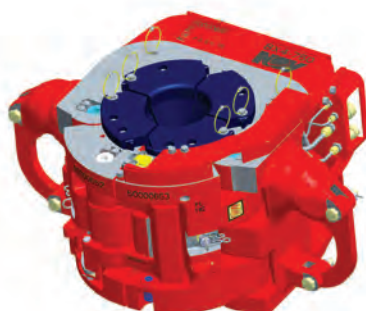


## BX3, BX4-50, BX4-75, BX5

### Hydraulic elevator



This Manual is applicable to the following BX elevators:

BX3 pn 203300Y30 with serial number NL0112881 onwards

BX4-50 pn 50000640Y: All elevators

BX4-75 pn 50000650Y: All elevators

BX5 pn 50004000Y30 with serial number NL0108849 onwards

Refer to Manual pn 203200-345-MAN-001 for the following BX elevators:

BX3 pn 203300Y30 with serial number NL0112880 and below

BX4-50 pn 203290Y30: All elevators

BX4-75 pn 203200Y30: All elevators

BX5 pn 50004000Y30 with serial numbers NL0108848 and below

### Original Instructions

REFERENCE	REFERENCE DESCRIPTION
BX3, BX4-50, BX4-75, BX5	Hydraulic elevators
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DOCUMENT NUMBER	REV
<b>50000802-MAN-001</b>	<b>B</b>
	June 2010





## User's Manual

**BX3, BX4-50, BX4-75, BX5**

**This Manual is applicable to the following BX elevators:**

BX3 pn 203300Y30 with serial number NL0112881 onwards

BX4-50 pn 50000640Y: All elevators

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BX4-75 pn 203200Y30: All elevators

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REFERENCE	REFERENCE DESCRIPTION	
BX3, BX4-50, BX4-75, BX5	Hydraulic elevators	
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<b>50000802-MAN-001</b>		<b>B</b>

## **Revision History**

B	June 2010	Update
A	Oct 2009	Update
-	Oct 2009	Issued for Implementation
Rev	Date	Reason for issue

This document is PDM-link controlled

## **Change Description**

Revision	Change Description
-	First Issue
A	Drawings updated, typo's removed.
B	Rating of BX bushings changed, information added about translations, SMX partnumbers changed.

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BX3, BX4-50, BX4-75, BX5

## 1-General Information

REFERENCE BX3, BX4-50, BX4-75, BX5	REFERENCE DESCRIPTION Hydraulic Elevators	
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## General information

### Instructions

Original Instructions are published in English; in the event the end-user may wish to obtain a translation of these in the official language of the country in which the machinery is to be used please contact your local NOV representative. Please note that this service may not be free of charge. Original Instruction can be downloaded from [www.NOV.com/drilling](http://www.NOV.com/drilling)

Оригиналните инструкции са публикувани на английски език; в случай, че крайният потребител желае да получи превод на тези инструкции на официалния език на държавата, в която се използва оборудването, моля, свържете се с вашия местен представител на NOV. Моля, имайте предвид, че тази услуга може да не е безплатна. Оригиналните инструкции могат да бъдат изтеглени от: [www.NOV.com/drilling](http://www.NOV.com/drilling)

Původní návod je zveřejněn v angličtině; pokud si koncový uživatel přeje získat překlad návodu v úředním jazyce země, ve které se zařízení bude používat, může se obrátit na místního zástupce společnosti NOV. Upozorňujeme, že tato služba nemusí být zdarma. Původní návod je k dispozici ke stažení na adrese [www.NOV.com/drilling](http://www.NOV.com/drilling)

Juhendi originaal on avaldatud inglise keeles. Kui lõppkasutaja soovib tõlget selle riigi ametlikus keeles, kus seadmeid kasutatakse, palume pöörduda NOV-i kohaliku esindaja poole. Palume silmas pidada, et see teenus ei pruugi olla tasuta. Juhendi originaali saab alla laadida veebisaidilt [www.NOV.com/drilling](http://www.NOV.com/drilling).

Instrukcijų originalas yra skelbiamas anglų kalba. Jei galutinis vartotojas norėtų gauti šių instrukcijų vertimą į šalies, kurioje įrengimai turi būti naudojami, oficialiąją kalbą, reikėtų kreiptis į vietinį NOV atstovą. Prašome atkreipti dėmesį, kad ši paslauga gali būti mokama. Instrukcijų originalą galima parsisiųsdinti iš tinklalapio [www.NOV.com/drilling](http://www.NOV.com/drilling)

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Les consignes originales sont publiées en anglais; dans le cas où l'utilisateur final demande une traduction de ces consignes vers la langue officielle du pays dans lequel la machine doit être utilisée, veuillez contacter le représentant NOV sur place. Le service de traduction peut être payant. Les consignes originales peuvent être téléchargées du site [www.NOV.com/drilling](http://www.NOV.com/drilling).

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## How to use this manual

This manual is divided into 9 sections + 1 product specific chapter (drawings).

When applicable, each section includes:

1. A table of contents, or an illustrated view index showing:
  - Major assemblies, system or operations
  - Page references to descriptions in text
2. Disassembly / assembly information and tools
3. Inspection information
4. Testing / trouble shooting information
5. Repair information
6. Adjustment information
7. Torque values

## Special information

Detailed descriptions of standard workshop procedures, safety principles and service operations are not included. Please note that this manual may contain warnings about procedures which could damage equipment, make it unsafe, or cause PERSONAL INJURY. Please understand that these warnings cannot cover all conceivable ways in which service (whether or not recommended by NOV might be done, or the possible hazardous consequences of each conceivable ways. Anyone using service procedures or tools, whether or not recommended by NOV, must be thoroughly satisfied that neither personal safety nor equipment safety will be jeopardized.

All information contained in this manual is based upon the latest product information available at any time of printing. We reserve the right to make changes at any time without notice.

## Intended audience

This manual is intended for use by field engineering, installation, operation, and repair personnel. Every effort has been made to ensure the accuracy of the information contained herein. NOV, Varco® 2009, NOV LP, will not be held liable for errors in this material, or for consequences arising from misuse of this material.

## Conventions

## Notes, Cautions, and Warnings

Notes, cautions, and warnings provide readers with additional information, and to advise the reader to take specific action to protect personnel from potential injury or lethal conditions. They may also inform the reader of actions necessary to prevent equipment damage. Please pay close attention to these advisories.

## Note:



The note symbol indicates that additional information is provided about the current topics.

## Caution:



*The caution symbol indicates that potential damage to equipment or injury to personnel exists. Follow instructions explicitly. Extreme care should be taken when performing operations or procedures preceded by this caution symbol.*

## Warning:



**The warning symbol 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.**

## Illustrations

Illustrations (figures) provide a graphical representation of equipment components or screen snapshots for use in identifying parts or establishing nomenclature, and may or may not be drawn to scale.

For component information specific to your rig configuration, see the technical drawings included with your NOV documentation.

## Safety Requirements

NOV equipment is installed and operated in a controlled drilling rig environment involving hazardous situations. Proper maintenance is important for safe and reliable operation. Procedures outlined in NOV manuals are the recommended methods of performing operations and maintenance.



**CAUTION:** *To avoid injury to personnel or equipment damage, carefully observe requirements outlined in this section.*

## General System Safety Practices

The equipment discussed in this manual may require or contain one or more utilities, such as electrical, hydraulic, pneumatic, or cooling water.



**CAUTION:** *Read and follow the guidelines below before installing equipment or performing maintenance to avoid endangering exposed persons or damaging equipment.*

- ❑ Isolate energy sources prior to beginning work.
- ❑ Avoid performing maintenance or repairs while the equipment is in operation.
- ❑ Wear proper protective equipment during equipment installation, maintenance, or repair.

## Personnel Training

All personnel performing installation, operations, repair, or maintenance procedures on the equipment, or those in the vicinity of the equipment, should be trained on rig safety, tool operation, and maintenance to ensure their safety.



**CAUTION:** Personnel should wear protective gear during installation, maintenance, and certain operations.

Contact the NOV training department for more information about equipment operation and maintenance training.

## Recommended Tools

Service operations may require the use of tools designed specifically for the purpose described. NOV recommends that only those tools specified be used when stated. Ensure that personnel and equipment safety are not jeopardized when following service procedures or using tools not specifically recommended by NOV.

## Replacing Components

- ❑ Verify that all components (such as cables, hoses, etc.) are tagged and labeled during assembly and disassembly of equipment to ensure correct installation.
- ❑ Replace failed or damaged components with NOV certified parts. Failure to do so could result in equipment damage or injury to personnel.

## Routine Maintenance

Equipment must be maintained on a routine basis. See this manual for maintenance recommendations.



**CAUTION:** Failure to conduct routine maintenance could result in equipment damage or injury to personnel.

## Proper Use of Equipment

NOV equipment is designed for specific functions and applications, and should be used only for its intended purpose.

## Lifting

The lifting procedures should carefully be observed and carried out according to the manual.

## BX Elevator limitations

The BX Elevator is designed to be used as an elevator for lifting tubular goods in the gas and oil well drilling environment, and must not be used for any other purpose.

## Design safety factor.

The design-safety factor and design verification of the elevators is in accordance with requirements of API specification 8C.

During manufacturing the elevator is proof load tested to 1.5 times the rated load.

## Limited warranty

The warranty will be void if the BX Elevator or parts were either:

- ☐ unauthorized modified, repaired or serviced
- ☐ replacement parts not manufactured by NOV were utilized
- ☐ not properly stored or maintained

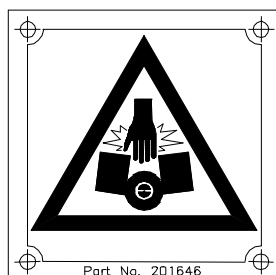
## Identification numbers

You will find the serial number of the tool stamped into the body.

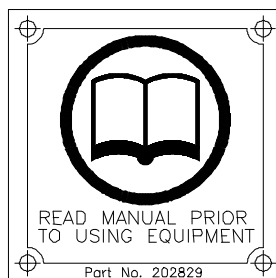
## Warning plates



**WARNING: Warning plates must be present on the BX Elevator. Do not remove the plates. When a warning plate has disappeared, it must be replaced.**



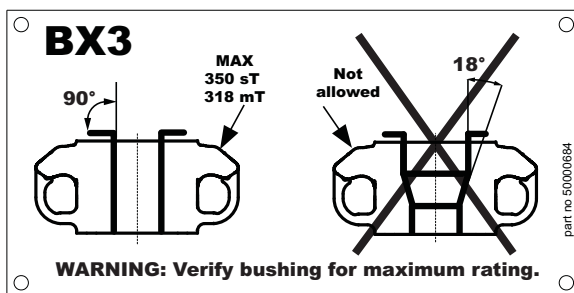
Warning plate part. nr.201646 Be careful: Keep hands out of range of moving parts. Do not touch the elevator



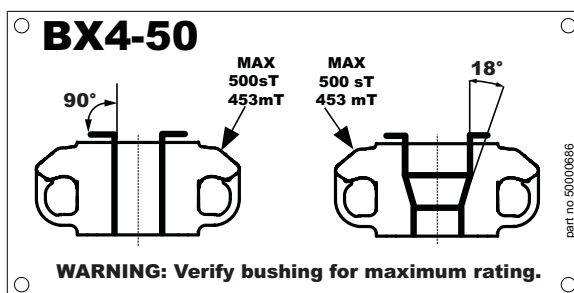
Warning plate part. nr.202829 Read the manual prior to use



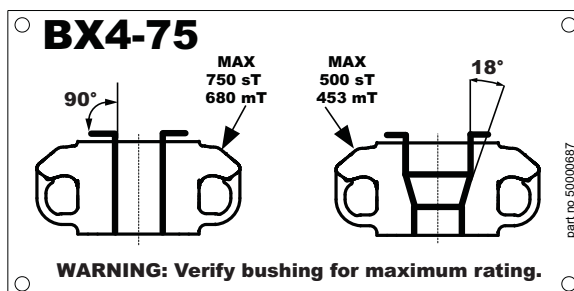
Warning plate part. nr.201647. Be careful: Falling load or parts can cause severe injury or death. Keep out of range.



