,22 [0,36]	14,45 [0,37]	14,81 [0,38]	15,16 [0,39]	15,51 [0,39]	15,85 [0,4]
13.625	PLAIN	13.817	14,32 [0,36]	14,32 [0,36]	14,32 [0,36]	14,32 [0,36]	14,35 [0,36]	14,57 [0,37]	14,93 [0,38]	15,28 [0,39]	15,62 [0,4]	15,96 [0,41]
14.000	UPSET	14.197	14,7 [0,37]	14,7 [0,37]	14,7 [0,37]	14,7 [0,37]	14,71 [0,37]	14,93 [0,38]	15,28 [0,39]	15,62 [0,4]	15,96 [0,41]	16,29 [0,41]
15.000	PLAIN	15.210	15,71 [0,4]	15,71 [0,4]	15,71 [0,4]	15,71 [0,4]	15,71 [0,4]	15,89 [0,4]	16,22 [0,41]	16,55 [0,42]	16,86 [0,43]	17,18 [0,44]
16.000	UPSET	16.222	16,72 [0,42]	16,72 [0,42]	16,72 [0,42]	16,72 [0,42]	16,72 [0,42]	16,86 [0,43]	17,18 [0,44]	17,48 [0,44]	17,78 [0,45]	18,08 [0,46]
16.750	PLAIN	16.981	17,48 [0,44]	17,48 [0,44]	17,48 [0,44]	17,48 [0,44]	17,48 [0,44]	17,6 [0,45]	17,89 [0,45]	18,19 [0,46]	18,48 [0,47]	18,76 [0,48]
18.000	UPSET	18.247	18,75 [0,48]	18,75 [0,48]	18,75 [0,48]	18,75 [0,48]	18,75 [0,48]	18,82 [0,48]	19,1 [0,49]	19,38 [0,49]	19,65 [0,5]	19,92 [0,51]
18.625	PLAIN	18.880	19,38 [0,49]	19,38 [0,49]	19,38 [0,49]	19,38 [0,49]	19,38 [0,49]	19,43 [0,49]	19,71 [0,5]	19,97 [0,51]	20,24 [0,51]	20,5 [0,52]
20.000	UPSET	20.272	20,77 [0,53]	20,77 [0,53]	20,77 [0,53]	20,77 [0,53]	20,77 [0,53]	20,79 [0,53]	21,04 [0,53]	21,29 [0,54]	21,54 [0,55]	21,79 [0,55]
21.500	PLAIN	21.790	22,29 [0,57]	22,29 [0,57]	22,29 [0,57]	22,29 [0,57]	22,29 [0,57]	22,29 [0,57]	22,51 [0,57]	22,74 [0,58]	22,98 [0,58]	23,21 [0,59]
22.000	UPSET	22.295	22,8 [0,58]	22,8 [0,58]	22,8 [0,58]	22,8 [0,58]	22,8 [0,58]	22,8 [0,58]	23 [0,58]	23,23 [0,59]	23,46 [0,6]	23,68 [0,6]
23.313	PLAIN	23.621	24,12 [0,61]	24,12 [0,61]	24,12 [0,61]	24,12 [0,61]	24,12 [0,61]	24,12 [0,61]	24,29 [0,62]	24,5 [0,62]	24,72 [0,63]	24,93 [0,63]
24.000	UPSET	24.315	24,82 [0,63]	24,82 [0,63]	24,82 [0,63]	24,82 [0,63]	24,82 [0,63]	24,82 [0,63]	24,96 [0,63]	25,17 [0,64]	25,38 [0,64]	25,59 [0,65]
24.500	PLAIN	24.820	25,32 [0,64]	25,32 [0,64]	25,32 [0,64]	25,32 [0,64]	25,32 [0,64]	25,32 [0,64]	25,45 [0,65]	25,66 [0,65]	25,87 [0,66]	26,07 [0,66]
26.000	UPSET	26.335	26,84 [0,68]	26,84 [0,68]	26,84 [0,68]	26,84 [0,68]	26,84 [0,68]	26,84 [0,68]	26,93 [0,68]	27,13 [0,69]	27,32 [0,69]	27,52 [0,7]
28.000	PLAIN	28.355	28,86 [0,73]	28,86 [0,73]	28,86 [0,73]	28,86 [0,73]	28,86 [0,73]	28,86 [0,73]	28,91 [0,73]	29,09 [0,74]	29,28 [0,74]	29,46 [0,75]
30.000	UPSET	30.375	30,88 [0,78]	30,88 [0,78]	30,88 [0,78]	30,88 [0,78]	30,88 [0,78]	30,88 [0,78]	30,9 [0,78]	31,07 [0,79]	31,24 [0,79]	31,41 [0,8]
32.000	PLAIN	32.395	32,9 [0,84]	32,9 [0,84]	32,9 [0,84]	32,9 [0,84]	32,9 [0,84]	32,9 [0,84]	32,9 [0,84]	33,04 [0,84]	33,2 [0,84]	33,36 [0,85]
36.000	UPSET	36.435	36,94 [0,94]	36,94 [0,94]	36,94 [0,94]	36,94 [0,94]	36,94 [0,94]	36,94 [0,94]	36,94 [0,94]	37,01 [0,94]	37,16 [0,94]	37,3 [0,95]

