

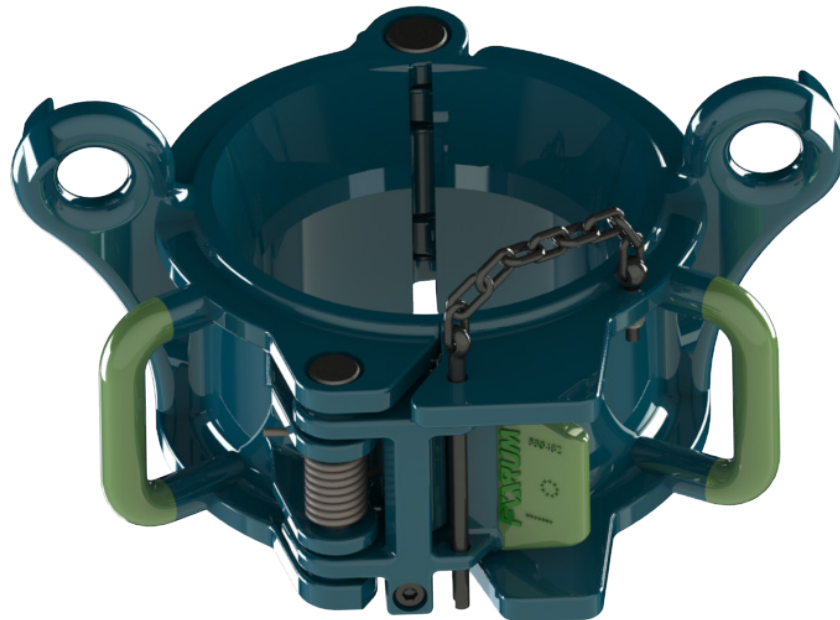
Single Joint Elevator

Type Series LSJ/ SJS			Type Series SJD			Type Series SJ		
Type	P/N	*R.C.	Type	P/N	*R.C.	Type	P/N	*R.C.
LSJ-4/1	660480-Y-BC*	4 tons	SJD-Y-BC*	650360	6 tons	SJ-2/5-Y	650200	2,5 tons
LSJ-4/2	660440-Y-BC*	4 tons	SJD-Y-BC*	650380	6 tons	SJ-3/1-Y	650300	3 tons
SJS-4/1	660400-Y-BC*	4 tons						
SJS-4/2	660420-Y-BC*	4 tons						
SJS-5/3	660500-Y-BC*	5 tons						
SJS-5/4	660520-Y-BC*	5 tons						
SJS-5/5	660540-Y-BC*	5 tons						
SJS-6/6	660600-Y-BC*	6 tons						
SJS-6/8	660640-Y-BC*	6 tons						
SJS-6/9	660660-Y-BC*	6 tons						
SJS-6/10	660680-Y-BC*	6 tons						

*BC = Bore Code *R.C. = Rated Capacity

Operation Instructions

Original Instructions



Manual PN PN 650200-Y ,Revision: 002,08-2016

Revision history

01	2012-02	B+V OT, ROK	Initial Release
02	2016-08	Forum B+V OT, ROK	Company Name Change, Layout Change, Update, This manual replace: 660480-Y-BC Rev 008 - Manual SJS/ LSJ-elevator 650200-Y Rev 000 - Manual SJ-elevator 650360-Y-BC Revision 002 - Manual SJD-elevator

Document Approval

Version	Author	Eng. Check	Approval Check
02	Forum B + V Oil Tools SS 12/15	Forum B + V Oil Tools MH 04/16	Forum B + V Oil Tools MH 08/16

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

Printed in Germany.

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DESCRIPTION

COMMISSIONING

INSTALLATION

OPERATIONS

MAINTENANCE AND INSPECTION

SIZE COMPONENTS

DRAWINGS

APPENDIX

DESCRIPTION

COMMISSIONING

INSTALLATION

OPERATIONS

MAINTENANCE AND
INSPECTION

SIZE COMPONENTS

DRAWINGS

APPENDIX

A. GENERAL INFORMATION

I Warnings and Note

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

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

II Intended use of this manual

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

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

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

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

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

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

IV Intend of use

The Forum B + V Oil Tools Single Joint Elevator to hold vertical pipes. The operator has to do hazard analysis on its own, because Forum B + V Oil Tools can not take all conditions of any drilling project into consideration for Single Joint Elevator.

V Improper / Unsafe Use

The equipment must only be used for the designated purpose.

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

VI Limited Warranty

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

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

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

VII Conformity

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

▲ NOTE THIS OPERATING MANUAL IS A PART OF THE TECHNICAL DOCUMENTATION FOR THE SINGLE JOINT ELEVATOR.

The EC Declaration of Conformity is delivered together with the Single Joint Elevator.

Keep these instructions and the associated documents for later use.

VIII Operational Environment

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

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

The machine is approved for operation in explosion hazard areas. For machines containing any hydraulic powered parts, the directive 2014/34/EC "Equipment and protective systems in potentially explosive atmospheres" applies.

The corresponding ATEX certificates are present in the Data book.

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

CE **Ex** II 2G IIB T5 for hydraulic and pneumatic equipment
or

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

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

IX General safety issues

- ▲ **WARNING** ONE SHOULD AVOID CREATING IGNITION SOURCES, LIKE HEAT, AS A RESULT OF THE USE OF THE EQUIPMENT WITH OTHER TOOLS OR EQUIPMENT.
- ▲ **WARNING** DO NOT USE THE EQUIPMENT FOR ANY OTHER PURPOSE THAN GIVEN IN THIS DOCUMENT WITHIN IT'S SPECIFICATION.
- ▲ **WARNING** FAILURE TO CONDUCT ROUTINE MAINTENANCE COULD RESULT IN EQUIPMENT DAMAGE OR INJURY TO PERSONNEL.
- ▲ **WARNING** WEAR PERSONAL PROTECTION EQUIPMENT WHILE WORKING WITH THE EQUIPMENT.
- ▲ **WARNING** IF ANY SAFETY ELEMENTS (LIKE SAFETY ROPES, SAFETY SHEETS, PLATES OR WASHERS) WERE DISASSEMBLED DUE TO MAINTENANCE WORK, DO NOT RE-USE THEM. ALWAYS REPLACE THEM WITH NEW SAFETY ELEMENTS.
- ▲ **WARNING** ALL WARNING PLATES, SIGNS AND LABELS ATTACHED TO THE EQUIPMENT MUST BE OBSERVED. THE WARNING PLATES, SIGNS AND LABELS MUST BE PRESENT ON THE EQUIPMENT. DO NOT REMOVE THE LABELS. IF THEY ARE MISSING, REPLACING IS MANDATORY.
- ▲ **WARNING** ANY MODIFICATION TO THE EQUIPMENT CARRIED OUT WITHOUT THE APPROVAL OF FORUM B + V OIL TOOLS GmbH WILL VOID ANY WARRANTY.
- ▲ **WARNING** USING THE EQUIPMENT WITH DAMAGED OR WORN PARTS CAN CREATE SERIOUS INCIDENTS.
- ▲ **WARNING** THE COMPANY OPERATING THE EQUIPMENT IS RESPONSIBLE FOR EVALUATING SAFE AND PROPER USE OF THE EQUIPMENT IN A HAZARD ANALYSIS.
- ▲ **WARNING** IT IS NOT ALLOWED TO USE ANY COMPONENTS WHICH ARE OF "NON-B+V" ORIGINE, OR USE "NON-OEM" PARTS WHICH ARE NOT APPROVED BY B+V. IT WILL VOID ANY WARRANTY AND MAY EFFECT THE CORRECT FUNCTIONING OF THE EQUIPMENT AND IT'S SAFETY FEATURES.
- ▲ **WARNING** THE OPERATING COMPANY IS OBLIGATED TO ISSUE WORKING INSTRUCTIONS FOR SAFE USE AND SUPERVISE OBSERVANCE OF THESE WORKING INSTRUCTIONS.
- ▲ **WARNING** EVERY EMPLOYEE, WHICH OPERATES, SERVICES, INSPECTS OR OTHERWISE INVOLVED WITH THE USE OF THE EQUIPMENT IN OTHER AREAS HAS TO ENSURE, THAT THESE ACTIONS ARE DONE BY TRAINED AND BY AN FORUM B + V OIL TOOLS GmbH AUTHORIZED PERSONNEL,
- ▲ **WARNING** AND SHOULD COMPLETE REGULAR COURSES OF TRAINING, TO ENSURE PROPER USE AS WELL AS SAFE OPERATION, CORRECT MAINTAINANCE AND INSPECTION.
- ▲ **WARNING** IF NECESSARY, A REASONABLE, ADDITIONAL SUPERVISOR SHOULD BE APPOINTED DURING OPERATION.
- ▲ **WARNING** STAY AWAY FROM THE EQUIPMENT DURING OPERATION. IN CASE IT IS REMOTE OPERATED IT MAY MAKE MOVEMENTS WITHOUT WARNING.
- ▲ **WARNING** SAFETY ISSUES ELEVATOR
- ▲ **WARNING** DO NEVER UNLATCH/OOPEN THE EQUIPMENT WHILE A PIPE IS SUSPENDED IN THE EQUIPMENT; THE PIPE WILL BE LOST!

- ▲ **WARNING** WHILE USING THE ELEVATOR, ALWAYS MAKE SURE THE DOOR IS COMPLETELY CLOSED WITH THE LATCH/LATCH LOCK FULLY ENGAGED AND IF APPLICABLE THE VERIFICATION PIN PROPERLY INSTALLED.
- ▲ **WARNING** PAY SPECIAL ATTENTION TO THE VERIFICATION PIN (IF APPLICABLE), LATCH AND LATCH LOCK FOR ANY SIGNS OF WEAR, BENDING OR DAMAGE AT ANY TIME. IN CASE PARTS ARE DAMAGED OR BENT, REPLACE IMMEDIATELY BY NEW, ORIGINAL PARTS.
- ▲ **WARNING** THE LIFTING OF VERTICAL PIPES IS TO BE PERFORMED CAREFULLY AND MUST BE MONITORED. THE PICKING UP OF HORIZONTAL OR TILTED PIPES IS DANGEROUS AND NOT PERMITTED BY THE MANUFACTURER.
- ▲ **WARNING** IF THE OPERATOR CONSIDERS TO USE THE ELEVATOR FOR OTHER OPERATIONS THAN THE INTENDED USE (FOR EXAMPLE HANDLING OF HORIZONTAL PIPES), IT IS MANDATORY TO MAKE AN ADDITIONAL RISK ANALYSIS.