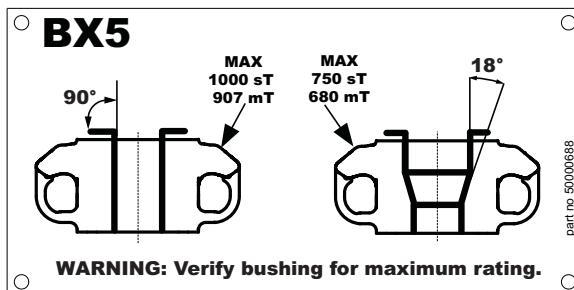
Rate tag part. no. 50000684 Allowed Load-Ratings for different types of tubular BX3



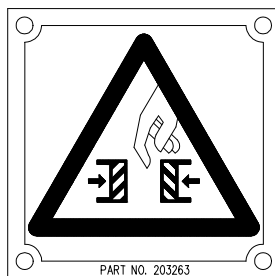
Rate tag part. no. 50000686 Allowed Load-Ratings for different types of tubular BX4-50



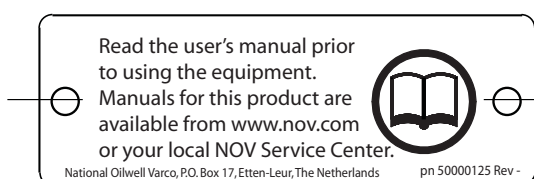
Rate tag part. no. 50000687 Allowed Load-Ratings for different types of tubular BX4-75



Rate tag part. no. 50000688 Allowed Load-Ratings for different types of tubular BX5



Warning plate part. nr.203263. Be careful: Keep hands out of range of moving parts. Do not touch the elevator.



Information plate 50000125. URL to user's manuals and read manual prior to use.

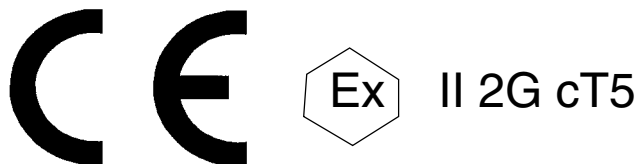
NATIONAL OILWELL VARCO	
Equipment Type	
Model Number	
Serial number	NL
Size Range	
Rating	
Weight	Kg. Lbs.
Date of Mfg.	
CE Ex	
Manufactured by National Oilwell Varco, P.O. Box 17, Etten-Leur, The Netherlands	

Universal name plate 50001003.

## CE marking

The BX-elevator complies with the Machinery Directive 98/37/EC, 2006/42/EC and the Directive 94/9/EC "Equipment and protective systems in potentially explosive atmospheres"

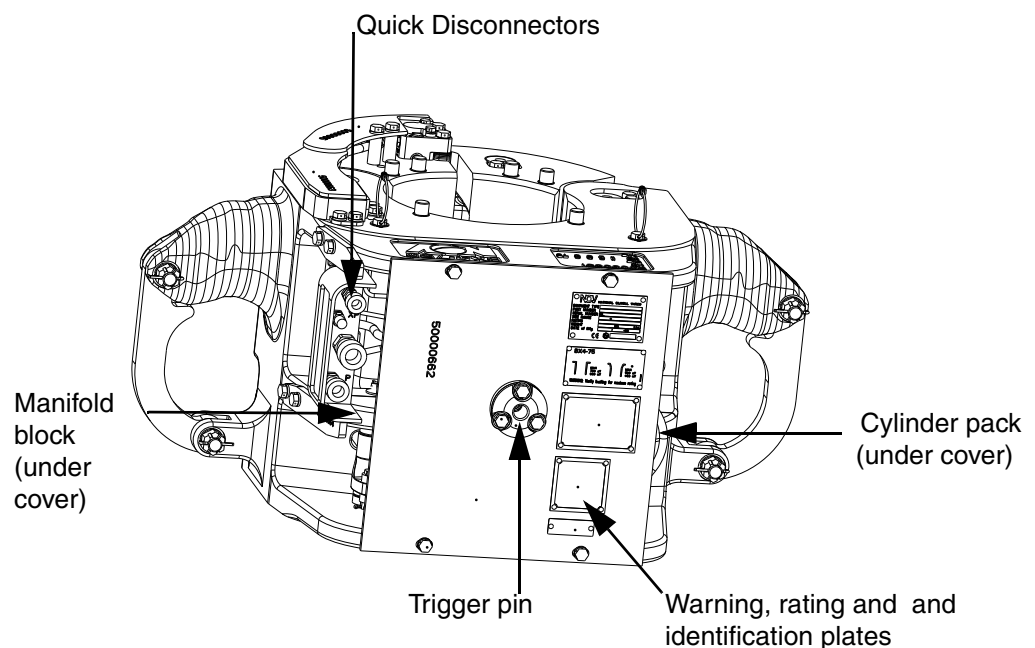
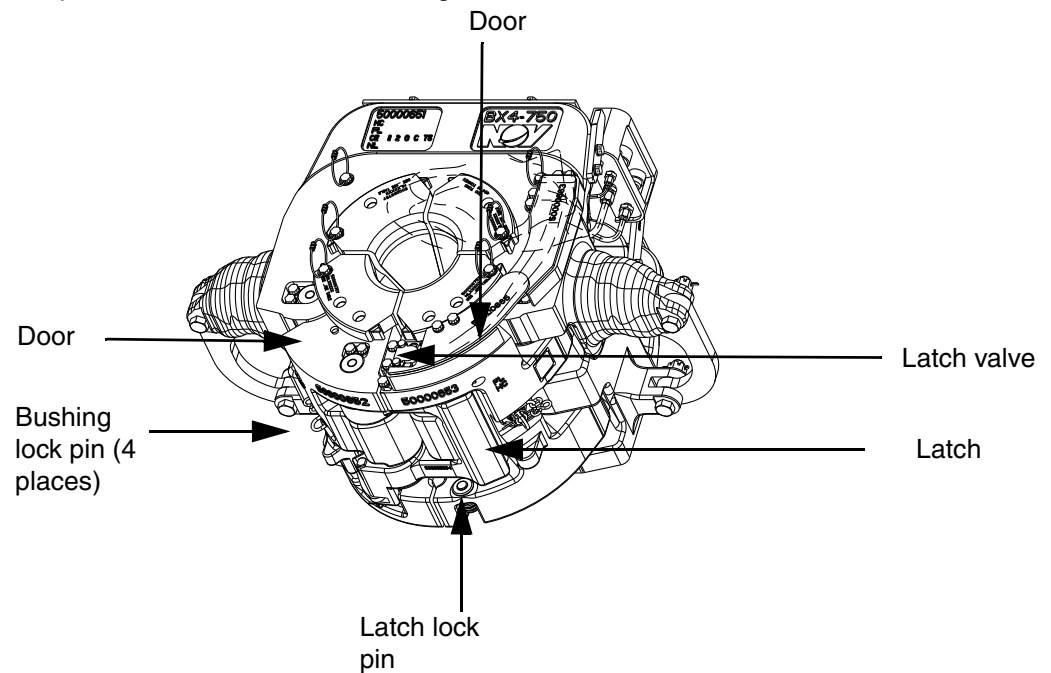
The marking is as follows:



**WARNING:** Care should be taken to avoid creating possible ignition sources, like sparks, due to improper use of the tool in combination with other equipment.

## BX major components

The BX elevator is a hydraulic operated double door elevator, which is equipped with replaceable bushings to handle various styles and sizes of tubular. The elevator will automatically close when the pipe hits the body bushing. Opening of the elevator is remote controlled. The BX-elevator has a vertically spring loaded bushing in the right hand door, which, pushed downwards under load, will activate a mechanical latch lock to prevent accidental opening of the elevator while lifting load. By detecting the return signal-pressure (XP-line) from the elevator it is determined that the elevator is properly closed and latched. The elevator contains an easy removable cylinder pack, manifold block and bushing set.



## **BX hydraulics**

### **Elevator Closing Sequence**

- P=2,000 Psi / 13,789 KPa
- Xp= 0 Psi / KPa (armed to close)

Reference is made to BX4 hydraulic schematic 50004050-3. When looking at the schematic, the elevator is open, door cylinder and latch cylinders are in. Valve F is in the middle position. When pipe is coming in the trigger activates valve L allowing pressure on line 5. Valve F then shifts allowing pressure on line 7 which moves the door cylinder out. At the same time the retract plunger is retracted inside the elevator bore, and is making room for the pipe coming in. The elevator starts to close. When the door cylinder piston passes the signal port lines 10 is pressurized piloting valve K open. This allows flow from line 7 to line 11 to start closing the latch cylinder. When the latch cylinder piston passes the signal port line 12 is pressurized which allows valve G to be piloted open. This allows flow from line 7 to line 24. Pilot line 10 opens valve X, allowing line 24 to connect to line 40 via latch valve Z with line 4 once the latch is closed. Valve D reduces the system pressure in line 13 to 1,000 Psi / 6,895 KPa which passes through valve C via XP to the Pressure Switch mounted on the Top-Drive. This gives the driller the 'elevator closed' indication.

Pressures elevator closed:

- Xp=1,000 Psi / 6,894 KPa
- Float=P=2,000 Psi / 13,789 KPa
- T=Max 200 Psi / 1,379 KPa

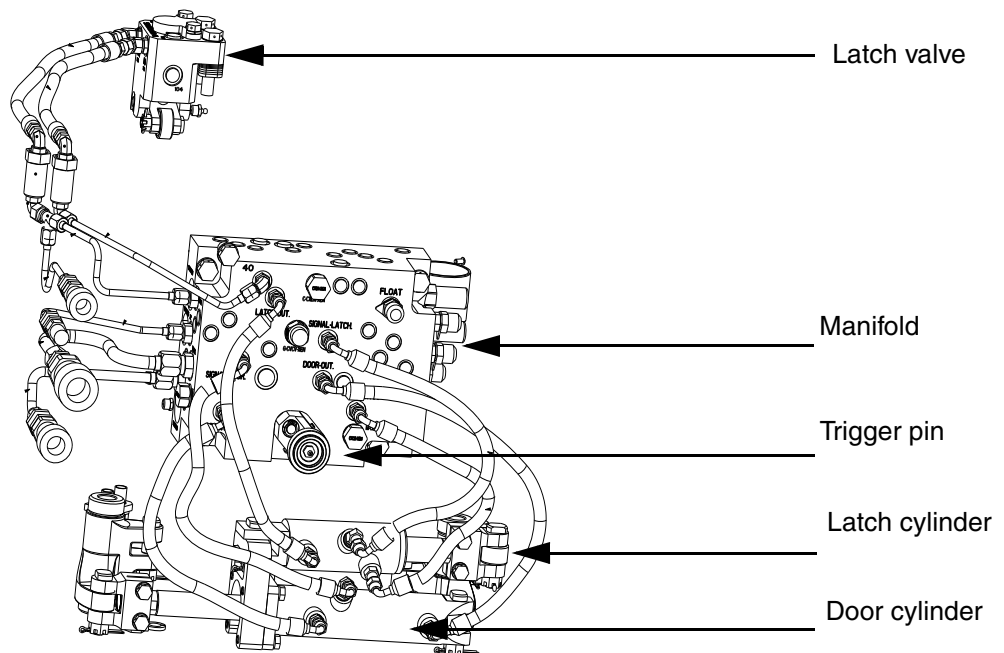
### **Elevator Opening Sequence**

- P=2,000 Psi / 13,789 KPa
- Xp=2,200 Psi / 15,168 KPa (armed to close)

When giving command to open by pressurizing XP with system pressure (must be greater than the set value of 1,500 Psi / 10,340 KPa and 200 Psi / 1,379 KPa or greater than P) , valve E opens and line 6 is pressurized. This causes valve F to shift to its mid position. Line 7 is relieved of pressure and line 8 is pressurized. At the same time the retract plunger is relieved. Due to line 6 being pressurized valve M is piloted open allowing flow from line 8 to line 14 causing the latch cylinder to move inwards. As soon as the latch cylinder piston passes the signal port line 12 is pressurized which pilots open valve H allowing flow from line 14 to line 9. At the same time the trigger is being pushed back in the elevator bore. The door cylinder starts to move inwards. The elevator has now unlatched and the doors are open. When the trigger finger no longer contacts the pipe the cam valve shifts which depressurizes line 5. The command to open i.e. XP pressurized can now be removed and the elevator is armed to close.