INSPECTION / MAINTENANCE

6.5.2 Critical Areas

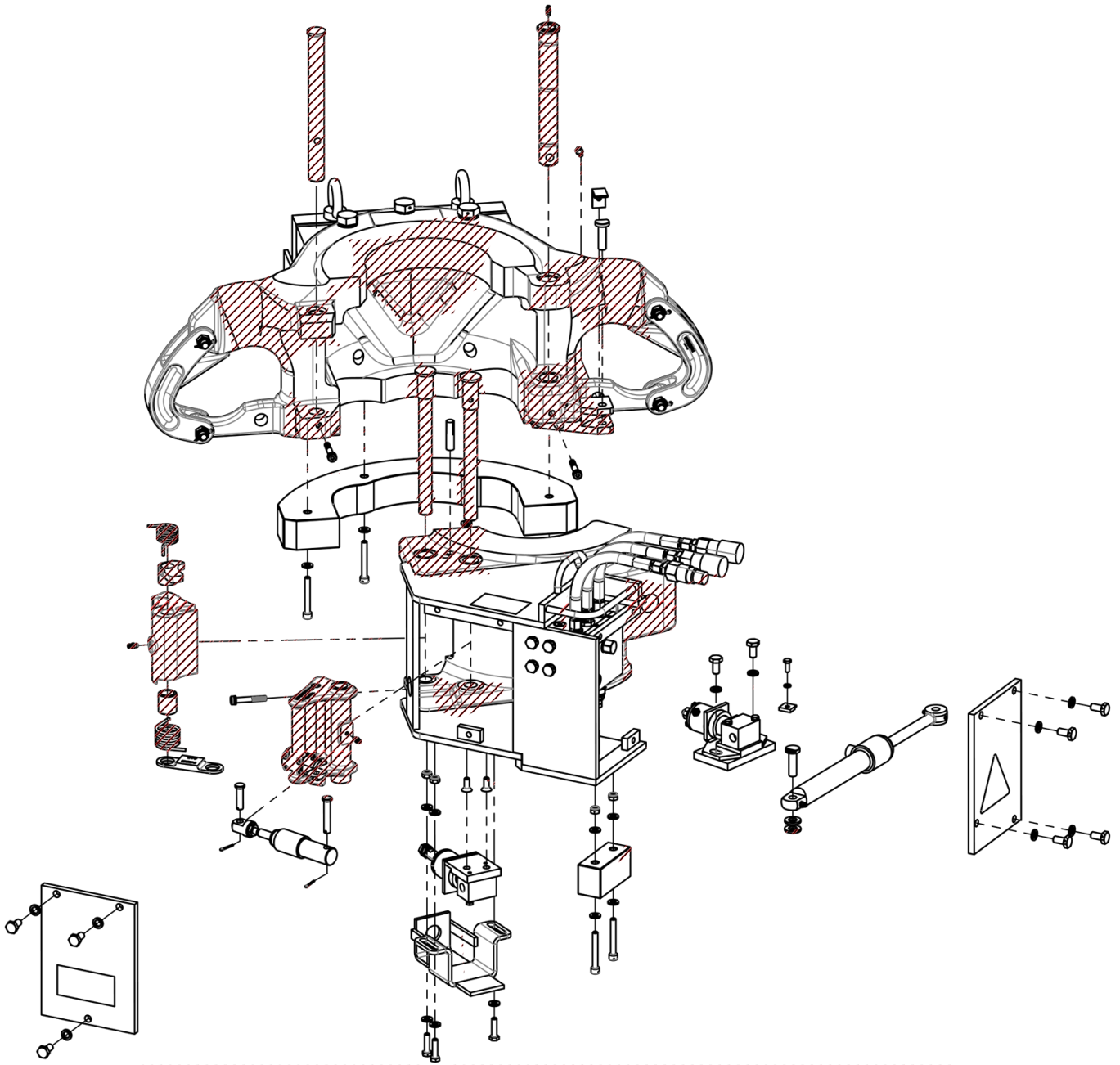


Fig. 39: SDL 150-H Critical Areas

## 6.6 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 of the SDL 150-H. Remove this contamination regularly to prevent incrustation and ensure safe operation of the Equipment. Clean contamination from drilling from the SDL 150-H regularly. The Equipment should be cleaned thoroughly at the end of each shift at the latest. FORUM Handling Tools recommends cleaning the SDL 150-H with a high pressure steam cleaner. Use it to clean the SDL 150-H thoroughly from inside and outside. Clean particularly the shoulder inclines on the body.

# STORAGE / DISPOSAL

STORAGE /  
DISPOSAL



## 7 Storage / Disposal

This section deals with procedures to be taken to the storage after the decommissioning of the SDL 150-H. The aim is to protect the Equipment, the environment and people from damages. Therefore FORUM Handling Tools recommends to read and implement the following procedure accurately.

### 7.1 Storage

#### Storage procedure

1. Store the equipment on a pallet located on an even, supporting surface.
  - » Observe the weight specifications in the technical data.
2. Ensure that the equipment is stored so that no person can be injured by moving parts or sharp edges.
3. Secure the equipment with tensioning cables or in another manner to prevent it from slipping or tipping when moved.
4. Lubricate the equipment as described in section „6.1 Lubrication“ on page 61.
5. Conserve all bare metal surfaces. FORUM Handling Tools recommends the use of a lubricant or Tectyl.
  - » These surfaces should be checked periodically to be sure that no corrosion has occurred.
6. Protect the equipment against water penetration with a plastic tarp.