X Safe handling

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

XI Safety Signs

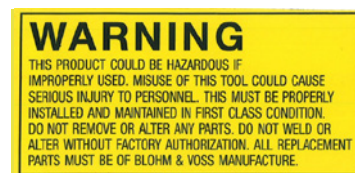


Fig. 1: Warning sign PN 671638
General warning



Fig. 2: Warning sign PN 671642
Apply grease



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



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



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

XII Conformity

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

INFO

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

XIII Contact Forum B + V Oil Tools worldwide

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

Forum B + V Oil Tools GmbH

Hermann-Blohm-Strasse 2
20457 Hamburg
Germany
tel: +49 40 370 226 855
fax: +49 40 370 226 899
Email: oilequipments@f-e-t.com
web: www.f-e-t.com

Forum Access Oil Tools

1023 Forum Drive
Broussard, LA 70518 USA
tel: 337-373-1800
fax: 337-837-4466

FORUM ENERGY TECHNOLOGIES Drilling Service Locations

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

Canada

#106, 3903 - 75 Ave
Leduc, Alberta T9E 0K3
tel: +1 780-980-0345
fax: +1 780-986-3278

Mexico

Avenida Avante Monterrey N 300
Parqu Industrialxico
tel:+ 52 81 8245 6800

Scotland

Peregrine Road, Westhill
Aberdeenshire, AB32 6JL
tel: +44 (0) 1224 744000

United Arab Emirates

Oilfields Supply Center
Building B-45
Jebel Ali Free Zone Dubai UAE
tel:+971 4 883 5266

Singapore

No 51 Benoi Road #06-00
Liang Huat Industrial Complex, Singapore
629908
tel: +65 6465 4850
fax: +65 6465 4851
Out of hours +65 91389812

XIV Information on the Forum B + V Oil Tools GmbH homepage

INFO

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

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

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

www.blohmvooss-oiltools.com



Technical Documentations
Safety Notes and Product Updates

The screenshot shows the website's navigation bar with links for HOME, COMPANY, PRODUCTS, QUALITY, ENGINEERING, SERVICE, SALES, JOBS, PRESS, CONTACT, and CATALOG. Below the navigation is a search bar and a list of technical documentations for Forum B + V equipment, including Elevator / Spiders, Elevators, Elevator Systems, Bushings, Elevator Links, Manual Tongs, Manual Slips, Power Slips, Slip Lifter, Safety Clamps, Wrench, Pipe Spinner and Floorhands, and Control Units. On the right side, there are links for Technical Documentations, Safety Notes and Product Updates, Logout, Newsletter Settings (with checkboxes for Product Updates and Safety Notes), and a Change Password form.

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

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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
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Fig. 6: Illustration Service–Homepage

DESCRIPTION

DESCRIPTION

1 DESCRIPTION

1.1 General

1.1.1 Type SJ, SJS/LSJ, SJD

The Center Latch, Single Joint Elevators are designed to pick up and handle single joint tubulars, which have, depending on type series, a lifting capacity between 3 tons and 6 tons. Type series SJ is also equipped with a tapered load shoulder (5°, 12° or 18°). Compared to the type series SJ and SJS, type series SJD is designed with a slip assembly to allow different ranges of pipe sizes.

The Temperature working range ambient is:

- 40° C to + 60° C.

- 40° F to + 140° F.

1.1.2 Design Specification

Material and manufacturing standard in accordance to ISO 13535:2002/API 8C.

1.1.3 Identification

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

1.2 Main assembly

The Center Latch, Single Joint Elevator consist of the following main parts:

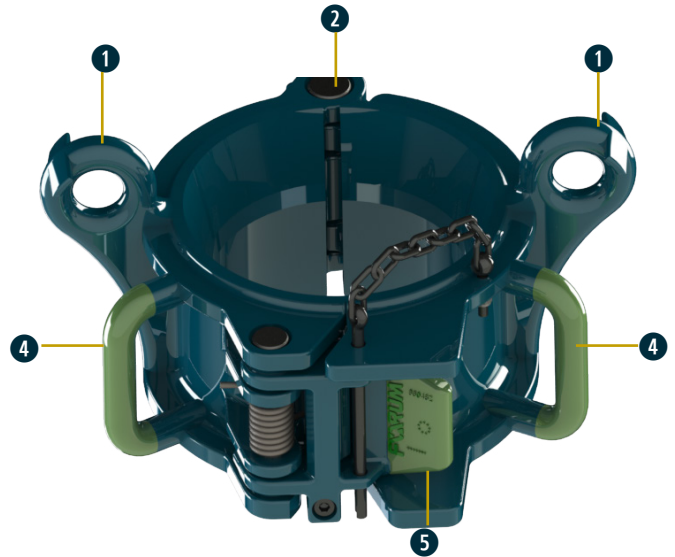


Fig. 7: Type series SJD front view.

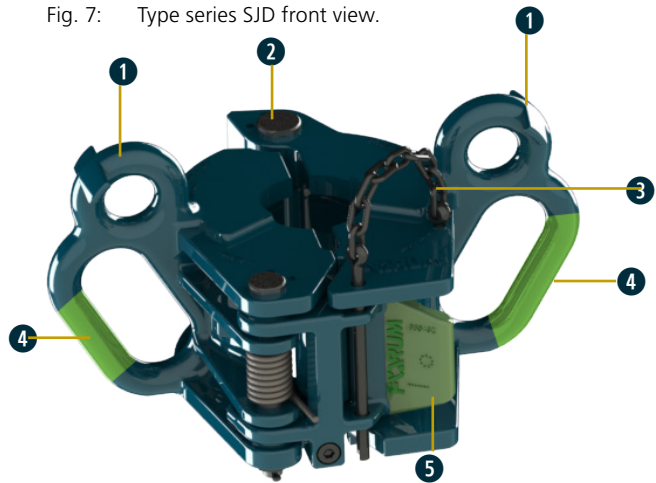


Fig. 8: Type series LSJ view.

-	I / r Frame	1	Lifting Ears
2	Hinge pin	3	Safety pin with chain
4	I-r Handle	5	Latch
5	Latch		Grease nipple

1.3 Technical data

1.3.1 SJ Center Latch Type Series

Type	P/N	Rated Cap.	Size O.D. 1,7 m	Swivel Susp.	Weight	Temp. Working range
SJ-2/5	650 200-Y	2,5 tons	2.3/8" - 5.1/2"	650 312	41 lbs	- 40° F (- 40° C) - + 140° F (+ 60° C)
SJ-3/1	650 300-Y	3 tons	3.1/2" - 7.5/8"	650 312	55 lbs	- 40° F (- 40° C) - + 140° F (+ 60° C)

Additional information for the SJ Center Latch Type Series

Pipe Range	SJ 2/5 - Slip Assembly			SJ 3/1 Assembly		
	5° TBG	12° TBG	18° DP	5° TBG	18° DP	12" TBG
2.3/8"	650 209	650 230	650 219	-	-	650 418
2.7/8"	650 210	650 231	650 220	-	-	650 419
3.1/2"	650 211	650 232	650 221	-	650 411	650 420
4"	650 212	650 233	650 222	-	650 412	-
4.1/2"	650 213	650 234	650 223	650 319	650 413	650 421
5"	650 214	-	-	650 316	650 414	-
5.1/2"	650 215	-	-	650 317	650 415	650 425
5.7/8"	-	-	-	-	650 417	650 422
6.5/8"	-	-	-	650 313	650 416	-
7"	-	-	-	650 314	-	-
7.5/8"	-	-	-	650 315	-	-

1.3.2 SJS/ LSJ Center Latch Type Series

Type	P/N	Rated Capacity	Size O.D. 1,7 m	Swivel Susp.	3 m Swivel Susp.	Weight	Temp. Working range
LSJ-4/1	660 480 -Y-BC	4 tons	2.3/8" - 4"	660 412	660 415	28 lbs	- 40° F (- 40° C) - + 140° F (+ 60° C)
LSJ-4/2	660 440-Y-BC	4 tons	4" - 6"	660 412	660 415	32 lbs	- 40° F (- 40° C) - + 140° F (+ 60° C)
SJS-4/1	660 400-Y-BC	4 tons	2.3/8" - 4"	660 412	660 415	28 lbs	- 40° F (- 40° C) - + 140° F (+ 60° C)
SJS-4/2	660 420-Y-BC	4 tons	4" - 6"	660 412	660 415	32 lbs	- 40° F (- 40° C) - + 140° F (+ 60° C)
SJS-5/3	660 500-Y-BC	5 tons	6.1/2" - 9.5/8"	660 512	660 513	78 lbs	- 40° F (- 40° C) - + 140° F (+ 60° C)
SJS-5/4	660 520-Y-BC	5 tons	9.5/8" - 12.3/4"	660 512	660 513	98 lbs	- 40° F (- 40° C) - + 140° F (+ 60° C)
SJS-5/5	660 540-Y-BC	5 tons	13" - 16"	660 512	660 513	123 lbs	- 40° F (- 40° C) - + 140° F (+ 60° C)
SJS-6/6	660 600-Y-BC	6 tons	16.3/4" - 20"	660 612	660 614	138 lbs	- 40° F (- 40° C) - + 140° F (+ 60° C)
SJS-6/8	660 640-Y-BC	6 tons	22" - 30"	660 612	660 614	173 lbs	- 40° F (- 40° C) - + 140° F (+ 60° C)
SJS-6/9	660 660-Y-BC	6 tons	30" - 36"	660 612	660 612	185 lbs	- 40° F (- 40° C) - + 140° F (+ 60° C)

1.3.3 SJD Center Latch Type Series

Type	P/N	Rated Cap.	Size O.D. 1,7 m	Swivel Susp.	Weight	Temp. Working range
SJD	650 360-Y-BC	6 tons	2.7/8" - 5.7/2"	660 612	35 lbs	- 40° F (- 40° C) - + 140° F (+ 60° C)
SJD	650 380-Y-BC	6 tons	6.1/4" - 9"	660 612	80 lbs	- 40° F (- 40° C) - + 140° F (+ 60° C)

1.4 Main dimensions

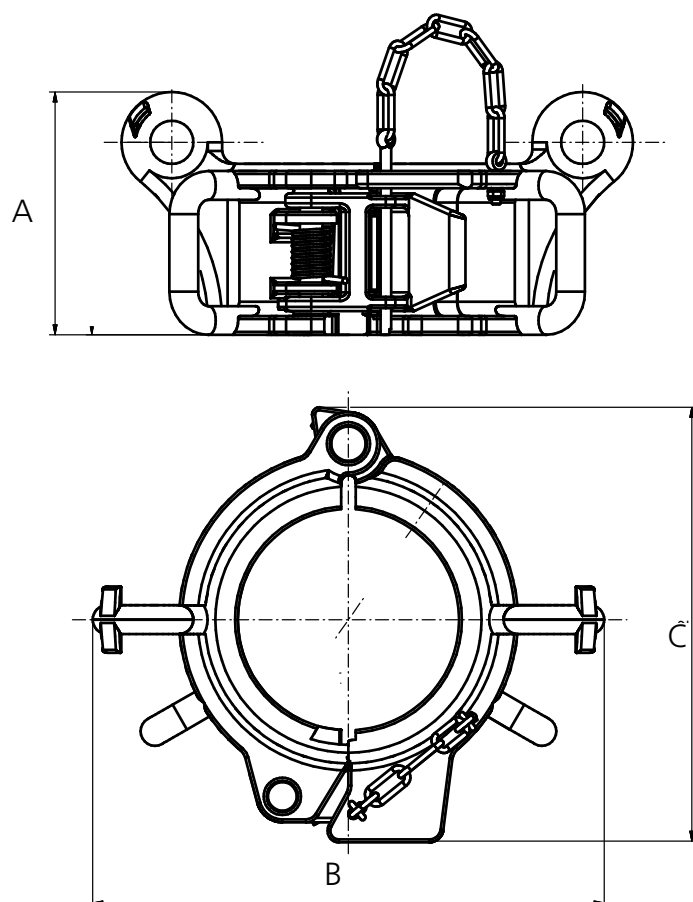


Fig. 9: Type series SJS front and top view

1.4.1 Type Series SJS/ LSJ Main dimensions

Type	Part number	Size (inches)	A	B	C
LSJ-4/1	660 480 -Y-BC	2.3/8" – 5.1/2"	184 mm	225 mm	316 mm
LSJ-4/2	660 440 -Y-BC	3.1/2" – 7.5/8"	184 mm	275 mm	305 mm
SJS-4/1	660 400 -Y-BC	2.3/8" – 5.1/2"	184 mm	225 mm	316 mm
SJS-4/2	660 420 -Y-BC	3.1/2" – 7.5/8"	184 mm	275 mm	305 mm
SJS-5/3	660 500 -Y-BC	6.1/2" - 9.5/8"	169 mm	380 mm	430 mm
SJS-5/4	660 520 -Y-BC	9.5/8" - 12.3/4"	169 mm	465 mm	520 mm
SJS-5/5	660 540 -Y-BC	13" - 16"	169 mm	549 mm	610 mm
SJS-6/6	660 600 -Y-BC	16.3/4" - 20"	187 mm	660 mm	720 mm
SJS-6/8	660 640 -Y-BC	22" - 30"	187 mm	932 mm	972 mm
SJS-6/9	660 660 -Y-BC	30" - 36"	130 mm	1100 mm	1180 mm