Pressures elevator open:

- Xp=2,200 Psi / 15,168 KPa
- P= 2,000 Psi / 13,789 KPa
- Float=0 Psi / 0 KPa
- T=Max 200 Psi / 1,379 KPa





## BX3, BX4-50, BX4-75, BX5

### 2-Specifications

REFERENCE BX3, BX4-50, BX4-75, BX5	REFERENCE DESCRIPTION Hydraulic Elevators
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DOCUMENT NUMBER <b>50000802-MAN-001</b>	VarcoBJ BV Nijverheidsweg 45 4879AP Etten-Leur Tel: +31-76-5083000 Fax: +31-76-5046000 REV <b>B</b>





## General specifications

### Upgrade BX-elevator

The existing BX-elevators, designed in the mid 1990's, have been replaced mid 2009 with upgraded models. Major improvements are: The hydraulic system is simplified, new bushings (BX4 only) have been introduced & now all elevators have a removable backplate for easy access. Refer to the end of this chapter (Replaced Parts) for more details.

### Existing BX-4 Bushings

Existing BX4 bushings are suitable for the upgraded elevators. The upgraded BX4 elevators can also carry the previous bushings. See the BX4 bushing overview in this chapter.

### General specifications, requirements & sizes

Subject	Description	
Weight and dimensions	BX3 Elevator with Bushings	Up to 2,445 lbs / 1,100kg
	BX3 Elevator without Bushings	2,165 lbs / 975 kg
Weight and dimensions	BX4-50 Elevator with Bushings	Up to 2,278 lbs / 1,033 kg
	BX4-50 Elevator without Bushings	2,025 lbs / 919 kg
	BX4-75 Elevator with Bushings	Up to 2,292 lbs / 1,040 kg
	BX4-75 Elevator without Bushings	2,047 lbs / 929 kg
Weight and dimensions	BX5 Elevator with Bushings	Up to 3,100 lbs / 1,400 kg
	BX5 Elevator without Bushings	2,875 lbs / 1,290 kg
Hydraulic system	Minimum working pressure	2,000 psi (13,789 kPa) and 5 gpm (19 l/min) flow at elevator and rotator
	Maximum working pressure	2,500 psi (17,236 kPa) and 7 Gpm (26.5 l/min) at elevator and rotator
	Tbg. and hose sizes	All Tbg. and hoses that connect the elevator to the power unit main ring need to have a minimum nominal size of ½" diameter
	Maximum oil temperature	140°F (60°C)
	Specification of hydraulics	SAE AS 4059 class 9 ISO 4406: 1999 Class 19/17/14 NAS 1638 class 8
	Filter to be applied in the hydraulic supply line	50 micron
Temperature	Minimum allowed ambient temperature	-4°F (- 20°C)
	Maximum allowed ambient temperature	104°F (+ 40°C)
	In case the ambient temperature is outside this range, please contact NOV for guidance	

### Load ratings

Type	Part no.	Size range [inches]	Maximum load rating for the elevator		Link size	
			90° Coupling [sTon/mTon]	18° Tool Joint [sTon/mTon]	Min [inches]	Max [inches]
BX3	203300Y10	9.5/8" - 20"	350 / 318	not allowed	2.3/4"	3.1/2"
BX4-50	50000640Y	2.3/8" - 9.3/4"	500 / 453	500 / 453	2.3/4"	4.3/4"
BX4-75	50000650Y	2.3/8" - 9.3/4"	750 / 680	500 / 453	3.1/2"	4.3/4"
BX5	50004000Y10	3.1/2" - 11"	1000 / 907	750 / 680	4.3/4"	5.1/2"

## Bushing overview

### BX3-Bushings

#### Casing

Size	Part number	Max. Rating [sTon/mTon]	Approx. Weight [kg / lbs]
9.5/8" Csg.	203310Y141	350 / 318	204 / 450
9.7/8" Csg.	203310Y649	350 / 318	202 / 445
10.3/4" Csg.	203310Y142	350 / 318	196 / 432
10.5/8" Csg.	203310Y453	350 / 318	182 / 401
11.3/4" Csg.	203310Y143	350 / 318	182 / 401
11.7/8" Csg.	203310Y729	350 / 318	182 / 401
12.3/4" Csg.	203310Y345	350 / 318	182 / 401
12.7/8" Csg.	203310Y676	350 / 318	182 / 401
13.3/8" Csg.	203310Y144	350 / 318	182 / 401
13.5/8" Csg.	203310Y596	350 / 318	182 / 401
14" Csg.	203310Y690	350 / 318	182 / 401
16" Csg.	203310Y145	350 / 318	158 / 348
16.3/4" Csg.	203310Y664	350 / 318	158 / 348
18" Csg.	203310Y723	350 / 318	140 / 308
18.5/8" Csg.	203310Y146	350 / 318	134 / 295
20" Csg.	203310Y147	350 / 318	108 / 238

#### DC plain w/ lifting plug

Size	Part number	Max. Rating [sTon/mTon]	Approx. Weight [kg / lbs]
10" DC Plain	203312Y228	150 / 136	163 / 360
10.1/2" DC Plain	203312Y229	150 / 136	163 / 360
11" DC Plain	203312Y230	150 / 136	163 / 360

## BX4-Bushings



**WARNING:** In some cases the BX4-bushing may handle higher loads than the elevator is rated for. E.g. 8" Riser handling Bushing with part number 203214Y757 fits in the BX4-50 elevator, which can safely handle 500 sTon only while the Bushing can handle up to 750 sTon!

**BX4-50:** up to 500 sTon / 453 mTon for 18° Tool Joint and 90° coupling.

**BX4-75:** up to 500 sTon / 453 mTon for 18° Tool Joint

**BX4-75:** up to 750 sTon / 680 mTon for 90° coupling

### Drill Collar w/Zip Lift

Bushing size and type	Previous Part number	Current Part number	Rating [sTon/mTon]	Approx. Weight [kg / lbs]
5.1/4" DC w/Zip lift	203211Y179	50000677Y179	150 / 136	98 / 216
5.1/2" DC w/Zip lift	203211Y180	50000677Y180	150 / 136	94 / 207
6.1/4" DC w/Zip lift	203211Y337	50000677Y337	150 / 136	86 / 189
6" DC w/Zip lift	203211Y362	50000677Y362	150 / 136	92 / 202
6.1/2" DC w/Zip lift	203211Y373	50000677Y373	150 / 136	88 / 193
6.3/8" DC w/Zip lift	203211Y409	50000677Y409	150 / 136	86 / 193
4.3/4" DC w/Zip lift	203211Y435	50000677Y435	150 / 136	88 / 194
5" DC w/Zip lift	203211Y530	50000677Y530	150 / 136	86 / 189
8" DC w/Zip lift	203211Y336	50000677Y336	150 / 136	86 / 189
7.3/4" DC w/Zip lift	203211Y339	50000677Y339	150 / 136	88 / 193
7.1/4" DC w/Zip lift	203211Y357	50000677Y357	150 / 136	87 / 191
7" DC w/Zip lift	203211Y361	50000677Y361	150 / 136	86 / 193
6.3/4" DC w/Zip lift	203211Y387	50000677Y387	150 / 136	88 / 193
8.1/4" DC w/Zip lift	203211Y422	50000677Y422	150 / 136	86 / 193
10" DC w/Zip lift	203211Y195	50000677Y195	150 / 136	79 / 173
9.3/4" DC w/Zip lift	203211Y367	50000677Y367	150 / 136	81 / 178
9.1/2" DC w/Zip lift	203211Y370	50000677Y370	150 / 136	83 / 182
8.1/2" DC w/Zip lift	203211Y426	50000677Y426	150 / 136	85 / 187
9" DC w/Zip lift	203211Y427	50000677Y427	150 / 136	87 / 191
8.3/4" DC w/Zip lift	203211Y553	50000677Y553	150 / 136	85 / 187
4.1/8" DC w/Zip lift	203211Y177	203211Y177	150 / 136	86 / 189
3.1/2" DC w/Zip lift	203211Y625	203211Y625	150 / 136	88 / 194
4.1/4" DC w/Zip lift	203211Y674	203211Y674	150 / 136	86 / 193
3.1/8" DC w/Zip lift	203211Y735	203211Y735	150 / 136	88 / 194
3.3/8" DC w/Zip lift	203211Y736	203211Y736	150 / 136	88 / 194

### Tubing

Bushing size and type	Previous Part number	Current Part number	Rating [sTon/mTon]	Approx. Weight [kg / lbs]
2.3/8" Csg./plain Tbg.	203210Y158	203210Y158	500 / 453	86 / 189
2.3/8" OD.EU. Tbg.	203210Y159	203210Y159	500 / 453	86 / 189
2.7/8" plain Tbg.	203210Y160	203210Y160	500 / 453	84 / 185
2.7/8" OD. EU. Tbg.	203210Y161	203210Y161	500 / 453	84 / 185
3.1/2" Csg./plain tub.	203210Y162	203210Y162	500 / 453	82 / 180
3.1/2" OD. EU. Tbg.	203210Y163	203210Y163	500 / 453	82 / 180
4" OD. plain Tbg.	203210Y164	203210Y164	500 / 453	80 / 176
4" OD. EU. Tbg.	203210Y165	203210Y165	500 / 453	80 / 176
2.88" special gun tube Bushing	203210Y867	203210Y867	500 / 453	90 / 198
3.50" special gun tube Bushing	203210Y868	203210Y868	500 / 453	90 / 198

**Casing**

Bushing size and type	Previous Part number	Current Part number	Rating [sTon/mTon]	Approx. Weight [kg / lbs]
4.1/2" Csg./ plaine Tbg.	203210Y129	50000676Y129	750 / 608	91 / 200
5" Csg.	203210Y131	50000676Y131	750 / 608	91 / 200
5.1/2" Csg.	203210Y132	50000676Y132	750 / 608	91 / 200
6" Csg.	203210Y134	50000676Y134	750 / 608	97 / 213
6.5/8" Csg.	203210Y135	50000676Y135	750 / 608	97 / 213
7" Csg.	203210Y136	50000676Y136	750 / 608	97 / 213
7.5/8" Csg.	203210Y137	50000676Y137	750 / 608	97 / 213
8.5/8" Csg.	203210Y139	50000676Y139	750 / 608	49 / 108
9.5/8" Csg.	203210Y141	50000676Y141	750 / 608	49 / 108
4.1/2" OD. EU. Tbg.	203210Y167	50000676Y167	750 / 608	91 / 200
6.1/4" Csg.	203210Y505	50000676Y505	750 / 608	97 / 213
7-1/4" Csg - 1/16 bevel	203210Y563	50000676Y563	750 / 608	97 / 213
9.7/8" Csg.	203210Y649	50000676Y649	750 / 608	49 / 108
7.3/4" Csg.	203210Y705	50000676Y705	750 / 608	97 / 213
8" Csg.	203210Y757	50000676Y757	750 / 608	49 / 108
8.3/4" Csg.	203210Y804	50000676Y804	750 / 608	49 / 108
4.1/2" Csg./ plane Tbg.	203210Y848	50000676Y848	750 / 608	91 / 200
6.7/8" 55",45",35" taper	203210Y834	50000676Y834	750 / 608	97 / 213
7" Hydrill 521 #26 w/Lift plug	203210Y854	50000676Y854	750 / 608	97 / 213
9.1/8" Csg.	203210Y883	50000676Y883	750 / 608	49 / 108