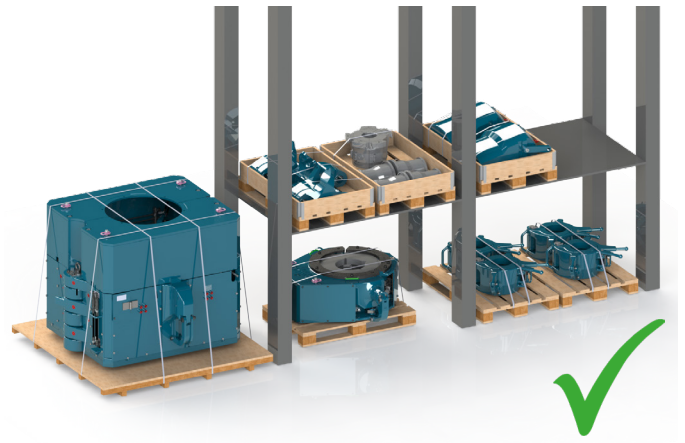


Fig. 40: Correct Storage

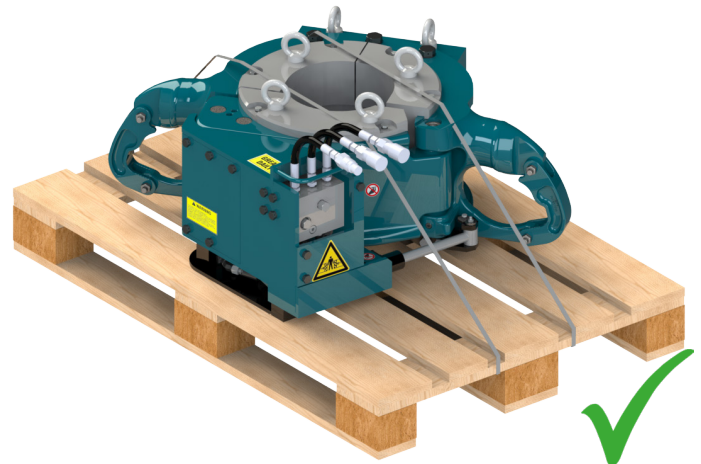


Fig. 41: Correct Storage on pallet



Fig. 42: Correct Storage on pallet and pallet borders

**Intermediate Storage**

**Protection of equipment**

- Apply corrosion preventative to all bare surfaces.
- Protect all other bare surfaces with Tectyl Type 864 or an equivalent agent.
- Place the SDL 150-H only on surrounded pallets and secure them with tensioning cables and anti-slip mat.

**Ambient Conditions**

- Store in dry surroundings (maximum humidity 80%).

**Longer Storage**

**Protection of equipment**

- Apply corrosion preventative to all bare surfaces .
- Protect all other bare surfaces with Tectyl Type 864 or an equivalent agent.
- Place the SDL 150-H only on surrounded pallets and secure them with tensioning cables and anti-slip mat.
- Protect the SDL 150-H against water penetration with a plastic tarp.
- Disassemble all hydraulic components and drain the oil.

**Ambient Conditions**

- Store in dry surroundings (maximum humidity 80%).

**7.2 Disposal**

When used properly the SDL 150-H does not pose any hazard for users or the environment.

However, operation of the SDL 150-H 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, lubricants, 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 Handling Tools is not obligated to take back used equipment.

**List of Service Products Used**

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

**[This] page [is] intentionally left blank**

# APPENDIX

APPENDIX

## 8 Appendix

A. SAMPLE OF EC DECLARATION	77
B. THIRD PARTY DOCUMENTS	78
I SAFETY DATA-SHEET	78
II COMPONENTS	79

## A. Sample of EC Declaration



**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 Elevator Type SDL 150-H**

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

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

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

API 8C, 5. Edition	Specification for Drilling and Well Servicing Equipment
DIN EN ISO 13535	Petroleum and natural gas industries - Drilling and well-servicing equipment
DIN EN ISO 12100	Safety of machinery, Risk assessment and Risk Reduction
DIN EN ISO 80079-36	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:	[refer to data book]
Rated Capacity:	[refer to data book]
Part Number:	[refer to data book]
Serial Number:	[refer to data book]
Delivery date:	[refer to data book]
Order No.:	[refer to data book]
Marking:	<b>CE</b> 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 2014/34/EU Article 13 ( 1) b) ii) have been deposit at the notified body 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 and API 01 approved by API Quality Registrar, Washington D.C./USA, Registration No. 2850 + 01-2769.

Hamburg, issued on [refer to data book]

Authorized Representative

Name  
Position

Matthias Theiss  
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.blohmvooss-oiltools.com  
 Registered Office: Hamburg  
 Blohm + Voss is a trademark of Blohm + Voss Shipyards GmbH®

Managing Directors: Matthias Theiss, Dr. Uwe Wagner, 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 3303 0000  
 EUR-Acc.: IBAN: DE73 3003 0880 0012 8350 19  
 USD-Acc.: 401 / 2835 / 006 / IBAN: DE50 3003 0880 4012 8350 06  
 14.09.2017

Fig. 43: EC Certificate of Conformity Sample

## B. Third Party Documents

### I Safety Data-Sheet

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



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

## II Components

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

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

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

## OUR CORE VALUES

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



## FORUM Handling Tools

### FORUM B + V Oil Tools GmbH

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

### FORUM Energy Technologies Inc.

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