1.4.2 Type Series SJ Main dimensions

Type	Part number	Size (inches)	A	B	C
SJ-2/5	650 200-Y	2.3/8" – 5.1/2"	179 mm	327 mm	320 mm
SJ-3/1	650 300-Y	3.1/2" – 7.5/8"	179 mm	387 mm	370 mm

1.4.3 Type Series SJD Main dimensions

Type	Part number	Size (inches)	A	B	C
SJD	650 360-Y-BC	2.7/8" - 5.7/2"	169 mm	290 mm	356 mm
SJD	650 380-Y-BC	6.1/4" - 9"	169 mm	393 mm	430 mm

COMMISSIONING

COMMISSIONING

2 COMMISSIONING

Forum B + V Oil Tools strongly recommends to accomplish the commissioning with the Forum B + V Oil Tools Commissioning Service. Read manual before first use.

▲ **NOTE** READ MANUAL BEFORE FIRST USE !

OK Check crew is aware of all possible point of risk danger regarding handling the B+V equipment.

OK Go through manual with crew.

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

Scope of supply

OK Cross check all delivered parts

Check and Lubrication

OK Check for any damage and repair if needed

OK Check the elevator can be closed properly

OK Check for correct seating of the hinge and latch pin

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

OK Check if elevator is installed as outlined in manual

OK Check if all bolts, nuts, washers and lock wire are in place.

Function test

OK Check elevator opens properly.

OK Check elevator closes properly.

OK Check elevator is latched and locked properly.

OK Check the elevator will close, latch and lock properly

OK Check safety / lock wire is present

OK Pick up a pipe and check if the elevator performs as required

INSTALLATION

INSTALLATION

3 INSTALLATION

3.1 Lifting and transport

▲ WARNING LIFT THE SJ ELEVATOR ON THE LIFTING EARS ONLY.

▲ WARNING WEAR YOUR PERSONAL PROTECTION EQUIPMENT AT ALL TIMES.

3.2 Installation Checklist

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

OK Make sure the equipment is working properly

OK Make sure all bolts and nuts are tightened.

Connections

OK Close elevator

OK Check elevator is latched and locked properly.

OK Open elevator.

OK Check all tools are removed from the elevator.

Check and lubricate

OK Check for any damage and repair if needed.

OK Check elevator can be closed, latched and locked properly.

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

OK Check if all bolts, nuts, washers and lock wire are in place.

OK Check correct setting of latch.

OPERATION

OPERATION

4 OPERATIONS

4.1 Operational safety issues

- ▲ **WARNING** NEVER OPEN THE ELEVATOR WHEN THE PIPE LOAD IS STILL SUSPENDED BY THE ELEVATOR.
- ▲ **WARNING** OBSERVE THE ELEVATOR CONTINUOUSLY WHILE CLOSING TO CHECK IF THE ELEVATOR IS PROPERLY CLOSED.
- ▲ **WARNING** ALL WARNING PLATES, SIGNS AND LABELS ATTACHED TO THE EQUIPMENT MUST BE OBSERVED.
- ▲ **WARNING** DO NEVER UNLATCH/OPEN THE ELEVATOR WHILE A PIPE IS SUSPENDED IN THE ELEVATOR; THE PIPE WILL BE LOST!
- ▲ **WARNING** USING THE ELEVATOR WITH DAMAGED OR WORN PARTS CAN CREATE SERIOUS INCIDENTS.
- ▲ **WARNING** THE PICKING UP OF HORIZONTAL OR TILTED PIPES IS DANGEROUS. THIS USE IS NOT PERMITTED. THE LIFTING OF VERTICAL PIPES IS TO BE PERFORMED CAREFULLY AND MUST BE MONITORED.
- ▲ **WARNING** ANY MODIFICATION TO THE ELEVATOR CARRIED OUT WITHOUT THE APPROVAL OF FORUM B + V OIL TOOLS WILL VOID ANY WARRANTY.

4.2 Safety

It is recommended to have the SJ Elevator operated by the driller.

The driller (and or the floor man) must coordinate operation of the elevator and slips/spider so one equipment is engaged around the tubular before the other is disengaged. Thus, one or both tools continuously suspend the tubular during all stages of pipe handling operations.

- ▲ **WARNING** NEVER OPEN THE ELEVATOR WHEN THE PIPE LOAD IS STILL SUSPENDED BY THE ELEVATOR.

4.3 Operation MU (make up)

1. Pick up a section of pipe.
2. Now make up the stand or joint.
3. When the pipe is made up, pick up the load.
4. Now lower the string.
5. Pick up the weight of the pipe string, before opening the elevator.
6. Open the elevator and pick up a new section of pipe.

4.4 Operation BO (break out)

7. Pick up the string with the elevator.
8. Pull out the string.
9. Release the stringweight from the elevator.
10. Now BO the stand or joint.
11. When the pipe is BO, pick up the stand and handle.

4.5 Opening the elevator

12. Remove the safety pin with chain (1).
13. Pull the latch (2) against the spring force. This will open the latch mechanism.
14. Pull both the elevator halves apart by using the elevator handles.
15. Now the elevator is open.

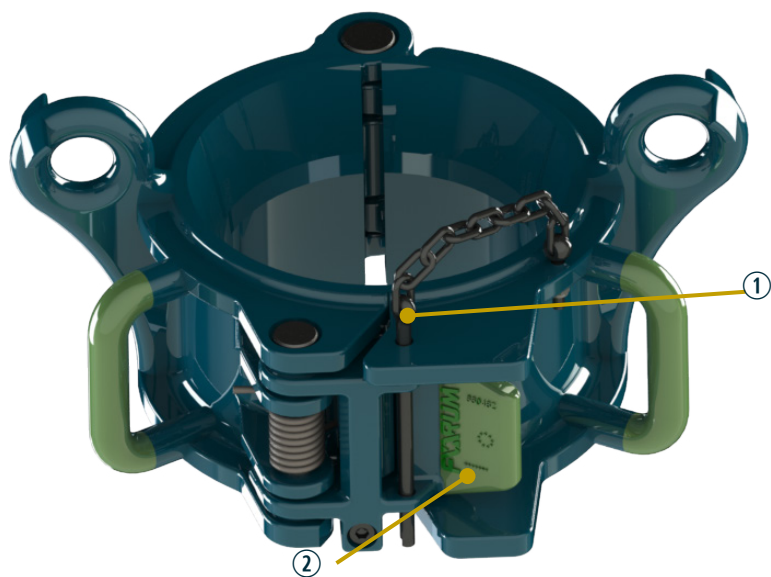


Fig. 10: Closed SJD front view

4.6 Closing the elevator

16. Force the elevator body halves together using the elevator handles.
17. Check if the latch has snapped into place properly
18. Secure the latch with the safety pin.
19. Now the elevator is closed.

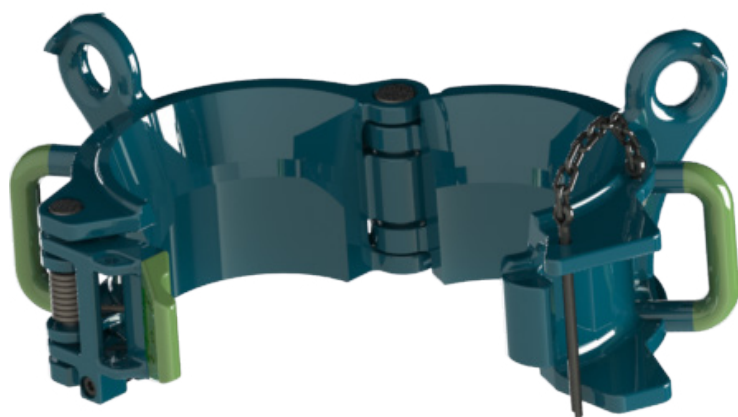


Fig. 11: Opened SJD front view

4.7 Troubleshooting

OPERATION

	Lubrication points are lubricated as recommend by Forum B + V Oil Tools?	Hinge pin/ Latch pin and bore diameter are still sufficient?	Is the latch spring in a untained condition and still at the right position?	Are there loose, untightened or damaged components e?	Has the correct required slip size been selected?	Is there dirt or other objects in the work area?	Are there blocked grease nipples?	Contact Technical Support in case of an emergency, for advanced help and tips and especially if troubleshooting is without succes!
Elevator does not open/ opens irregular.								
Elevator does not close/ closes irregular.								
The elevator holds the drill pipe irregular.								
Hinge and Latch pin can not be drawn.								
Device is grease dry unless lubrication has been performed.								
Elevator opens/ closes ungently/ stuttered.								
Latch opens/ closes ungently/ stuttered.								

Forum B + V Oil Tools recommends to follow this step in case of unsolvable problems!
 Forum B + V Oil Tools recommends to follow this shown step.
 Shown steps must not be followed.

▲ **NOTE** THIS TABLE DOES NOT SHOW ALL POSSIBLE COMMON SYMPTOMS. IT CAN NOT BE EXCLUDED THAT DIFFERENT SYMPTOMS MAY OCCUR IN COMBINATION. THEREFOR IT IS NECESSARY TO GO THROUGH TROUBLESHOOTING IN A USEFUL ORDER. TROUBLESHOOTING CAN BE ALSO AN EXHAUSTING AND FRUSTRATING PROCESS. FORUM B + V OIL TOOLS RECOMMENDS TO CALL THE TECHNICAL SUPPORT EARLY BEFORE LOOSING TOO MUCH TIME FOR TROUBLESHOOTING. ALWAYS CONSIDER THE RECOMMEND SAFETY NOTES WHILE TROUBLESHOOTING. DON'T FORGET TO SWITCH OFF PRESSURE BEFORE INSTALLING NEW COMPONENTS OR MANOMETER. DO NOT MAKE ANY FORM OF REPARATION, EXPANSIONS OR CHANGES WHICH ARE NOT RECOMMEND AND SUPPORTED BY FORUM B + V OIL TOOLS. CONTACT TECHNICAL SUPPORT, IF THERE ARE SINGLE COMPONENTS OR ASSEMBLIES WHICH HAVE TO BE REPLACED!