**Square Shoulder Drill Pipe Bushing**

Bushing size and type	Previous Part number	Current Part number	Rating [sTon/mTon]	Approx. Weight [kg / lbs]
5" IEU sq.shoulder DP	203212Y106	50000675Y106	750 / 608	89 / 196
5.1/2" IEU sq.shoulder DP	203212Y107	50000675Y107	750 / 608	81 / 179
2.7/8" EU sq.shoulder DP	203212Y101	203212Y101	500 / 453	99 / 218
3.1/2" IU sq.shoulder DP	203212Y102	203212Y102	500 / 453	97 / 213
3.1/2" EU sq.shoulder DP	203212Y103	203212Y103	500 / 453	97 / 213
4" IU sq.shoulder DP	203212Y104	203212Y104	500 / 453	95 / 209

**Riser Handling Bushing**

Bushing size and type	Current Part number	Previous Part number	Rating [sTon/mTon]	Approx. Weight [kg / lbs]
6.5/8" Riser Handling	50000676Y333	203214Y333	750 / 608	108 / 238
7.1/4" Riser Handling	50000676Y885	203214Y563	750 / 608	102 / 224
8" Riser Handling	50000676Y884	203214Y757	750 / 608	96 / 211
8.3/4" Riser Handling	50000676Y783	203214Y783	750 / 608	90 / 198
8.5/8" Riser Handling	50000676Y784	203214Y784	750 / 608	84 / 185
9.5/8" Riser Handling	50000676Y788	203214Y788	750 / 608	80 / 176
7" Riser Handling	50000676Y790	203214Y790	750 / 608	70 / 154
Special 55deg, 8.5/8" riser	50000676Y869	203210Y869	750 / 608	77 / 169

**Drill Pipe Bushings**

Bushing size and type	Previous Part number	Current Part number	Rating [sTon/ mTon]	Approx. Weight [kg / lbs]
2.7/8" IU DP	203212Y117	50000675Y117	500 / 453	110 / 242
2.7/8" EU DP	203212Y118	50000675Y118	500 / 453	110 / 242
3.1/2" IU DP	203212Y119	50000675Y119	500 / 453	104 / 230
3.1/2" EU DP	203212Y776	50000675Y776	500 / 453	104 / 230
4" IU DP	203212Y777	50000675Y777	500 / 453	98 / 217
4" EU & 4.1/2" IEU DP	203212Y778	50000675Y778	500 / 453	98 / 217
4.1/2" EU & 5" IEU DP	203212Y779	50000675Y779	500 / 453	97 / 215
5.1/2" IEU DP	203212Y780	50000675Y780	500 / 453	104 / 230
5.1/2" IF IEU DP	203212Y781	50000675Y781	500 / 453	104 / 230
6.5/8" IEU DP	203212Y782	50000675Y782	500 / 453	84 / 186
5.7/8" DP 18degr (6" EU max.)	203212Y789	50000675Y789	500 / 453	104 / 230
4" DP with 4.1 max upset	203212Y798	50000675Y798	500 / 453	98 / 217
6.5/8" DP 7.1/8" upset	203212Y823	50000675Y823	500 / 453	84 / 186

**Drill Collar Plain Bushing**

Bushing size and type	Previous Part number	Current Part number	Rating [sTon/ mTon]	Approx. Weight [kg / lbs]
6" DC plain	203213Y349	50000678Y349	150 / 136	96 / 210
4.3/4" DC plain	203213Y354	50000678Y354	150 / 136	88 / 194
6.1/2" DC plain	203213Y135	50000678Y765	150 / 136	96 / 210
6.3/4" DC plain	203213Y338	50000678Y338	150 / 136	96 / 210
6.1/4" DC plain	203213Y348	50000678Y348	150 / 136	96 / 210
8" DC plain	203213Y334	50000678Y334	150 / 136	90 / 198
9.1/2" DC plain	203213Y346	50000678Y346	150 / 136	90 / 198
8.1/4" DC plain	203213Y347	50000678Y347	150 / 136	90 / 198
9" DC plain	203213Y356	50000678Y356	150 / 136	90 / 198
8.1/2" DC plain	203213Y580	50000678Y580	150 / 136	90 / 198
2.1/2" DC plain	203213Y201	203213Y201	150 / 136	92 / 204
2.3/4" DC plain	203213Y203	203213Y203	150 / 136	92 / 204
3" DC plain	203213Y205	203213Y205	150 / 136	92 / 204
3.1/8" DC plain	203213Y206	203213Y206	150 / 136	92 / 204
3.1/4" DC plain	203213Y207	203213Y207	150 / 136	92 / 204
3.1/2" DC plain	203213Y209	203213Y209	150 / 136	92 / 204
3.3/4" DC plain	203213Y211	203213Y211	150 / 136	92 / 204
4.1/8" DC plain	203213Y519	203213Y519	150 / 136	92 / 204
4.1/4" DC plain	203213Y548	203213Y548	150 / 136	92 / 204
3.3/8" DC plain	203213Y795	203213Y795	150 / 136	92 / 204

**BX5-Bushings****Casing Bushing**

Bushing size and type	Part number	Rating [sTon/mTon]	Approx. Weight [kg / lbs]
4.1/2" Csg.	50004010Y129	750 / 680	116 / 255
4.3/4" Csg.	50004010Y130	750 / 680	114 / 251
5" Csg.	50004010Y131	750 / 680	112 / 246
5.1/2" Csg.	50004010Y132	750 / 680	110 / 242
5.3/4" Csg.	50004010Y133	750 / 680	108 / 238
6" Csg.	50004010Y134	750 / 680	106 / 233
6.5/8" Csg.	50004010Y135	750 / 680	104 / 229
7" Csg.	50004010Y136	750 / 680	102 / 224
7.5/8" Csg.	50004010Y137	750 / 680	100 / 220
7.3/4" Csg.	50004010Y705	750 / 680	98 / 216
8.5/8" Csg.	50004010Y139	750 / 680	96 / 211
9.5/8" Csg.	50004010Y141	750 / 680	94 / 207
9.7/8" Csg.	50004010Y649	750 / 680	92 / 202
10.3/4" Csg.	50004010Y142	750 / 680	90 / 298

**Drill Collars ZIP-lift**

Bushing size and type	Part number	Rating [sTon/mTon]	Approx. Weight [kg / lbs]
4.3/4" DC w/ ZIP lift	50004011Y435	150 / 136	89 / 196
6" DC w/ ZIP lift	50004011Y362	150 / 136	82 / 180
6.1/4 " DC w/ ZIP lift	50004011Y337	150 / 136	80 / 176
6.1/2" DC w/ ZIP lift	50004011Y373	150 / 136	76 / 167
6.3/4" DC w/ ZIP lift	50004011Y387	150 / 136	72 / 158
7.3/4" DC w/ ZIP lift	50004011Y339	150 / 136	70 / 154
8" DC w/ ZIP lift	50004011Y336	150 / 136	67 / 147
8.1/4" DC w/ ZIP lift	50004011Y422	150 / 136	65 / 143
8.1/2" DC w/ ZIP lift	50004011Y426	150 / 136	62 / 136
9" DC w/ ZIP lift	50004011Y427	150 / 136	60 / 132
9.1/2" DC w/ ZIP lift	50004011Y370	150 / 136	56 / 123
9.3/4" DC w/ ZIP lift	50004011Y367	150 / 136	52 / 114
10" DC w/ ZIP lift	50004011Y195	150 / 136	46 / 101
10.3/4" DC w/ ZIP lift	50004011Y527	150 / 136	42 / 93
11" DC w/ ZIP lift	50004011Y419	150 / 136	40 / 88

**Drill Pipe**

Bushing size and type	Part number	Rating [sTon/mTon]	Approx. Weight [kg / lbs]
3.1/2" DP IEU 18°	50004012Y766	750 / 680	122 / 268
4" DP IU	50004012Y777	750 / 680	122 / 268
4" DP EU & 4.1/2 " IEU	50004012Y778	750 / 680	120 / 264
4.1/2" DP EU & 5" IEU	50004012Y779	750 / 680	122 / 268
5.1/2" DP IEU 18°	50004012Y780	750 / 680	118 / 260
5.1/2" DP IF	50004012Y781	750 / 680	116 / 255
6.5/8" DP IEU Drill	50004012Y782	750 / 680	104 / 229
5.7/8" DP EU	50004012Y789	750 / 680	114 / 251

**Drill Collars Plain (Lift-plug)**

Bushing size and type	Part number	Rating [sTon/mTon]	Approx. Weight [kg / lbs]
4.3/4" Plain DC	50004013Y354	150 / 136	89 / 196
5.1/4" Plain DC	50004013Y219	150 / 136	82 / 180
6.1/4" Plain DC	50004013Y348	150 / 136	80 / 176
6.1/2" Plain DC	50004013Y135	150 / 136	76 / 167
8" Plain DC	50004013Y334	150 / 136	72 / 158
8.1/4 " Plain DC	50004013Y347	150 / 136	70 / 154
8.1/2" Plain DC	50004013Y357	150 / 136	67 / 147
9" Plain DC	50004013Y356	150 / 136	65 / 143
9.1/2" Plain DC	50004013Y346	150 / 136	62 / 136
10" Plain DC	50004013Y228	150 / 136	60 / 132
10.1/2 " Plain DC	50004013Y229	150 / 136	56 / 123
11" Plain DC	50004013Y230	150 / 136	52 / 114

**Special square shoulder**

Bushing size and type	Part number	Rating [sTon/mTon]	Approx. Weight [kg / lbs]
8" Special square shoulder	50004014Y757	1000 / 907	100/220
8.3/4" Special square shoulder	50004014Y783	1000 / 907	92/202
8.5/8" Special square shoulder	50004014Y784	1000 / 907	85/187
9.5/8" Special square shoulder	50004014Y788	1000 / 907	80/176

## Calculating the safe working load

Safe working load (SWL) = Design Load - Dynamic load.

Design load equals the Rating.

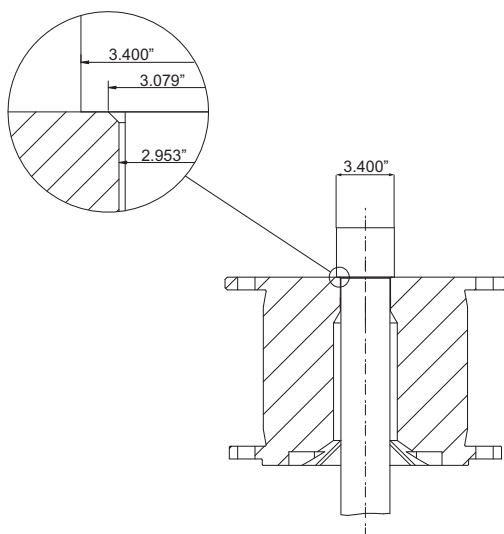


**WARNING:** The safe working load (SWL) is determined by the weakest link in the chain comprising the elevator, bushing & pipe (cross section and grade).

## Examples

Below examples are for information only. It gives some guidelines for calculation of the SWL of elevators and bushings, but gives no information about the SWL of the pipe. NOV does not know the SWL of a pipe, but in general one will use the yield strength of the tubular. This is calculated by multiplying the cross section of the tubular with the grade. In all cases: Check with the pipe manufacturer!

### Example 1: Square shoulder tubular



In this example: BX4-75 with 2.875" tube

Rating bushing: 500 sTon

Rating elevator: 750 sTon

Minimum yield on elevator bushing: 110,000 Psi

1. Measure Tool joint or coupling OD (or get from datasheet for new tubular), in this case 3.4"
2. Measure elevator bore (get from data sheet for new bushing), in this case 3.079"
3. Calculate (projected) bearing area.

$$\frac{\pi}{4} (D^2 - d^2) = \frac{\pi}{4} (3.400^2 - 3.079^2) = 1.63 \text{ sq. inch}$$

4. Calculate SWL of elevator based on contact area.

Allowable force:

Area x Yield = Lbs

$$1.633 \times 110,000 = 179,630 \text{ Lbs}$$

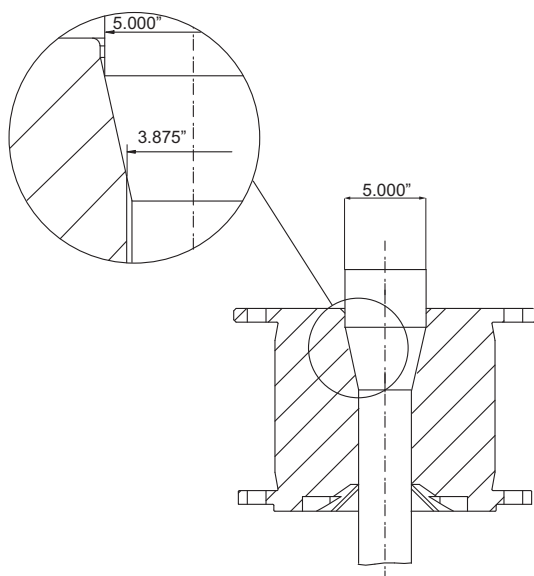
Allowable SWL:

$$\frac{179,630 \text{ Lbs}}{2000} = 89.8 \text{ sTons}$$

2000

5. Check tubular manufacturer data for restrictions on contact or bearing stress for specific tubular

## Example 2: 18° Drill pipe



In this example: BX4-75 with 3.1/2" drill pipe  
 Rating bushing: 500 sTon  
 Rating elevator: 500 sTon  
 Minimum yield on elevator bushing: 110,000 Psi

1. Measure Tool joint or coupling OD (or get from datasheet for new tubular), in this case 5"
2. Measure elevator bore (get from data sheet for new bushing), in this case 3.875"
3. Calculate (projected) bearing area.

$$\frac{\pi}{4} (D^2 - d^2) = \frac{\pi}{4} (5.000^2 - 3.875^2) = 7.842 \text{ sq. inch}$$

4. Calculate SWL of elevator based on contact area.

Allowable force:

Area x Yield = Lbs

$$7.842 \times 110,000 = 862,620 \text{ Lbs}$$

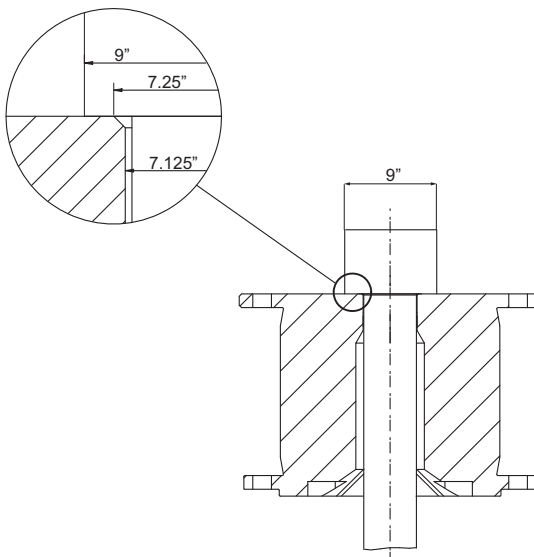
Allowable SWL:

$$\frac{862,620 \text{ Lbs}}{2000} = 431.3 \text{ sTons}$$

2000

5. Check tubular manufacturer data for restrictions on contact or bearing stress for specific tubular

## Example 3: Casing



In this example: BX4-75 with 7" casing  
 Rating bushing: 750 sTon  
 Rating elevator: 750 sTon  
 Minimum yield on elevator bushing: 110,000 Psi

1. Measure Tool joint or coupling OD (or get from datasheet for new tubular), in this case 9"
2. Measure elevator bore (get from data sheet for new bushing), in this case 7.25"
3. Calculate (projected) bearing area.

$$\frac{\pi}{4} (D^2 - d^2) = \frac{\pi}{4} (9^2 - 7.25^2) = 22.33 \text{ sq. inch}$$

4. Calculate SWL of elevator based on contact area.

Allowable force:

Area x Yield = Lbs

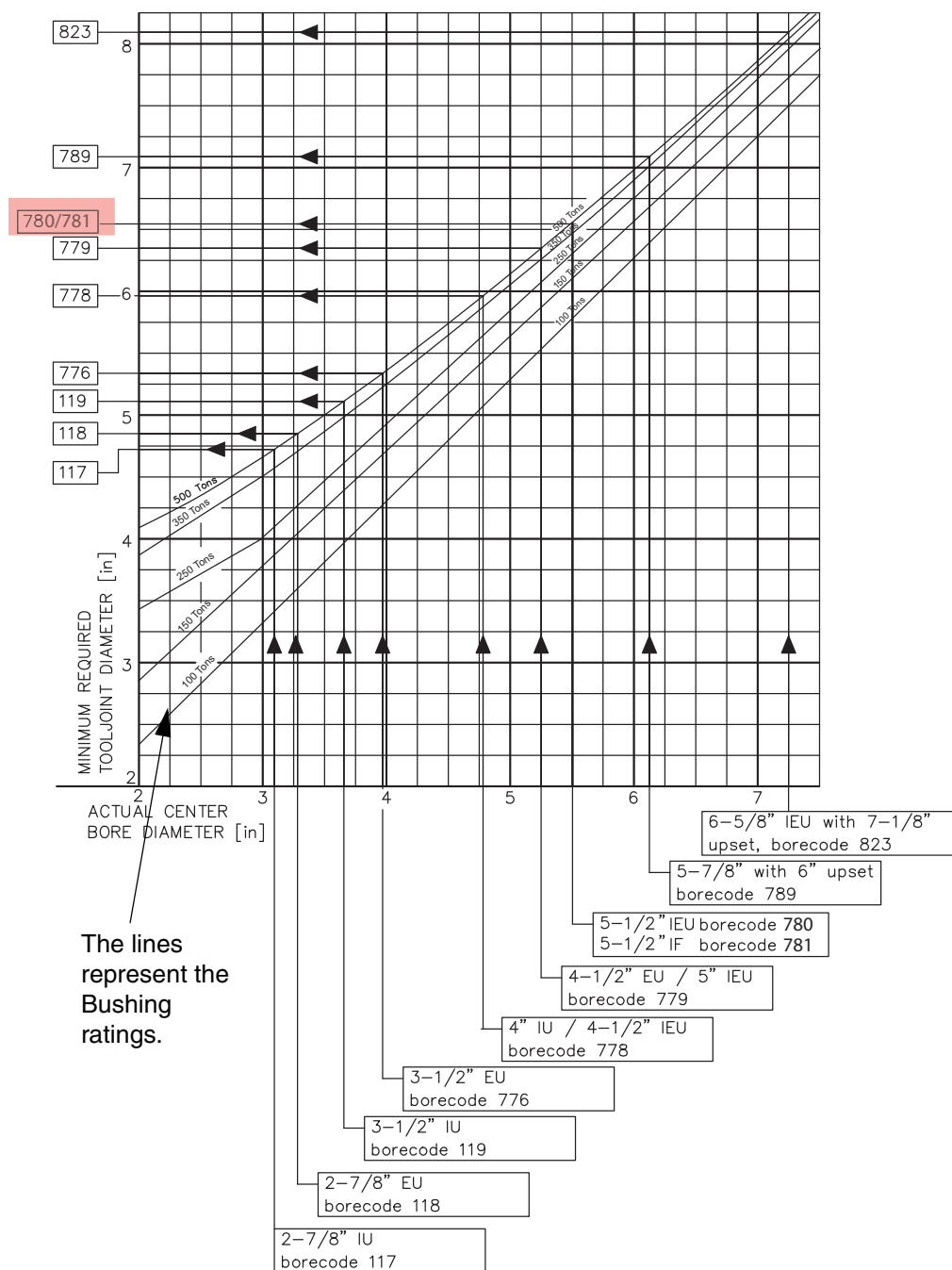
$$22.33 \times 110,000 = 2,456,300 \text{ Lbs}$$

Allowable SWL:

$$\frac{2,456,300 \text{ Lbs}}{2000} = 1228.2 \text{ sTons, to heavy for bushing, thus not allowed.}$$

2000

5. Conclusion: The SWL is limited to 750 sTon due to rating of bushing.
6. Check tubular manufacturer data for restrictions on contact or bearing stress for specific tubular

**Minimum required tool joint diameters\***

\*For reference only; always consult pipe manufacturer for actual values!

## Replaced parts

The previous elevators with part number 203300Y30 (BX3), 203290Y30 (BX4-50), 203200Y30 (BX4-75) & 50004000Y30 (BX5) can be modified with the new manifold block and cylinders according to below list.

### Replaced parts BX4-50 pn203200Y30 & BX4-75 pn203290Y30

Cylinders	Previous part number	Current part number
Ass'y door cylinder BX4-50&BX4-75	203220-1	50000667
Ass'y latch cylinder BX4-50&BX4-75	50004151	50000668
Door cylinder BX4&3	50004150	50000667-10
Latch cylinder BX	203220-5	50000668-10
Bushing BX Cylinder	-	50000669
Bushing BX Cylinder	-	50000669-1
Pin latch cylinder BX	-	50000673
Seal Kit BX cylinders	203220-2	50000667-1
Cylinder kit BX4-50&BX4-75,20320(9)0y30	-	50000644-1
Manifold	Previous part number	Current part number
BX4 tube port 40 to latch valve	50003974	50003974-100
BX4 tube float sign. to latch valve	50003975	50003975-100
BX4 tube, float bracket	50003982	50003982-100
BX4 tube, XP	50003983	50003983-100
BX4 tube, P	50003984	50003984-100
BX4 tube, Tank	50003985	50003985-100
Manifold ass'y. BX 3,4 & 5	50004048-1	50004050-1
1/2-14 UNC BOLT	50008-40-C8D	50008-22-C8D
Washer, lock-regular.1/2"	979785-12	50908-C
Elbow, 90° swivel int 37' /37'	56518-4-4-S	no longer required
Locknut, bulkhead	56547-6-S	no longer required
UNION,BULKHEAD 37 DEG	56538-6-6-S	no longer required
Reducer, int 37'/37'	56517-6-4-S	no longer required
Elbow, O-ring Boss /37'	56519-4-4-S	no longer required
Tee, swivel int 37' /37' /37'	56525-4-4-S	no longer required
Sun pilot to open check valve	93547-1B30N	no longer required
QD bracket 'XP-'line'	203270-14	no longer required
Check-valve bracket	203270-15	no longer required
Tbg., check-valve to signal port	50004045	no longer required
Hydr. tube, steel fittings.1/4"	50003973	no longer required
Tbg., check-valve to 'XP' QD	203270-17	no longer required
Nipple, straight, BSP to JIC	979532-4-4	no longer required
Reducer	979852-8-4	no longer required
Line mount body (sun) type 'ECV'	979940-ECV	no longer required
Washer, flat	50805-N-C	no longer required
Screw, cap-Hex. HD (UNC-2A)	50005-12-C8D	no longer required
Manifold Kit BX4-50&BX4-75,20320(9)0Y30	-	50000644

### Replaced parts BX5 pn 50004000Y30

Cylinders	Previous part number	Current part number
Ass'y door cylinder BX5	50004020	50000680
Ass'y latch cylinder BX5	50004153	50000681
Door cylinder BX5	50004021	50000680-10
Latch cylinder BX5	50004152	50000681-10
Bushing BX Cylinder	-	50000669
Bushing BX Cylinder	-	50000669-1
Pin latch cylinder BX	-	50000673
Seal Kit BX5 cylinders	203220-2	50000680-1
Cylinder kit BX5, 50004000Y30	-	50000645-1
Manifold	Previous part number	Current part number
BX5 tube port 40 to latch valve	50004066	50004066-100
BX5 tube float sign. to latch valve	50004067	50004067-100
BX5 tube, float bracket	50004068	50004068-100
BX5 tube, XP	50004069	50004069-100
BX5 tube, P	50004070	50004070-100
BX5 tube, Tank	50004071	50004071-100
Manifold ass'y. BX 3,4 & 5	50004048-1	50004050-1
1/2-14 UNC BOLT	50008-40-C8D	50008-22-C8D
Washer, lock-regular.1/2"	979785-12	50908-C
Elbow, 90° swivel int 3/4" /3/4"	56518-4-4-S	no longer required
Locknut, bulkhead	56547-6-S	no longer required
UNION,BULKHEAD 3/4 DEG	56538-6-6-S	no longer required
Reducer, int 3/4"/3/4"	56517-6-4-S	no longer required
Elbow, O-ring Boss /3/4"	56519-4-4-S	no longer required
Tee, swivel int 3/4" /3/4" /3/4"	56525-4-4-S	no longer required
Sun pilot to open check valve	93547-1B30N	no longer required
QD bracket 'XP'-line'	203270-14	no longer required
Check-valve bracket	203270-15	no longer required
Tbg., check-valve to signal port	50004045	no longer required
Hydr. tube, steel fittings.1/4"	50003973	no longer required
Tbg., check-valve to 'XP' QD	203270-17	no longer required
Nipple, straight, BSP to JIC	979532-4-4	no longer required
Reducer	979852-8-4	no longer required
Line mount body (sun) type 'ECV'	979940-ECV	no longer required
Washer, flat	50805-N-C	no longer required
Screw, cap-Hex. HD (UNC-2A)	50005-12-C8D	no longer required