MAINTENANCE AND INSPECTION

MAINTENANCE AND
INSPECTION

5 Inspection / Maintenance

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



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



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



WEAR EYE PROTECTION!



WEAR PROTECTIVE HELMET!



WEAR PROTECTIVE GLOVES!



WEAR SAFETY SHOES!

Instructions for inspection and maintenance

1. In the event of visible damage or excessive wear contact the Forum B + V Oil Tools Service Department or an authorized repair company.
2. Ensure that welding work on cast parts is performed exclusively by the Forum B + V Oil Tools Service Department or an authorized repair company observing the Forum B + V Oil Tools welding instructions.
3. Ensure that all other maintenance work is performed only by personnel trained for this work and familiar with the risks involved in operating the machine.
4. Ensure that all repair work not performed by Forum B + V Oil Tools is nevertheless accomplished in compliance with the manufacturer's specifications and instructions.
5. Small cracks and irregularities, which do not affect the safety or proper operation of the Elevator can be removed by grinding („5.5 Critical Areas“ on page 28).
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 Single Joint Elevator elevator is set down on a good supporting surface so that it cannot tip.
2. Provide for sufficient lighting at the workplace.


Trouble shooting

1. In all events where the Single Joint Elevator elevator function are not as expected, following checks must be carried out to identify the cause.
2. Check proper lubrication.
3. Check software program regarding device specification.
4. Check bushing size and installation.

MAINTENANCE AND INSPECTION

5.1 Lubrication

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

	WEAR EYE PROTECTION!
---	-----------------------------

	WEAR PROTECTIVE GLOVES!
---	--------------------------------

The Elevators are supplied with lubricating grease manually by a grease gun through lubrication nipples.

When the equipment is in use, the following lubrication procedure should be performed daily, or as inspection indicates:

5.1.1 Lubrication Points on Machine.

The elevator needs to be lubricated regularly on hourly basis in operation following locations:

- Grease Point :
- ① Hinge Pins
 - ② Latch Pin, Spring

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

Tools



Fig. 12: Recommended Grease Pump (P/N 775810).



Fig. 13: Instructions: Lubricate at least on a daily basis (P/N 671642)

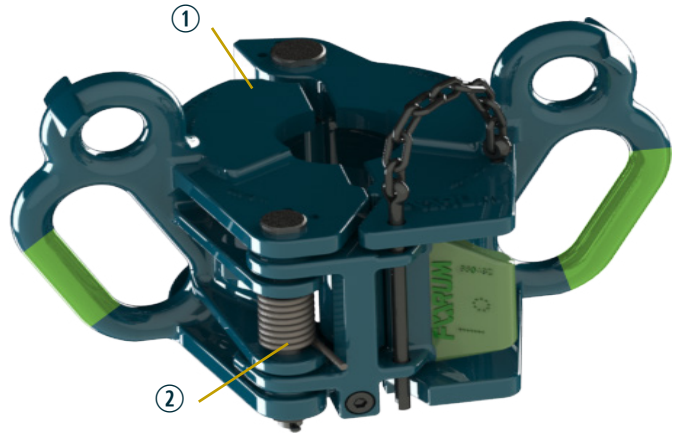


Fig. 14: Grease points on Single Joint Elevator elevator

5.2 Inspections

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

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

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

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

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

INFO



The specified maintenance intervals are recommended for the Elevator during its service life. The necessity of inspections depends primarily on the following conditions:

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

5.2.2 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 / - 4 °F).

5.2.3 Inspection Following Removal

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

5.2.1 Inspection Intervals

Category	Interval	Preparatory measures
I	Daily	- Elevator in working environment,
II	Weekly	- Elevator on workspace
III	Montchly, Semi - annually	- Elevator on workspace
IV	Every year	- Elevator on workspace

5.3 Inspection Categories

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

INFO



Inspection categories acc. to API RP 7L

5.3.1 Inspection Category I

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

Scope/Prerequisites

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

Procedure:

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

5.3.2 Inspection Category II

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

Scope/Prerequisites

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

Procedure:

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

5.3.3 Inspection Category III

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

Scope/Prerequisites

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

Procedure:

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

5.3.4 Inspection Category IV

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

Scope/Prerequisites

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

Procedure:

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


5.3.5 Inspection check list

Task / Interval	Daily	Weekly	6 Monthly	1 Year
Ongoing observation.	✓	✓	✓	✓
Grease all grease points, as shown on page 21.	✓	✓	✓	✓
Correct function of the locking mechanism (latch assembly).	✓	✓	✓	✓
Correct size of bushing/ slip segments.	✓	✓	✓	✓
Ongoing cleaning.	✓	✓	✓	✓
Check for NO loose components.	✗	!	✓	✓
Condition and completeness of warning labels.	✗	✗	!	✓
Check for visible cracks, breaks, elongation, corrosion, damages, wear.	✗	✗	!	✓
NDT testing of all critical parts.	✗	✗	✗	!

✓ Necessary

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

✗ Not necessary

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

5.3.6 Inspection Reports

INFO



The following check lists serve as copy templates for inspections to be performed in compliance with API RP 7L and are required to file performed inspections as defined in the user manual



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

Machine model

Serial number

Inspection Category I

Date / Place of Inspection	Checked		Name of Inspection Operator / Supervisor	Sign.
	OK	NOK		
	<input type="checkbox"/>	<input type="checkbox"/>		

Remarks:

Inspection Category II

Date / Place of Inspection	Checked		Name of Inspection Operator / Supervisor	Sign.
	OK	NOK		
	<input type="checkbox"/>	<input type="checkbox"/>		

Remarks:

Inspection Category III

Date / Place of Inspection	Checked		Name of Inspection Operator / Supervisor	Sign.
	OK	NOK		
	<input type="checkbox"/>	<input type="checkbox"/>		

Remarks:

Inspection Category IV

Date / Place of Inspection	Checked		Name of Inspection Operator / Supervisor	Sign.
	OK	NOK		
	<input type="checkbox"/>	<input type="checkbox"/>		

Remarks:

5.4 Measuring of Wear

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 are loosening the elevator should be dismantled for general engineering check up.

For square shoulder elevators a rule marked in sixteenth of an inch as adequate. The straight edge of a rule is used to check the squareness of the top bore and the end of a rule is inserted into the worn pockets and ridges. Wear of 1/16 inch (1,6 mm) or more should require refacing of collar surface.

5.4.1 Minimum ear dimensions

▲ WARNING 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 SUITABILITY FOR CONTINUED USE.

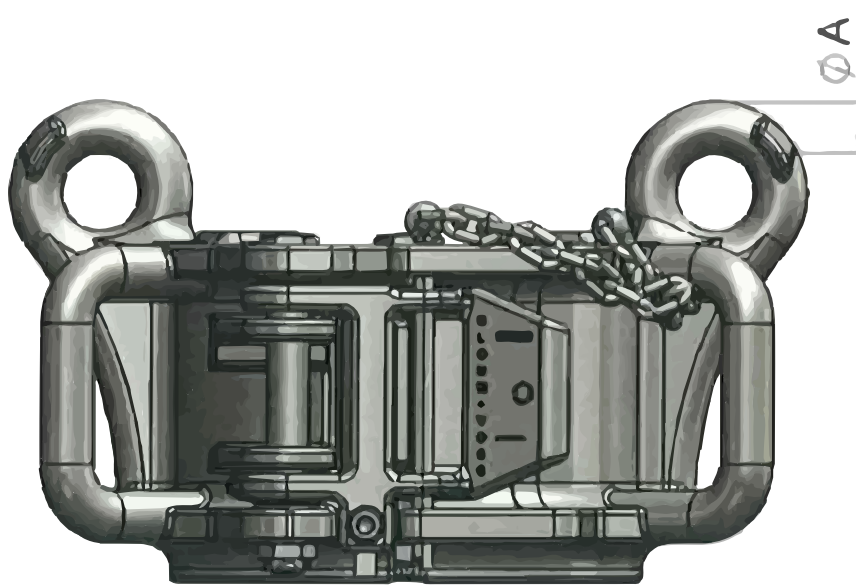


Fig. 15: SJS front view - Diemnsion A

MAINTENANCE AND INSPECTION

Type Series SJS/ LSJ			Type Series SJD			Type Series SJ		
Type	P/N	Min. A dimension mm [inch]	Type	P/N	*R.C.	Type	P/N	*R.C.
LSJ-4/1	660480-Y-BC*	14,6 [0,57]	SJD-Y-BC	650360	14,6 [0,57]	SJ-2/5-Y	650200	14,6 [0,57]
LSJ-4/2	660440-Y-BC*	14,6 [0,57]	SJD-Y-BC	650380	14,6 [0,57]	SJ-3/1-Y	650300	14,6 [0,57]
SJS-4/1	660400-Y-BC*	14,6 [0,57]						
SJS-4/2	660420-Y-BC*	14,6 [0,57]						
SJS-5/3	660500-Y-BC*	14,6 [0,57]						
SJS-5/4	660520-Y-BC*	14,6 [0,57]						
SJS-5/5	660540-Y-BC*	14,6 [0,57]						
SJS-6/6	660600-Y-BC*	19,6 [0,77]						
SJS-6/8	660640-Y-BC*	19,6 [0,77]						
SJS-6/9	660660-Y-BC*	19,6 [0,77]						

5.4.2 Wear data criteria

5.4.2.1 Type Series SJ

Hinge Pin	SJ 2/5	SJ 3/1	SJ 3/2	SJ 3/3
Hinge Pin P/N	660410	660510	660510	660510
Hinge Pin Dia. New	19,85 [0,78]	21,85 [0,86]	21,85 [0,86]	21,85 [0,86]
Bore Dia. New Max.	20,052 [0,79]	22,052 [0,87]	22,052 [0,87]	22,052 [0,87]
Bore Dia. Worn Max.	20,412 [0,8]	22,412 [0,88]	22,412 [0,88]	22,412 [0,88]

Latch Pin	SJ 2/5	SJ 3/1	SJ 3/2	SJ 3/3
Latch Pin PN:	660404	660404	660404	660404
Latch Pin Dia. New	15,85 [0,62]	15,85 [0,62]	15,85 [0,62]	15,85 [0,62]
Elevator Bore Dia. New Max.	16,043 [0,63]	16,043 [0,63]	16,043 [0,63]	16,043 [0,63]
Elevator Bore Dia. Worn Max.	16,373 [0,64]	16,373 [0,64]	16,373 [0,64]	16,373 [0,64]
Latch Bore Dia. New Max.	16,73 [0,66]	16,73 [0,66]	16,73 [0,66]	16,73 [0,66]
Latch Bore Dia. Worn Max.	17,06 [0,67]	17,06 [0,67]	17,06 [0,67]	17,06 [0,67]