**Replaced parts BX3 pn 203300Y30**

Cylinders	Previous part number	Current part number
Ass'y door cylinder BX3	203318-1	50000682
Ass'y latch cylinder BX4-50&BX4-75	50004151	50000668
Door cylinder BX4&3	50004150	50000667-10
Latch cylinder BX	203220-5	50000668-10
Bushing BX Cylinder	-	50000669
Bushing BX Cylinder	-	50000669-1
Pin latch cylinder BX	-	50000673
Seal Kit BX cylinders	203220-2	50000667-1
Cylinder kit BX3, 203300y30	-	50000643-1
Manifold	Previous part number	Current part number
BX3 tube port 40 to latch valve	50003926	50003926-100
BX3 tube float sign. to latch valve	50003927	50003927-100
BX3 tube, float bracket	50003928	50003928-100
BX3 tube, XP	50003929	50003929-100
BX3 tube, P	50003930	50003930-100
BX3 tube, Tank	50003931	50003931-100
Manifold ass'y. BX 3,4 & 5	50004048-1	50004050-1
1/2-14 UNC BOLT	50008-40-C8D	50008-22-C8D
Washer, lock-regular.1/2"	979785-12	50908-C
Elbow, 90' swivel int 37' /37'	56518-4-4-S	no longer required
Locknut, bulkhead	56547-6-S	no longer required
UNION,BULKHEAD 37 DEG	56538-6-6-S	no longer required
Reducer, int 37'/37'	56517-6-4-S	no longer required
Elbow, O-ring Boss /37'	56519-4-4-S	no longer required
Tee, swivel int 37' /37' /37'	56525-4-4-S	no longer required
Sun pilot to open check valve	93547-1B30N	no longer required
QD bracket 'XP-'line'	203270-14	no longer required
Check-valve bracket	203270-15	no longer required
Tbg., check-valve to signal port	203270-18	no longer required
Hydr. tube, steel fittings.1/4"	50003973	no longer required
Tbg., check-valve to 'XP' QD	203270-17	no longer required
Nipple, straight, BSP to JIC	979532-4-4	no longer required
Reducer	979852-8-4	no longer required
Line mount body (sun) type 'ECV'	979940-ECV	no longer required
Washer, flat	50805-N-C	no longer required
Screw, cap-Hex. HD (UNC-2A)	50005-12-C8D	no longer required
Manifold Kit BX3, 203300Y30	-	50000643



## BX3, BX4-50, BX4-75, BX5

### 3-Lubrication and maintenance

REFERENCE BX3, BX4-50, BX4-75, BX5	REFERENCE DESCRIPTION Hydraulic Elevators	
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DOCUMENT NUMBER <b>50000802-MAN-001</b>		REV <b>B</b>





## Lubrication & Maintenance



NOTE: The owner and user together with the manufacturer should jointly develop and update inspection, maintenance, repair and remanufacture procedures consistent with equipment application, loading, work environment, usage and operational conditions.

These factors may change as a result of new technology, product improvements or fundamental changes in service conditions.

NOV recommends using the Periodic inspection and maintenance Categories and Frequencies as mentioned in API RP8B Table 1. Detailed instructions for maintenance according to API RP8B Table 1 are outlined in this chapter.

### Safety



**WARNING:** It is not allowed to weld on elevators. Please contact an authorized NOV repair facility.

### Recommended hydraulic fluid

	Above -20° C / -4° F	Below -20° C / -4° F
Castrol	Hyspin AWS-46	Hyspin AWS-32
Chevron	AW Hyd oil 46	AW Hyd oil 32
Exxon	Nuto H 46	Nuto H 32
Gulf	Harmony 46AW	Harmony 32AW
Mobil	DTE 25	DTE 24
Shell	Tellus 46	Tellus 32
Texaco	Rando oil HD 46	Rando oil HD 32
Union	Unax AW 46	Unax AW 32

### Recommended General Purpose EP grease

Lube code description	Above -20° C	Below -20° C
Castrol	MP grease	n/a
Chevron	Avi-Motive	Avi-Motive W
Exxon	Lidok EP2	Lidok EP1
Gulf	Gulfcrown EP2	Gulfcrown EP1
Mobil	Mobilux EP2	Mobilux EP1
Shell	Alvania EP2	Alvania EP1
Texaco	Multifak EP2	Multifak EP1
Union	Unoba EP2	Unoba EP1

### Greasing the inserts and insert slots.



NOTE: To reduce the chance of inserts seizing in the insert slots, NOV recommends to remove the inserts after each job, coat the insert slot with light machine oil, EP-2 grease or any other fluid that does not affect the friction coefficient with string weight compared to a none coated insert slot.



**WARNING:** No grease or pipe dope should be used for lubricating the inserts and insert slots as this will reduce the friction coefficient resulting in higher loads on the slip toe and thus higher stress.

## Maintenance



**WARNING:** Ensure that all hydraulic lines are disconnected before ANY work is performed on the elevator. It's not always sufficient to isolate the hydraulic lines by using a ball valve, as the hoses might function as an accumulator, which could generate movement of the elevator. The ball-valve is installed to ease connecting and disconnecting the QD with pressure still on the line and for disconnecting the elevator from the power source.

### Daily inspection schedule(when BX is in use) cat II

#### Procedure

##### Daily Inspection (cat II) Visually inspect and repair when needed

1. Check for worn and damaged parts	<input type="checkbox"/> OK
2. Check for loose and missing parts	<input type="checkbox"/> OK
3. Check condition of mechanical latch lock	<input type="checkbox"/> OK
4. Check for kink, burr, pitting and crack free mechanical latch lock spring & trigger springs.	<input type="checkbox"/> OK
5. Check for leakage free fittings, tubes, hoses, valves & cylinders.	<input type="checkbox"/> OK
6. Check proper locking of all bushing lock bolts and nuts	<input type="checkbox"/> OK
7. Check that all bushings are well seated and retained in body and doors.	<input type="checkbox"/> OK
8. Check that all bushings are locked by secondary safety snaps.	<input type="checkbox"/> OK
9. Check hoses for signs cracks, wear or abrasion.	<input type="checkbox"/> OK
10. Check the wear-buttons for wear.	<input type="checkbox"/> OK
11. Check rotator:	
• Bending or cracking of rotary link blocks	<input type="checkbox"/> OK
• Cracking or bending of the stop pins	<input type="checkbox"/> OK
• Cracking or bending of the stop brackets.	<input type="checkbox"/> OK

##### Daily Inspection (cat II) Visually inspect and repair when needed

Check the proper locking of:	
1. Bolts and nuts	<input type="checkbox"/> OK
2. Safety chains	<input type="checkbox"/> OK
3. Slotted nuts & cotter pins	<input type="checkbox"/> OK
4. Lock tabs & lock bars	<input type="checkbox"/> OK
5. Roll pins and dowel pins	<input type="checkbox"/> OK
6. Snap rings	<input type="checkbox"/> OK
7. Cotter pins	<input type="checkbox"/> OK

## Daily operational check (cat II)

### Procedure

#### Daily Inspection (cat II) Visually inspect and repair when needed

1) Check the functioning of the latch mechanism.	<input type="checkbox"/> OK
2) Open and close 10 times. Elevator should close and latch completely at each cycle	<input type="checkbox"/> OK
3) Check for proper right hand (spring-loaded) door bushing movement by pressing bushing down and the proper functioning of the mechanical latch lock pin	<input type="checkbox"/> OK
4) Check proper functioning of the trigger mechanism	<input type="checkbox"/> OK

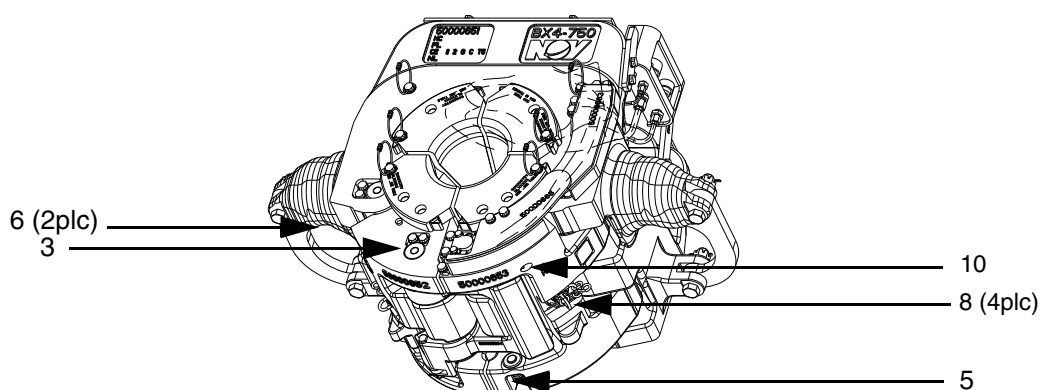
## Daily lubrication (cat II)

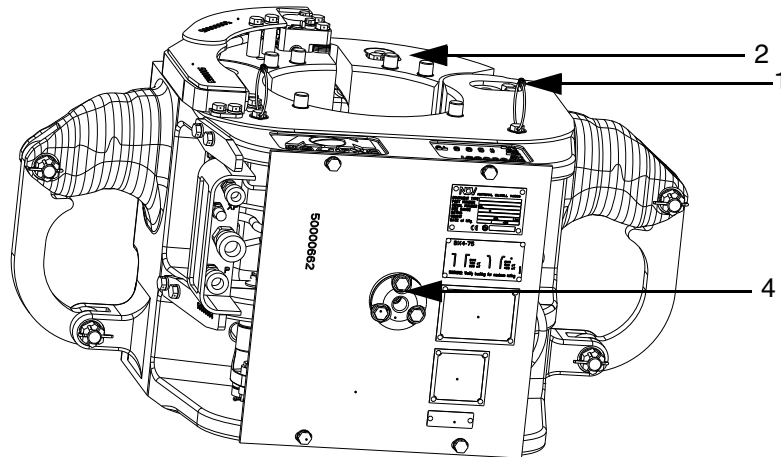
### Procedure

#### Daily Lubrication.

**Apply prescribed grease to all grease points until grease is coming out of the bores**

1. Grease hinge pin Left Hand door Top + Bottom	<input type="checkbox"/> OK
2. Grease hinge pin Right hand door Top + Bottom	<input type="checkbox"/> OK
3. Grease hinge pin latch Top + Bottom	<input type="checkbox"/> OK
4. Grease trigger	<input type="checkbox"/> OK
5. Grease latch lock (2x)	<input type="checkbox"/> OK
6. Grease contact surfaces links <b>(when elevator combined with rotator every 6 hours!)</b>	<input type="checkbox"/> OK
7. Grease back of bushings and the elevator bore and load-shoulder.	<input type="checkbox"/> OK
8. Grease bushing lock-pins	<input type="checkbox"/> OK
9. Brush grease on all bushing backs	<input type="checkbox"/> OK
10. Lubricate latch valve. For this purpose 2 nipples are available, it is sufficient to lubricate one of them.	<input type="checkbox"/> OK





10. Grease nipple latch valve on inside of door



10. Grease nipple latch valve on outside of door

## Weekly maintenance

### Procedure

#### Weekly maintenance

Perform the cylinder adjustment test

## Monthly maintenance

### Procedure

#### Preservation. Use prescribed grease only

Fill space between springs and pins with grease

## Six monthly inspection (cat III)

### Procedure

#### Six montly inspection

Check orientation of elevator doors and latch (no visible drop allowed)

Check easy and full closing of latch onto its lug contact surface without touching bottom or top of lug

## 3 monthly inspection (cat III) on RIG

### Procedure

#### Procedure on rig; drill pipe bushings

Depending on frequency and load pattern of strings handled with the elevator drill pipe bushings, it is recommended to decrease the time intervals for MPI inspection (ref 6 monthly inspection category III on Rig) to be carried out on a 3 monthly basis as per critical area drawing CA-254.

## 6 monthly inspection (cat III) on RIG

### Procedure

#### Procedure on rig; elevator

MPI exposed critical areas according drawings CA-251, 252, 253 and 254. Check if indications are out of acceptance standard

If indications out of acceptance standard, remove elevator of service. The elevator needs repair at the nearest authorized repair facility. Please contact NOV for guidance

## Annual (1 year) inspection (cat IV)

### Procedure

#### Annual (1 year) Inspection (cat IV)

Follow procedures according chapter "Repair"

Magnetic Particle Inspection; please contact a NOV repair center for guidance

Check for correct condition of cylinder seals

## Maintenance procedures

### API recommended practice RP 8B



NOTE: NOV recommends maintenance acc. to API RP8B

### Recommended inspections

The user/owner of the equipment should develop schedules of inspection based on experience, the manufacturer's recommendations, and one or more of the following factors:

environment; load cycles; regulatory requirements; operating time; testing; repairs; remanufacture.

Alternatively, NOV recommends using the Periodic inspection and maintenance Categories and Frequencies as mentioned in API RP8B Table 1. Long-term planning shall be adjusted in order not to interfere unnecessarily with the running operations.

#### Category I.

This category involves observing the equipment during operation for indications of inadequate performance. When in use, equipment shall be visually inspected on a daily basis for cracks, loose fits or connections, elongation of parts, and other signs of wear, corrosion or overloading. Any equipment found to show cracks, excessive wear, etc., shall be removed from service for further examination. The equipment shall be visually inspected by a person knowledgeable in that equipment and its function.

#### Category II.

This is Category I inspection plus further inspection for corrosion, deformation, loose or missing components, deterioration, proper lubrication, visible external cracks, and adjustment.

#### Category III

This is Category II inspection plus further inspection, which should include NOT of critical areas and may involve some disassembly to access specific components and to identify wear that exceeds the manufacturer's allowable tolerances.

#### Category IV

This is Category III inspection plus further inspection for which the equipment is disassembled to the extent necessary to conduct NDT of all primary-load-carrying components as defined by manufacturer. Equipment shall be:

- ❑ disassembled in a suitably-equipped facility to the extent necessary to permit full inspection of all primary-load-carrying components and other components that are critical to the equipment;
- ❑ inspected for excessive wear, cracks, flaws and deformations.

Corrections shall be made in accordance with the manufacturer's recommendations.

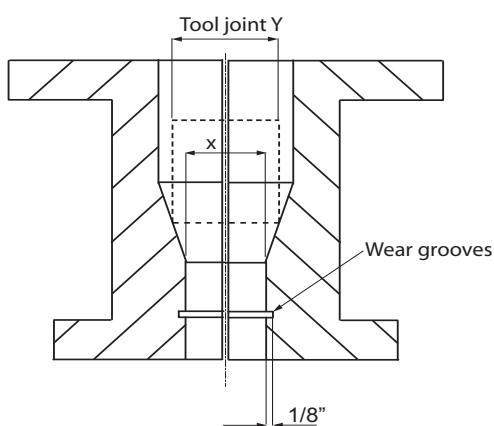
Prior to Category III and Category IV inspections, all foreign material such as dirt, paint, grease, oil, scale, etc. shall be removed from the concerned parts by a suitable method (e.g. paint-stripping, steam-cleaning, grit-blasting).

## Tool joint wear data drill-pipe

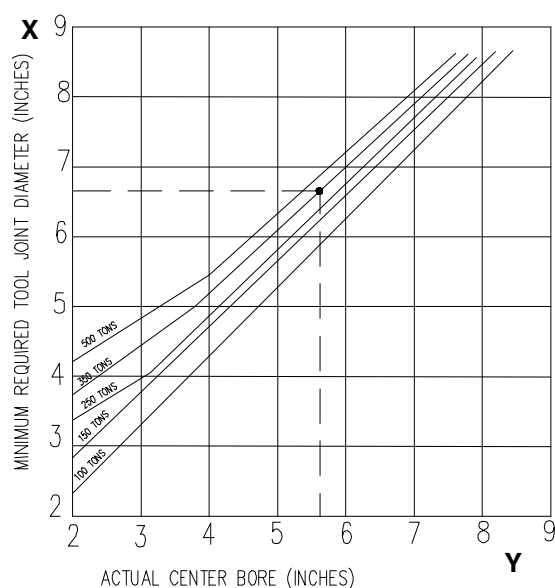
### Procedure

1. Determine the center bore diameter of the bushing in inches (size X)
2. The maximum wear on the diameter of the center bore: Nominal size + 0.25 inch
3. In the table, follow the line corresponding with the rating of the elevator (in short tons)
4. On the left hand side, read out the minimum required tool joint diameter (Y) in inches that can be handled safely with the elevator.
5. As soon as the tool joint diameter falls below the corresponding rating line, the bushing or the pipe must be changed.

\*until wear groove is gone



The lines represent the bushing rating.



### Example: 5 1/2" Drill pipe bushing, rated 350 Tons

#### Procedure

1. Actual center bore (X) is  $5 \frac{13}{16}$ . Follow the vertical line up until the "350 Tons" line.
2. Follow the line horizontally.
3. Read out minimum required tool joint diameter (Y) =  $6 \frac{3}{4}$ "

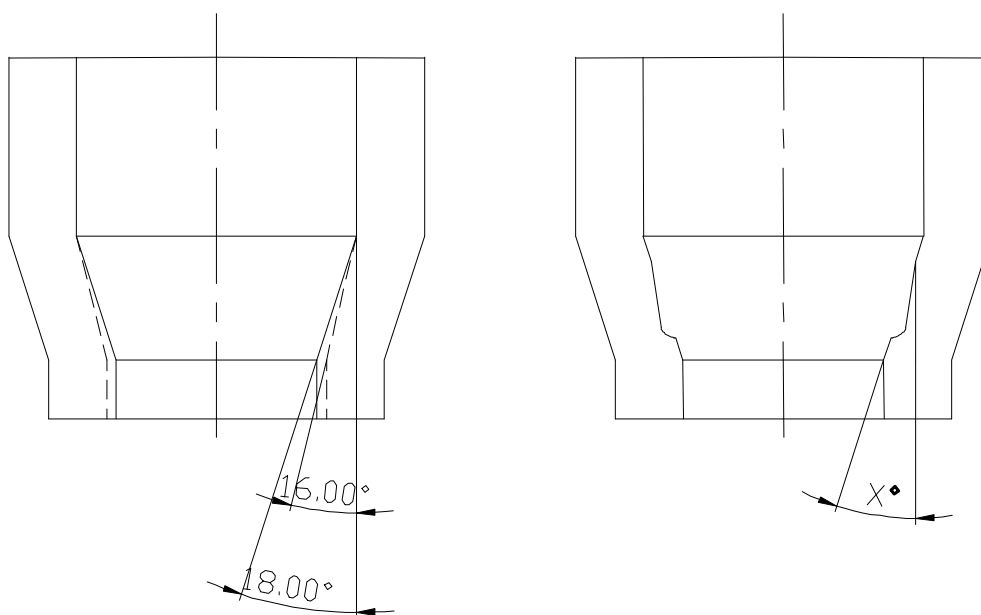
## Center-bore 18° taper profile inspection

Daily inspect the bushings visually. When in doubt, measure with contour gauge.

### Procedure

If the measured bore diameter, exceeds the max allowable bore diameter, the bore is not to be welded in. Instead please contact your nearest authorized NOV repair facility for guidance.

1. Superimposed actual pattern of bushing-bore. Press upper section of contour gauge against an unworn section of the bushing upper bore
2. If superimposed elevator angle falls below 16° remove elevator from service
3. In case of undercutting, X is the angle to be superimposed



Magnetic Particle Inspection

### Acceptance criteria for MPI

See also the critical area drawings in chapter "Drawings".

Type	Discontinuity descriptions	Max. Permitted degree	
		Critical areas	Non critical areas
I	Hot tears, cracks	None	Degree 1
II	Shrinkage	Degree 2	Degree 2
III	Inclusions	Degree 2	Degree 2
IV	Internal chills and chaplets	Degree 1	Degree 1
V	Porosity	Degree 1	Degree 2



NOTE: Only a NOV authorized repair facility is allowed to remanufacture BX Elevators which have indications outside the acceptance criteria.

## Hydraulic filter maintenance procedure

Depending on the quality of the hydraulic fluids on the rig it is important to check the condition of the inline-filters on a regular basis. The filters are designed to stand for at least 1-year service in conditions as required in this manual (see chapter 2). However, rig conditions may differ from these required conditions, or change by contamination, incidents, repairs etc.

Depending on the actual conditions it is important to conduct regular checks on the filters in the manifold block. For this reason the manifold block, the hoses and couplings need to be checked and cleaned thoroughly. It is advised to conduct the check at least after 1 month of service, after 6 months service and after one year of service. Depending on the results of the checks the interval between checks can be increased or decreased.

### Filter in manifold block

#### Procedure

1. XP-line filter on the side (p/n 979796-25-S)
2. Check filters.
3. Clean filters when needed (rinse with a solvent)



Filter set: Spring (not shown) (p/n 980252) and Cartridge (p/n 979796-25-S)

## Tests

### Load test

The BX Elevators are load tested after manufacture or repair to 1.5 times their rating.



**WARNING: BX Elevators which have experienced wear or are found to have cracks must be replaced or repaired by a Varco BJ authorized repair facility.**



**WARNING: Only original NOV parts must be used. BX Elevators are produced from cast alloy heat treated steel and must not be welded in the field. Improper welding can cause cracks and brittleness in heat-affected areas which can result in dramatic weakening of the part and possible failure. Repairs involving welding and/or machining should be performed only by a NOV authorized repair facility. Using a BX Elevator that has been improperly welded or repaired is dangerous.**

### Cylinder seal test

Checking for the condition of the seals in the BX-cylinders is to be carried out once a year.  
Procedure

- ☐ Remove cylinders from elevator
- ☐ Try to remove any remaining fluid from the cylinders by stroking them in and out manually a few times
- ☐ Plug off the Xp (barrel) port.
- ☐ Put system pressure (2,500 psi) on the rod side of the cylinder.



**CAUTION: Ensure cylinder cannot spray any leaking oil via the open port into air causing damage or injury to anyone.**

- ☐ On the piston side of the cylinder appr. 2 cubic centimeter/min (about a table spoon) is allowed to leak.
- ☐ If there is considerable more leakage, replace seals.

## Wear data/criteria

### Repair data



NOTE: In case the guidelines given in this chapter, conflict with the guidelines as set out in the NOV Repair manual, the guidelines set out in the NOV Repair manual shall prevail.

The wear data as given in the table(s) are for accepting the equipment in the field. The criteria that determine if equipment needs to be repaired are more stringent. After repair, the equipment must have wear allowance. Therefore on a repaired tool the Hinge & Latch Pin to Bore clearance should generally not exceed 50% of the maximum wear allowance.