5.4.2.2 Type Series SJS

Hinge Pin	SJS 4/1	SJS 4/2	SJS 5/3	SJS 5/4	SJS 5/5	SJS 6/6	SJS 6/8	SJS 6/9
Hinge Pin P/N	660410	660410	660510	660510	660510	660610	660610	660610
Hinge Pin Dia. New	19,85 [0,78]	19,85 [0,78]	21,85 [0,86]	21,85 [0,86]	21,85 [0,86]	24,85 [0,98]	24,85 [0,98]	24,85 [0,98]
Bore Dia. New Max.	20,052 [0,79]	20,052 [0,79]	22,052 [0,87]	22,052 [0,87]	22,052 [0,87]	25,052 [0,99]	25,052 [0,99]	25,052 [0,99]
Bore Dia. Worn Max.	20,412 [0,8]	20,412 [0,8]	22,412 [0,88]	22,412 [0,88]	22,412 [0,88]	25,412 [1]	25,412 [1]	25,412 [1]

Latch Pin	SJS 4/1	SJS 4/2	SJS 5/3	SJS 5/4	SJS 5/5	SJS 6/6	SJS 6/8	SJS 6/9
Latch Pin PN:	660404	660404	660404	660404	660404	660404	660404	660404
Latch Pin Dia. New	15,85 [0,62]	15,85 [0,62]	15,85 [0,62]	15,85 [0,62]	15,85 [0,62]	15,85 [0,62]	15,85 [0,62]	15,85 [0,62]
Bore Dia. New Max.	16,043 [0,63]	16,043 [0,63]	16,043 [0,63]	16,043 [0,63]	16,043 [0,63]	16,043 [0,63]	16,043 [0,63]	16,043 [0,63]
Bore Dia. Worn Max.	16,373 [0,64]	16,373 [0,64]	16,373 [0,64]	16,373 [0,64]	16,373 [0,64]	16,373 [0,64]	16,373 [0,64]	16,373 [0,64]
Latch Bore Dia. New Max.	16,73 [0,66]	16,73 [0,66]	16,73 [0,66]	16,73 [0,66]	16,73 [0,66]	16,73 [0,66]	16,73 [0,66]	16,73 [0,66]
Latch Bore Dia. Worn Max.	17,06 [0,67]	17,06 [0,67]	17,06 [0,67]	17,06 [0,67]	17,06 [0,67]	17,06 [0,67]	17,06 [0,67]	17,06 [0,67]

5.4.2.3 Type Series LJS

Hinge Pin	LJS 4/1	LJS 4/2
Hinge Pin P/N	660489	660489
Hinge Pin Dia. New	19,85 [0,78]	19,85 [0,78]
Bore Dia. New Max.	20,052 [0,79]	20,052 [0,79]
Bore Dia. Worn Max.	20,412 [0,8]	20,412 [0,8]

Latch Pin	LJS 4/1	LJS 4/2
Latch Pin PN:	660488	660488
Latch Pin Dia. New	15,85 [0,62]	15,85 [0,62]
Bore Dia. New Max.	16,043 [0,63]	16,043 [0,63]
Bore Dia. Worn Max.	16,373 [0,64]	16,373 [0,64]
Latch Bore Dia. New Max.	16,73 [0,66]	16,73 [0,66]
Latch Bore Dia. Worn Max.	17,06 [0,67]	17,06 [0,67]

5.4.2.4 Type Series SJD

Hinge Pin	SJD
Hinge Pin P/N	660410
Hinge Pin Dia. New	19,85 [0,78]
Bore Dia. New Max.	20,052 [0,79]
Bore Dia. Worn Max.	20,412 [0,8]

Latch Pin	SJD
Latch Pin PN:	660404
Latch Pin Dia. New	15,85 [0,62]
Elevator Bore Dia. New Max.	16,043 [0,63]
Elevator Bore Dia. Worn Max.	16,373 [0,64]
Latch Bore Dia. New Max.	16,73 [0,66]
Latch Bore Dia. Worn Max.	17,06 [0,67]

MAINTENANCE AND INSPECTION

5.5 Critical Areas

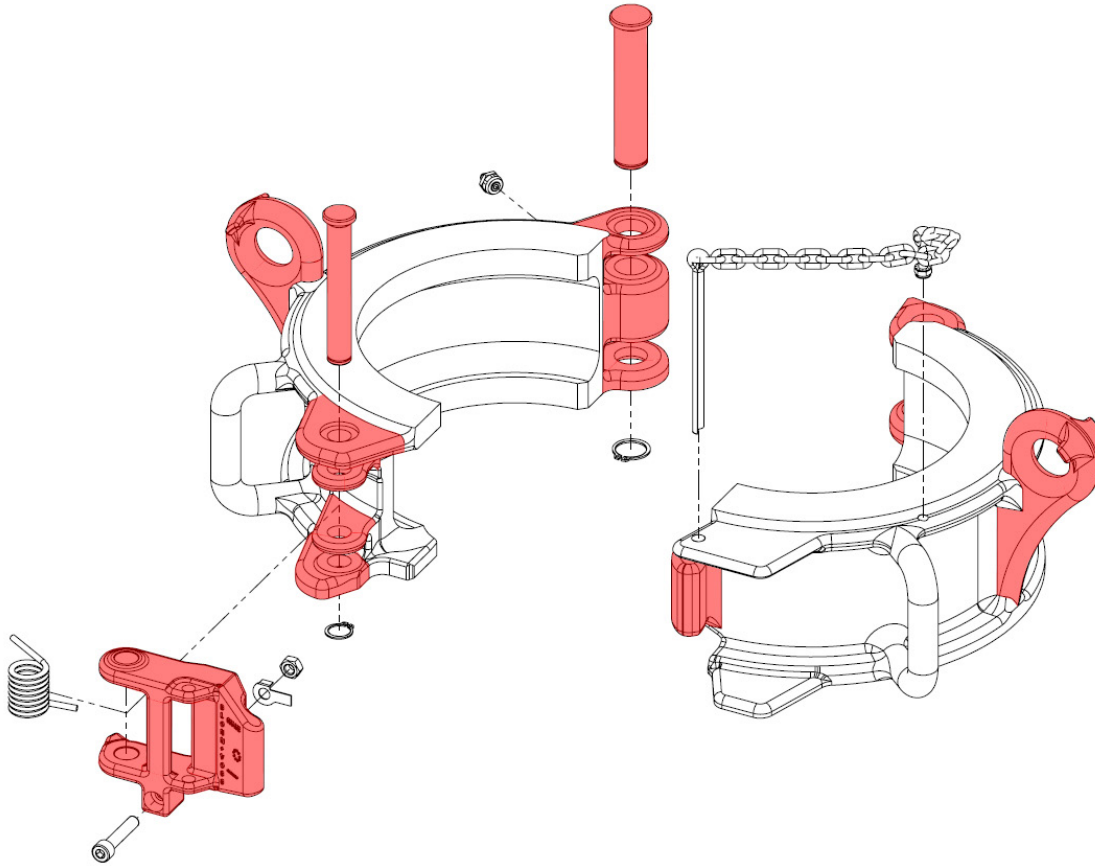


Fig. 16: Red marked critical areas on SJS - front view

6 Size Components

SIZE COMPONENTS

6 Size Components - Bore Codes

DP-Size 18°	Bore Code
2.3/8 EU	101
2.7/8" IU	102
2.7/8" EU	103
3.1/2" IU	104
3.1/2" EU	105
4" IU	106
4" EU	107
4.1/2" IU+IEU	107
4.1/2" EU	109
5" IEU	109
6.7/8"	110
5.1/2" IEU	111
5.7/8"	115
6.1/2"	113
6.5/8" IEU	114

For Drill Collar with Zip Groove	
4.1/8"	181
4.1/4"	210
4.1/2"	211
4.3/4"	182
5.1/4"	183
5.1/2"	184
5.3/4"	185
6"	186
6.1/4"	187
6.1/2"	188
6.3/4"	189
7"	190
7.1/4"	191
7.1/2"	192
7.3/4"	193
8"	194
8.1/4"	195
8.1/2"	196
8.3/4"	197

For Drill Collar without Zip Groove	Bore Code
3.1/8"	308
3.1/4"	271
3.3/8"	309
3.1/2"	272
4"	273
4.1/8"	274
4.1/2"	275
4.3/4"	276
5"	277
5.1/8"	278
5.1/4"	279
5.1/2"	280
5.3/4"	281
6"	282
6.1/8"	283
6.1/4"	284
6.3/8"	285
6.1/2"	286
6.3/4"	287
7"	288
7.1/4"	289
7.3/8"	290
7.1/2"	291
7.3/4"	292
8"	293
8.1/8"	294
8.1/4"	295
8.1/2"	296
8.3/4"	310

Tubing	
2.3/8" P	129
2.3/8" U	130
2.7/8" P	131
2.7/8" U	132
3.1/2" P	133
3.1/2" U	134
4" P	135
4" U	136
4.1/2" P	137
4.1/2" U	138
5.1/2" P	141

SIZE COMPONENTS

7 Drawings

DRAWINGS

7 Service

INFO



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

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

7.1 Malfunction

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

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

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

INFO



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

7.2 Repair

7.2.1 Repair by Customer

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

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

7.2.2 Repair by Manufacturer

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

INFO



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

7.2.3 Securing Screws with Nord Lock washers

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

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

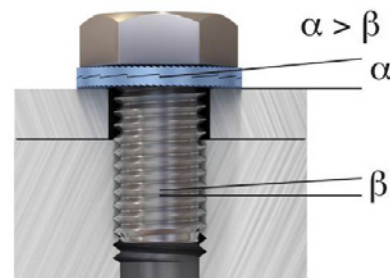


Fig. 17: Nord Lock Washer principle illustration



Fig. 18: Nord Lock Washer detailed illustration

Tightening torques for Nord Lock lock washers Several Nord Lock bolt securing systems are used on the SJ to generate safely lock bolted joints. Regarding the fact that different sizes and metric grades are applied detailed information from Nord Lock is given in the annex (refer to annex „I Nord Lock Washer (excerpt from Third Party Product information)“) 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 an refer to the annex in order to find the required fastening torque:

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



Fig. 19: Bolt head marking

On Forum B + V Oil Tools Pipe handling Equipment the metric grades 8.8, 10.9 and 12.9 are used and the tightening torques can be found in the „a. Torque Guidelines“

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

7.3 Drawing, Parts List and Spare Parts

7.3.1 Contact to Parts Department

INFO



Please contact the Forum B + V Oil Tools Technical Support or one of the authorized service companies specified in Chapter 1.9 to order replacement parts or in the event of any questions.

INFO



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

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

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

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

7.3.2 SJ Center Latch Elevator

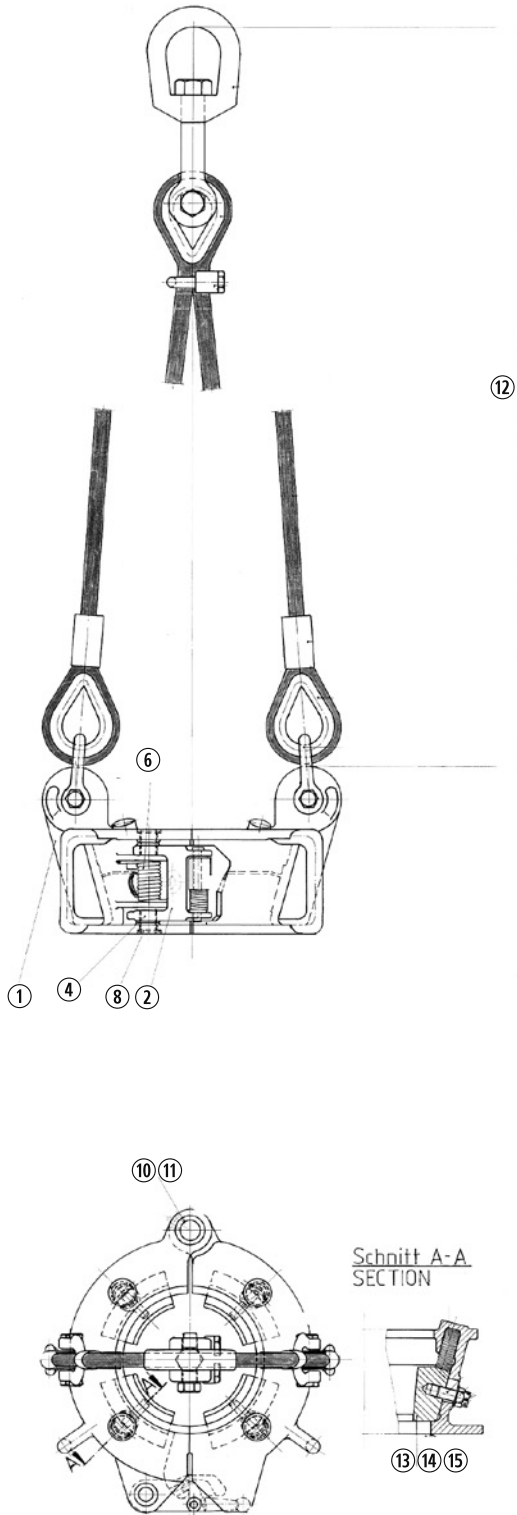


Fig. 20: Detailed view of a SJ Elevator

Part List SJ-2/5, -3/1

Pos.	Qty.	Part No.	Description
1+2	2	650200	SJ 2/5, 3/1 Body
3	1	660482	Latch
4	1	620608*	Retaining ring
5	1	660414*	Latch Lock Assembly
6	1	660404*	Latch Pin
7	1	660413*	Latch Spring
8	1	612509*	Retaining ring
9	1	660410*	Hinge Pin
10	1	774518-4	Screw
11	1	792112	Washer
12	1	650312	Swivel suspension
13	1	-	Slip Assembly
14	1	774518-4	Screw
15	1	792112	Washer

*Spare parts

Pipe Range SJ 2/5 - Slip Assembly			
	5° TBG	12° TBG	18° DP
2.3/8"	650 209	650 230	650 219
2.7/8"	650 210	650 231	650 220
3.1/2"	650 211	650 232	650 221
4"	650 212	650 233	650 222
4.1/2"	650 213	650 234	650 223
5"	650 214	-	-
5.1/2"	650 215	-	-

Pipe Range SJ 3/1 Assy.			
	5° TBG	18° DP	12" TBG
2.3/8"	-	-	650 418
2.7/8"	-	-	650 419
3.1/2"	-	650 411	650 420
4"	-	650 412	-
4.1/2"	650 319	650 413	650 421
5"	650 316	650 414	-
5.1/2"	650 317	650 415	650 425
5.7/8"	-	650 417	650 422
6.5/8"	650 313	650 416	-
7"	650 314	-	-
7.5/8"	650 315	-	-

7.3.3 LSJ And SJS Elevator

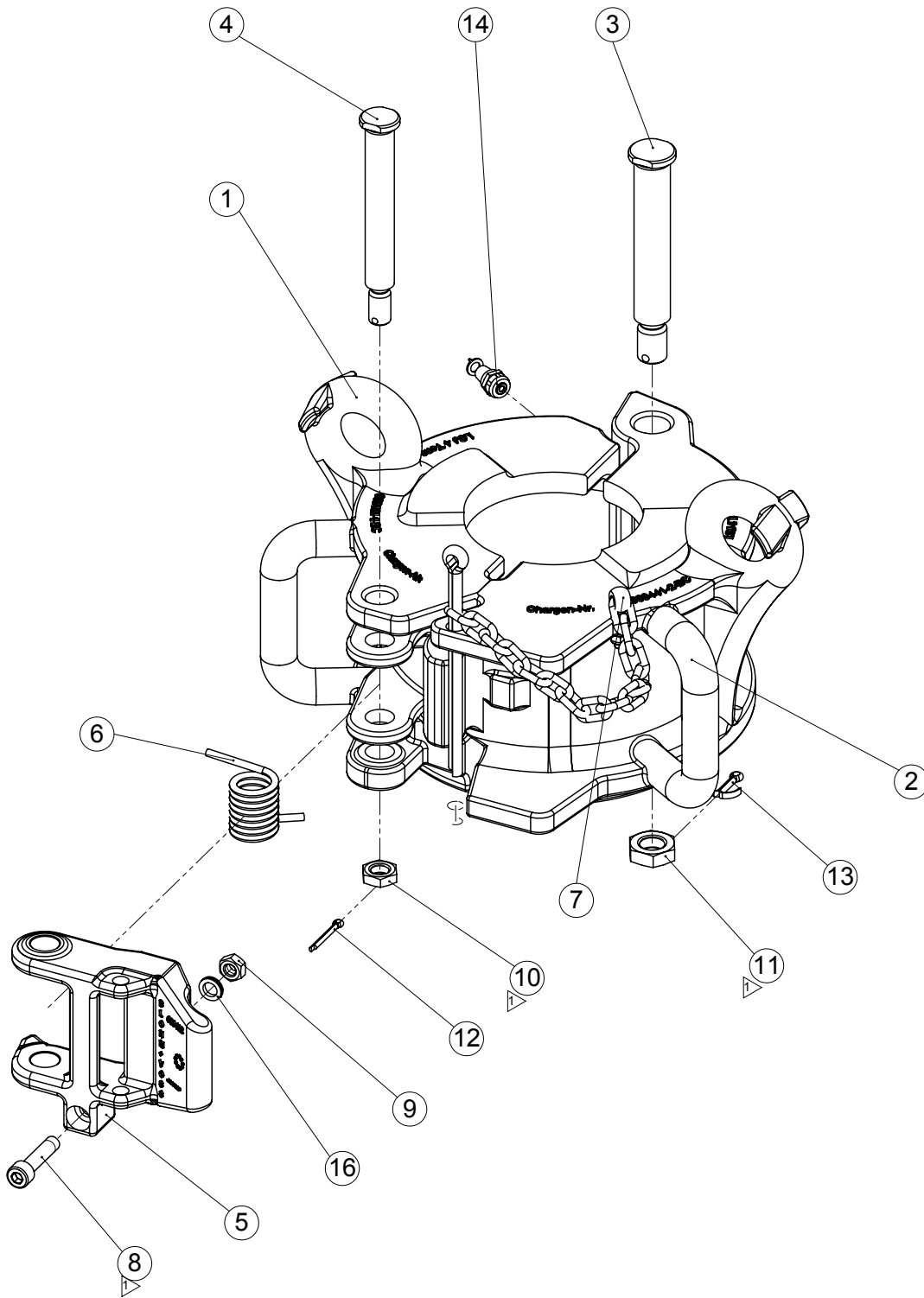


Fig. 21: Detailed view a SJS elevator

Part list LSJ-4/1

Pos.	Qty.	Part No.	Description
1	2	660480	LSJ 4/1 Body
2	1	660482	Latch
3	1	660414*	Latch Lock Assembly
4	1	660413*	Latch Spring
5	1	612515*	Grease nipple
6	1	660489*	Hinge Pin
7	1	660488*	Latch Pin
8	1	710348	Nut
9	1	612552	Nut
10	1	660416	Split Pin
11	1	753048	Split Pin
12	1	774518-4*	Screw
13	1	613633*	Nut
14	1	792112*	Washer
15	1	612518	Protection Cap

*Spare parts

Part list LSJ-4/2

Pos.	Qty.	Part No.	Description
1+2	2	660440	LSJ 4/2 Body
3	1	660489*	Hinge Pin
4	1	660488*	Latch Pin
5	1	660482	Latch
6	1	660413*	Latch Spring
7	1	660414*	Latch Lock Assembly
8	1	774518-4*	Screw
9	1	613633*	Nut
10	1	612552	Nut
11	1	710348	Nut
12	1	80340-1	Split Pin
13	1	660416	Split Pin
14	1	612515*	Grease nipple
15	1	612518	Protection Cap
16	1	792112*	Washer

*Spare parts

Part list SJS-4/1

Pos.	Qty.	Part No.	Description
1+2	1	660400	SJS 4/1 Body
3	1	660482	Latch
4	1	756725	Screw
5	1	792112	Washer
6	1	613633	Nut
7	1	620608	Retaining ring
8	1	660414	Latch Lock Assembly
9	1	660404	Latch Pin
10	1	660413	Latch Spring
11	1	612509	Retaining ring
12	1	660410	Hinge Pin
13	1	612515	Grease nipple
14	1	612518	Protection Cap
15	1	660414-2	Nut
16	1	660414-3	Lock washer

*Spare parts

Part list SJS-4/2

Pos.	Qty.	Part No.	Description
1+2	2	660420	SJS 4/2 Body
3	1	660482	Latch
4	1	756725	Screw
5	1	792112	Washer
6	1	613633	Nut
7	1	620608	Retaining ring
8	1	660414	Latch Lock Assembly
9	1	660404	Latch Pin
10	1	660413	Latch Spring
11	1	612509	Retaining ring
12	1	612515	Grease nipple
13	1	660410	Hinge Pin
14	1	612518	Protection Cap

*Spare parts

Part list SJS-5/3

Pos.	Qty.	Part No.	Description
1	2	660500	SJS-5/3 Body
2	1	660482	Latch
3	1	660414*	Latch Lock Assembly
4	1	660404	Latch Pin
5	1	660413*	Latch Spring
6	1	612509*	Retaining ring
7	1	660510	Hinge Pin
8	1	641011*	Retaining ring
9	1	612515*	Grease nipple
10	1	756725	Screw
11	1	792112	Washer
12	1	613633	Nut
13	1	612518	Protection Cap

*Spare parts

Part list SJS-5/4

Pos.	Qty.	Part No.	Description
1+2	1	660520	SJS-5/4 Body
3	1	660482	Latch
4	1	756725	Screw
5	1	792112	Washer
6	1	613633	Nut
7	1	641011*	Retaining ring
8	1	660414*	Latch Lock Assembly
9	1	660404*	Latch Pin
10	1	660413*	Latch Spring
11	1	612509*	Retaining ring
12	1	660510*	Hinge Pin
13	1	612515*	Grease nipple
14	1	612518	Protection Cap

*Spare parts

Part list SJS-5/5

Pos.	Qty.	Part No.	Description
1+2	2	660540	SJS-5/5 Body
3	1	660482	Latch
4	1	756725	Screw
5	1	792112	Washer
6	1	613633	Nut
7	1	660414*	Latch Lock Assembly
8	1	660404	Latch Pin
9	1	660413*	Latch Spring
10	1	612509*	Retaining ring
11	1	660510	Hinge Pin
12	1	641011*	Retaining ring
13	1	612515*	Grease nipple
14	1	612518	Protection Cap

*Spare parts

Part list SJS-6/6

Pos.	Qty.	Part No.	Description
1+2	2	660600	SJS-6/6 Body
3	1	660482	Latch
4	1	756725	Screw
5	1	792112	Washer
6	1	613633	Nut
7	1	641511*	Retaining ring
8	1	660414*	Latch Lock Assembly
9	1	660404	Latch Pin
10	1	660413*	Latch Spring
11	1	612509*	Retaining ring
12	1	660610	Hinge Pin
13	1	612515*	Grease nipple
14	1	612518	Protection Cap

*Spare parts

Parts list SJS-6/8

Pos.	Qty.	Part No.	Description
1+2	2	660640	SJS-6/8 Body
3	1	660602	Latch
4	1	660603*	Latch Lock
5	1	660404*	Latch Pin
6	1	660405*	Latch Lock Pin
7	1	660413*	Latch Spring
8	1	660407*	Latch Lock Spring
9	1	612509*	Retaining ring
10	1	620609	Split Pin
11	1	660610*	Hinge Pin
12	1	641511*	Retaining ring
13	1	660581	Spring-type straight pin
14	1	612515*	Grease nipple
15	1	643900-6	Safety Pin Assembly
16	1	643801	Wire line
17	1	643801-1	Rope Clamp
18	1	643801-11	wire line clamp 3mm
20	1	613905-7	Screw
21	1	792112	Washer
22	1	613633	Nut

*Spare parts

Parts list SJS-6/9

Pos.	Qty.	Part No.	Description
1+2	2	660660	SJS-6/9 Body
3	1	660602	Latch
4	1	660603*	Latch Lock
5	1	660404*	Latch Pin
6	1	660405*	Latch Lock Pin
7	1	660413*	Latch Spring
8	1	660407*	Latch Lock Spring
9	1	612509*	Retaining ring
10	1	620609	Split Pin
11	1	660610*	Hinge Pin
12	1	641511*	Retaining ring
13	1	660581	Spring-type straight pin
14	1	612515*	Grease nipple
15	1	643900-6	Safety Pin Assembly
16	1	643801	Wire line
17	1	643801-1	Rope Clamp
18	1	643801-11	wire line clamp 3mm
19	1	660660-01	Plate for Safety Pin
20	1	613905-7	Screw
21	1	792112	Washer
22	1	613633	Nut

*Spare parts

7.4 SJD Elevator

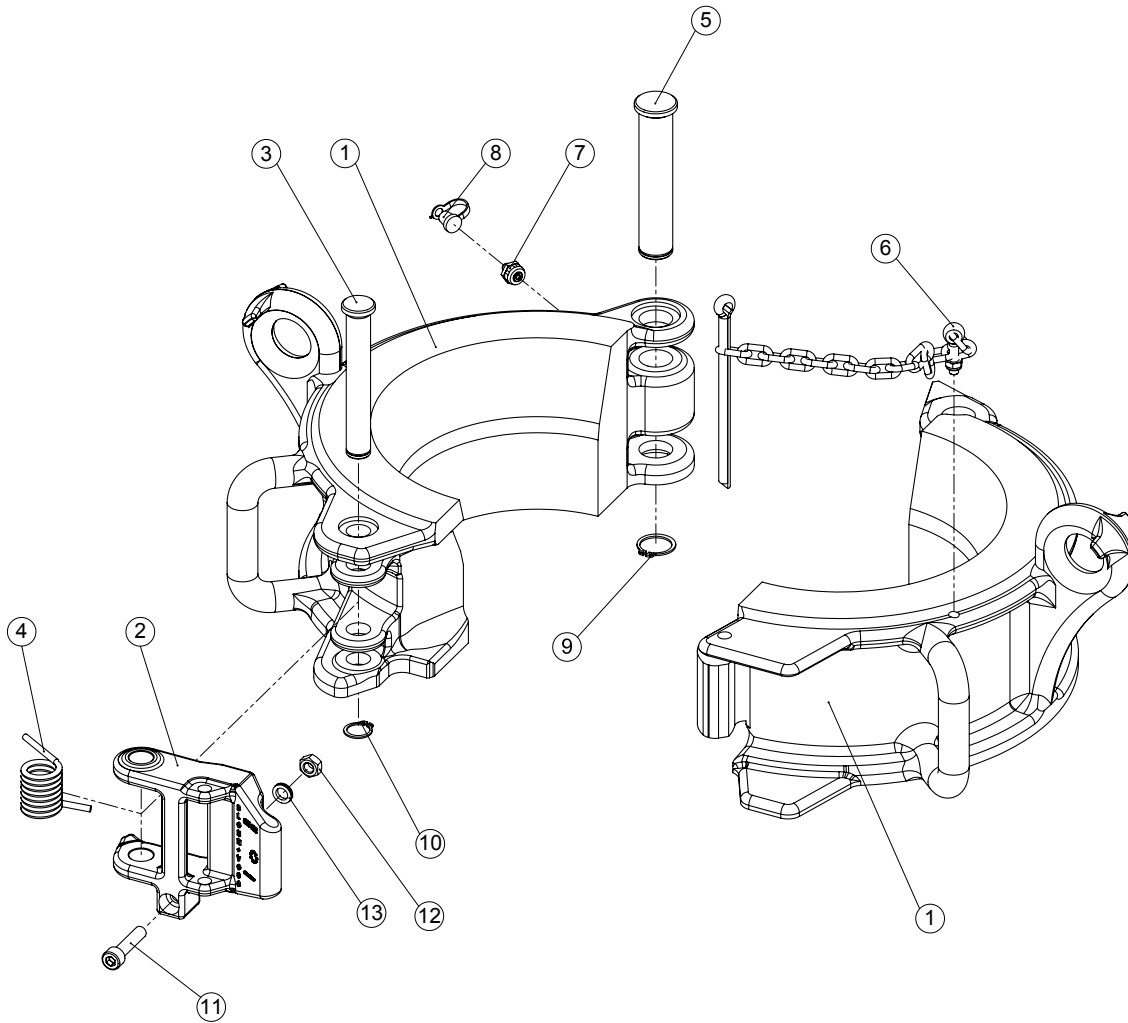


Fig. 22: Detailed view of a SJD

Part list SJD

Pos.	Qty.	Part No.	Description
1+2	2	650380	SJD Body
2	1	660482	Latch
3	1	660404	Latch Pin
4	1	660413	Latch Spring
5	1	660510	Hinge Pin
6	1	660414	Latch Lock Assembly
7	1	612515	Grease nipple
8	1	612518	Protection Cap
9	1	641011	Retaining ring
10	1	612509	Retaining ring
11	1	774518-4	Screw
12	1	613633	Nut
13	1	792112	Washer

*Spare parts

DRAWINGS

7.5 Spare part lists

7.5.1 Spare part list SJ-2/5, SJ-3/1

Pos.	Qty.	Part No.	Description
1	5	620608	Retaining ring
2	1	660414	Latch Lock Assembly
3	1	660404	Latch Pin
4	2	660413	Latch Spring
5	5	612509	Retaining ring
6	1	660410	Hinge Pin
7	8	650216	Slip Spring

7.5.2 Spare part list LSJ-4/1

Pos.	Qty.	Part No.	Description
3	1	660414	Latch Lock Assembly
4	1	660413	Latch Spring
5	10	612515	Grease nipple
6	1	660489	Hinge Pin
7	1	660488	Latch Pin
12	1	774518-4	Screw
13	1	613633	Nut
14	1	792112	Washer

7.5.3 Spare part list LSJ-4/2

Pos.	Qty.	Part No.	Description
3	1	660414	Latch Lock Assembly
4	1	660488	Latch Pin
5	1	660413	Latch Spring
6	1	660489	Hinge Pin
7	10	612515	Grease nipple
8	1	774518-4	Screw
9	1	613633	Nut
16	1	792112	Washer

7.5.4 Spare part list SJS-4/1

Pos.	Qty.	Part No.	Description
7	1	620608	Retaining ring
8	1	660414	Latch Lock Assembly
9	1	660404	Latch Pin
10	1	660413	Latch Spring
11	1	612509	Retaining ring
12	1	660410	Hinge Pin

7.5.5 Spare part list SJS-4/2

Pos.	Qty.	Part No.	Description
7	5	620608	Retaining ring
8	1	660414	Latch Lock Assembly
9	1	660404	Latch Pin
10	2	660413	Latch Spring
11	5	612509	Retaining ring
12	10	612515	Grease nipple
13	1	660410	Hinge Pin

7.5.6 Spare part list SJS-5/3

Pos.	Qty.	Part No.	Description
3	1	660414	Latch Lock Assembly
5	1	660413	Latch Spring
6	1	612509	Retaining ring
8	1	641011	Retaining ring
9	3	612515	Grease nipple

7.5.7 Spare part list SJS-5/4

Pos.	Qty.	Part No.	Description
7	1	641011	Retaining ring
8	1	660414	Latch Lock Assembly
9	1	660404	Latch Pin
10	1	660413	Latch Spring
11	1	612509	Retaining ring
12	1	660510	Hinge Pin
13	10	612515	Grease nipple

7.5.8 Spare part list SJS-5/5

Pos.	Qty.	Part No.	Description
7	1	660414	Latch Lock Assembly
9	1	660413	Latch Spring
10	1	612509	Retaining ring
12	1	641011	Retaining ring
13	3	612515	Grease nipple

7.5.9 Spare part list SJS-6/6

Pos.	Qty.	Part No.	Description
7	1	641511	Retaining ring
8	1	660414	Latch Lock Assembly
10	1	660413	Latch Spring
11	1	612509	Retaining ring
13	3	612515	Grease nipple

7.5.10 Spare part list SJS-6/8

Pos.	Qty.	Part No.	Description
4	1	660603	Latch Lock
5	1	660404	Latch Pin
6	1	660405	Latch Lock Pin
7	1	660413	Latch Spring
8	1	660407	Latch Lock Spring
9	1	612509	Retaining ring
11	1	660610	Hinge Pin
12	1	641511	Retaining ring
14	10	612515	Grease nipple

7.5.11 Spare part list SJS-6/9

Pos.	Qty.	Part No.	Description
4	1	660603	Latch Lock
5	1	660404	Latch Pin
6	1	660405	Latch Lock Pin
7	1	660413	Latch Spring
8	1	660407	Latch Lock Spring
9	1	612509	Retaining ring
11	1	660610	Hinge Pin
12	1	641511	Retaining ring
14	10	612515	Grease nipple

APPENDIX

APPENDIX

8 Appendix

A Sample of EC Certificate of Conformity

B Operating Instructions from Other Manufacturers

A. Sample of EC Declaration of Conformity



 FORUM B + V Oil Tools GmbH			
EC-DECLARATION OF CONFORMITY			
We,	FORUM B + V Oil Tools GmbH Hermann-Blohm-Strasse 2 20457 Hamburg / Germany		
declare that the products:	Single Joint Elevator Type LSJ / SJ / SJS / SJD		
which is the subject of this declaration, fulfils all of the relevant requirements of:	2006/42/EC Machinery Directive, 2014/34/EU ATEX Directive of Equipment for use in hazardous areas.		
Amongst others following harmonized and technical standards and specifications were used:	API 8C, 5. Edition Drilling and Production Hoisting Equipment (PSL1 and PSL2) DIN EN ISO 13535 Petroleum and natural gas industries - Drilling and production equipment - Hoisting equipment DIN EN ISO 12100 Safety of machinery, Risk assessment and Risk Reduction DIN ISO 14121-1 Safety of machinery, Risk assessment DIN EN 13463-1 Non-electrical equipment for use in potentially explosive atmospheres		
Description of Product:			
The following named lifting accessory will be described in more detail in the accompanying Data Book and/or certificate and the associated Technical Documentation			
Product /	[refer to data book]		
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]		
B+V Order No.:	[refer to data book]		
Marking:	CE  I		
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 Q1 approved by API Quality Registrar, Washington D.C./USA, Registration No. 2850 + Q1-2769.			
Hamburg, issued on	[refer to data book] [refer to data book]		
Authorized Representative:	Name Position		
<table border="0"> <tr> <td style="vertical-align: top;"> 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 </td> <td style="vertical-align: top; padding-left: 20px;"> Managing Directors: 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 EUR-Acc.: IBAN: DE73 3003 0880 0012 8350 19 USD-Acc.: 401 / 2835 / 006 / IBAN: DE50 3003 0880 4012 8350 06 Stand: 20.11.2015 </td> </tr> </table>		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	Managing Directors: 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 EUR-Acc.: IBAN: DE73 3003 0880 0012 8350 19 USD-Acc.: 401 / 2835 / 006 / IBAN: DE50 3003 0880 4012 8350 06 Stand: 20.11.2015
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	Managing Directors: 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 EUR-Acc.: IBAN: DE73 3003 0880 0012 8350 19 USD-Acc.: 401 / 2835 / 006 / IBAN: DE50 3003 0880 4012 8350 06 Stand: 20.11.2015		

Fig. 23: EC Certificate of Conformity Sample Page I

B. Third Party Documents

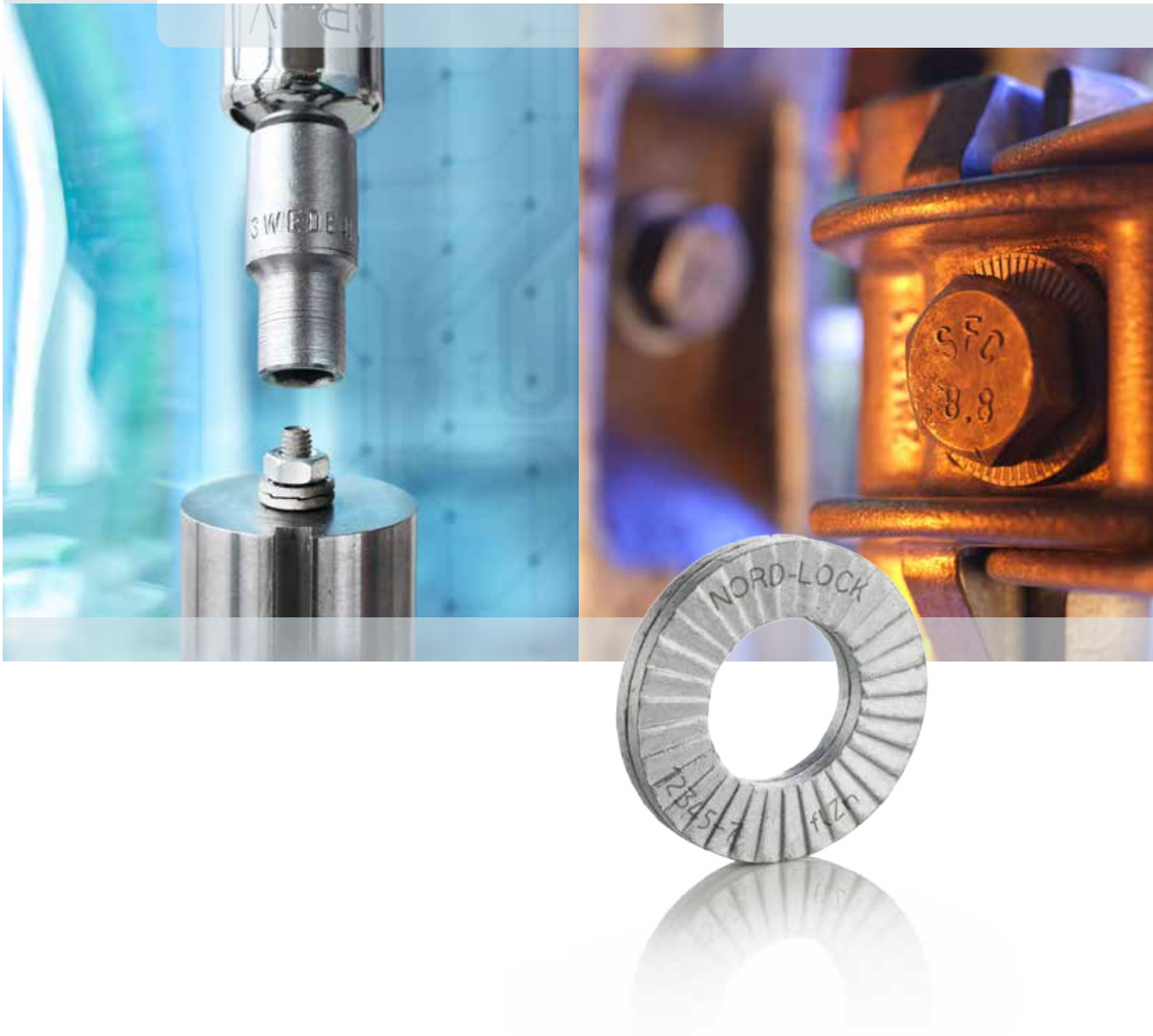
I Nord Lock Washer (excerpt from Third Party Product information)

ENGLISH • METRIC

Excerpt for B+V Operation Manual - Annex

Nord-Lock washers

Product information



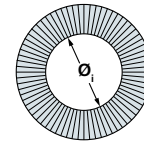
Nord-Lock steel washers

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

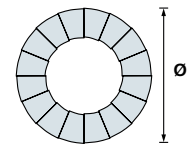
Dimension chart

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

NL3-NL8
Ø₁±0,1 mm
NL10-NL42
Ø₂±0,2 mm
NL45-NL130
Ø₂+0,5 / -0,0 mm

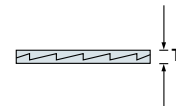


NL3-NL24
Ø₂±0,2 mm
NL27-NL42
Ø₂±0,3 mm
NL45-NL130
Ø₂+0,0 / -2,0 mm



NL3-NL42
T±0,25 mm

NL45-NL130
T±0,75 mm



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

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

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

Torque guidelines

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

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

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

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

G_r = ratio of yield point

μ_{th} = thread friction

μ_b = washer friction

1 N = 0,225 lb

1 Nm = 0,738 ft-lb

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

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

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

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

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

Nord-Lock washers joint guide



Tapped holes

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



Counter bores

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



Through holes

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



Stud bolts

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



Large / slotted holes



Soft underlying surfaces

Applications with large / slotted holes or soft underlying surfaces

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



Designs where Nord-Lock washers are not recommended

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

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

Using Nord-Lock washers



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

Installing the washers

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

Tightening

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

Untightening

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

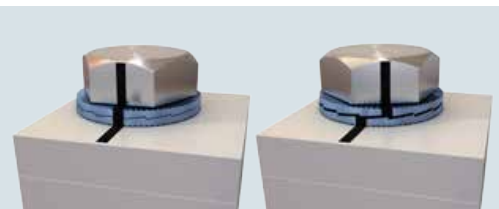
Reusing Nord-Lock

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



6

Possible to verify the locking function



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



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

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

Utilize the advantages of lubrication

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

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

II Data-sheet Grease

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

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

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

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

1.2 Company/undertaking identification

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

2. HAZARDS IDENTIFICATION

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

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

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

3.1.2 Hazard ingredients:

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

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

4. FIRST AID MEASURES

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

5. FIRE FIGHTING MEASURES

- 5.1 Suitable extinguishing media: Use foam, dry chemical powder, sand or carbon dioxide (CO₂).
- 5.2 Extinguishing media which must not be used for safety reasons: Do not use water.
- 5.3 Special exposure hazards arising from the substance or preparation itself, combustion products, resulting gases: Carbon monoxide, carbon dioxide, sulphur dioxide and other toxic fumes may be evolved on burning or exposure to strong heat.
- 5.4 Special protective equipment for fire-fighters: Full protective clothing and self-contained breathing apparatus.
- 5.5 Additional information: Water may be used to cool nearby heat exposed areas/objects/packages.

6. ACCIDENTAL RELEASE MEASURES

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

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

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7. HANDLING AND STORAGE

7.1 Handling

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

7.2 Storage

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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Exposure limit values: Ensure good ventilation. Avoid, as far as reasonably practicable, inhalation of vapour, mists or fumes generated during use. If vapour, mists or fumes are generated, their concentration in the workplace air should be controlled to the lowest reasonably practicable level. Comply with current local occupational exposure limit. Where not established, it is recommended that mineral oil mists are kept below 5 mg/m³ (8 hr TWA).

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

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

8.2 Personal protection equipment

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Appearance

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

9.2 Important health, safety and environmental information

Safety relevant basic data

- 9.2.1 pH value: g/l water at °C Not applicable.
- 9.2.2 Boiling point/range: Not determined.
- 9.2.3 Melting point/range: dropping point 150 °C DIN/ISO 2176
- 9.2.4 Flash point: (base oil) > 200 °C DIN/ISO 2592
- 9.2.5 Inflammability (solid/gaseous): No data available.
- 9.2.6 Inflammation point: No data available.
- 9.2.7 Autoignition (solid/gaseous): Product is not selfigniting.
- 9.2.8 Fire hazard properties: No data available.
- 9.2.9 Danger of explosion: Product does not present an explosion hazard.
- 9.2.10 Explosion limits: lower % upper % No data available.
- 9.2.11 Vapour pressure: at 20 °C < 0,1 hPa
- 9.2.12 Density: at 20 °C < 1,000 g/cm³
- 9.2.13 Solubility in water: at 20 °C dispersible
- 9.2.14 n-Octanol/water partition coefficient: No data available.
- 9.2.15 Viscosity, kinematic: at 40 °C (base oil) Approximately 190 mm²/s DIN 51562/T1
- 9.2.16 Solvent content: %

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

APPENDIX

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

Product name: AVIATICON FETT XRF
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10. STABILITY AND REACTIVITY

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

11. TOXICOLOGICAL INFORMATION

11.1 Acute effects (toxicity tests)

11.1.1 Acute toxicity:

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

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

11.2 Experiences made in practice

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

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

12. ECOLOGICAL INFORMATION

12.1 Ecotoxicity

- 12.1.1 Aquatic toxicity: No data available.

12.2 Mobility

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

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

- 12.3.1 Bioaccumulative potential: No data available.

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

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

13. DISPOSAL CONSIDERATIONS

13.1 Product

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

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

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13.2 Appropriate packaging

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

13.3 Additional information: none

14. TRANSPORT INFORMATION

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

15. REGULATORY INFORMATION

15.1 EU regulations

15.1.1 Chemical Safety Assessment:

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

15.1.2 Labelling

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

15.1.3 Other EU regulations:

15.2 National regulations (Germany)

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

16. OTHER INFORMATION

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

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

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

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