### Bushing/pin wear data

Allowed repair clearance Hinge & Latch pins. Max 0.023"

Allowed in-service clearance Hinge & Latch pins Max 0.045"

Allowed in-service clearance Lever & Bracket pins Max 0.015"

Allowed in-service clearance Bushing Position pins & Bushings (Inserts) Max 0.300"

## Bushing / pin repair parts

### BX3

	Part number	Qty
Cylinder bracket bushing ½"	203260-1	4 *
Door/Latch lever bushing ½"	203247-1	10 **
Door hinge-pin assembly	203206-1	2
1. Door hinge-pin wear-bushing in body	979770-65	8
2. Latch hinge-pin wear-bushing in door	979770-62	4
3. Body hinge-pin wear-bushing in door	979770-65	8
4. Latch hinge-pin wear-bushing	979779-64	2
Latch-pin assembly	203207-1	1
Trigger shaft	203238	1
Trigger shaft wear bushing	979771-2520	1

### BX4-50 & 4-75

Description	Part number	Qty
Bracket pin bushing 0.5"	203254	4
Bracket pin bushing 0.75:" x 0.472"	50005325	14
Bracket pin bushing 0.75:" x 0.750"	50005326	3
Trigger shaft	50000661	1
Trigger shaft wear bushing	979771-2520	2
Doorhinge-pin assembly	50000670-1	2
Latch-pin assembly	50000671-1	1
1.Body hinge-pin wear-bushing in door	979770-65	2
2.Body hinge-pin wear-bushing in door	979770-66	6
2. Latch hinge-pin wear-bushing	979770-64	2

## BX5

	Part number	Qty
Cylinder bracket bushing ½"	203260-1	8
Door/Latch lever bushing ½"	203247-1	4
Latch lock lever bushing	203247-1	2
Door hinge-pin assembly with bushings	40004006-1	2
1. Door hinge-pin wear-bushing in body	979770-7050	8
2. Latch hinge-pin wear-bushing in door	979770-6040	4
3. Body hinge-pin wear-bushing in door	979770-7050	8
4. Latch hinge-pin wear-bushing	979779-6040	2
5. Latch hinge-pin wear-bushing	979779-6030	2
Latch-pin assembly with bushings	50004007-1	1
Trigger shaft	50004038	1
Trigger shaft wear bushing	979771-2520	2

## Wear data hinge pins

### BX3

#### Hinge Pins

##### Door Hinge Pins BX3 #203206-1

Hinge pin doors diameter new Min 2.1642"

Hinge pin doors worn Min 2.1392"

Door bushing ID (fitted) new Max 2.1683"

Door bushing ID worn Max 2.1933"

Door bushing fitment bore Max 2.3640"

##### Latch Pins BX3 #203207-1

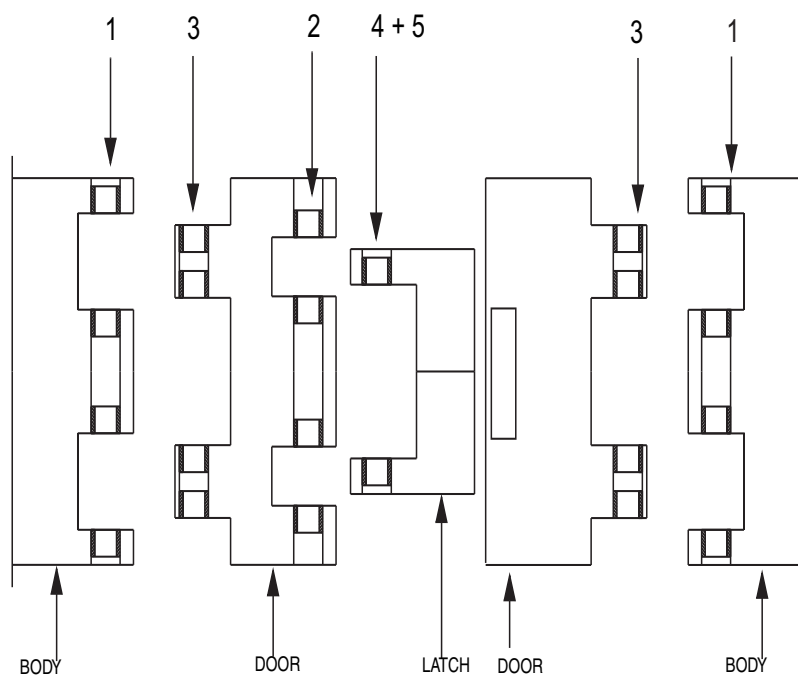
Latch pin diameter new Min 1.9673"

Latch pin diameter worn Min 1.9423"

Latch bushing ID (fitted) new Max 1.9710"

Latch bushing ID worn Max 1.9960"

Latch bushing fitment bore Max 2.1672"



## BX4-50 & 4-75

### Hinge Pins

#### Door Hinge Pins #50000670-1

Hinge pin doors diameter new Min 2,1636"
Hinge pin doors diameter worn Min 2,1542"
Hinge pin body bore diameter new Min 2,1664"
Hinge pin body bore diameter worn Max 2,3634"

#### Door pin Bushing #979770-65 & 66

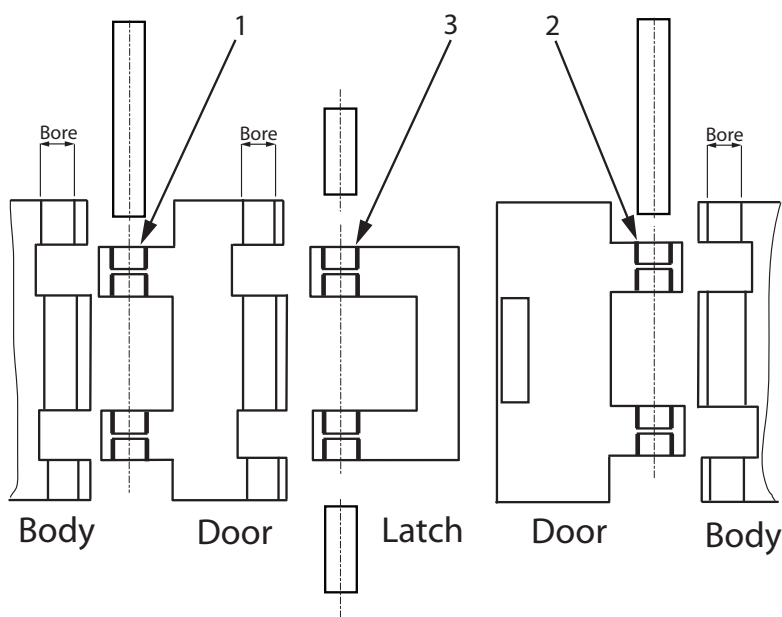
Door bushing ID (fitted) new Max 2.1642"
Door bushing ID worn Max 2.2142"
Door bushing ID fitment bore Max 2.3640"

#### Latch Pins #50000671-1 Size (inch)

Latch pin diameter new Min 1.9670"
Latch pin diameter worn Min 1,9570"
Latch pin door bore new Min 1,9695"
Latch pin door bore worn Max 2,195"

#### Latch pin bushings #979770-64

Latch bushing ID (fitted) new Max 1.9673"
Latch bushing ID worn Max 1.9773"
Latch bushing ID fitment bore Max 2.16742"



**BX5****Hinge Pins****Doors Hinge Pins BX 5 50004006**

Hinge pin doors diameter new Min 2.7547"

Hinge pin worn Min 2.7297"

Door bushing ID (fitted) new Max 2.7588"

Door bushing ID worn Max 2.7838"

Door bushing fitment bore Max 2.9546"

**Latch Pins BX 5 #50004007 Size**

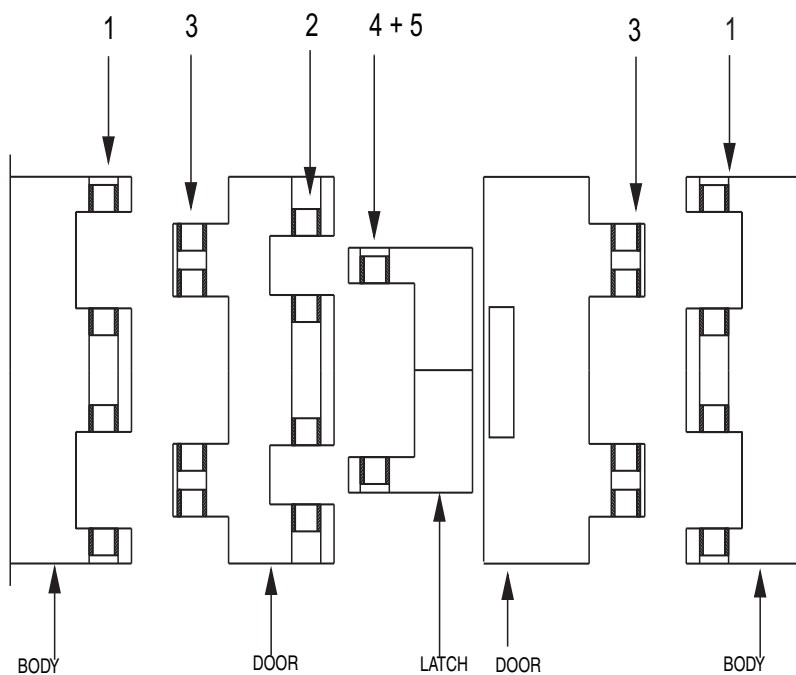
Latch pin diameter new Min 2.3610"

Latch pin diameter worn Min 2.3360"

Latch bushing ID (fitted) new Max 2.3651"

Latch bushing ID worn Max 2.3901"

Latch bushing fitment bore Max 2.5608"



## Wear data elevator closing mechanism

### Levers Pins & Bushings Size (inch)

Lever pins 0.500 Nominal diameter, new Min 0.4950
Lever pins 0.500 Nominal diameter, worn Min 0.4880
Lever pins fitment bore Max 0.5050

### Bushing 0.500 ID #50005325

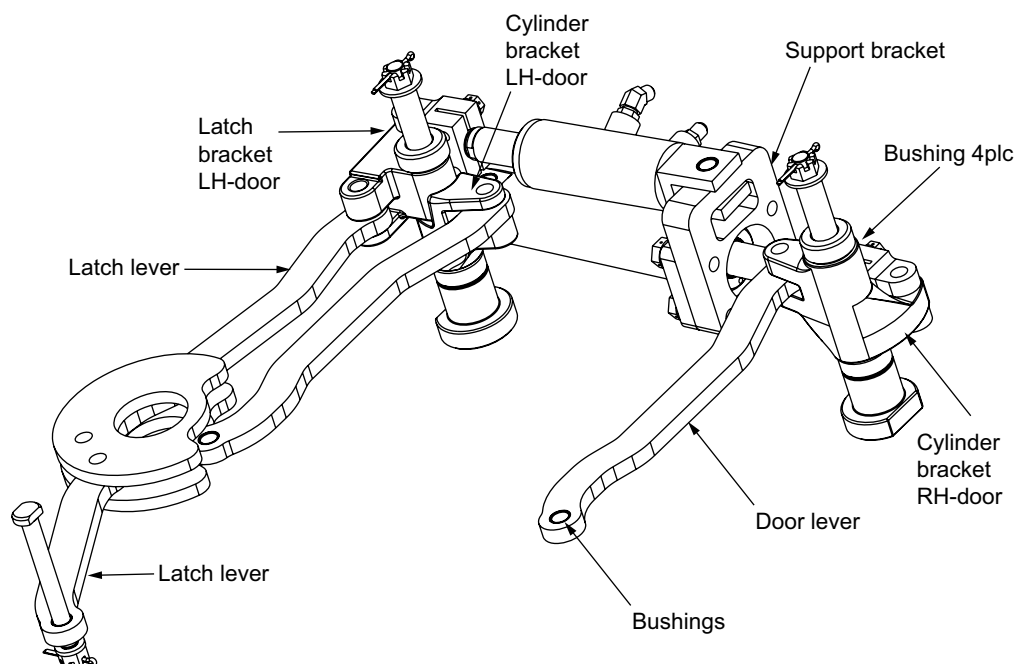
Lever bushings 0.500 ID new Max 0.5017
Lever bushings 0.500 ID worn Max 0.5035
Lever bushing fitment bore Max 0.5940

### Bracket Pins & Bushings Size (inch)

Bracket pins 0.750 Nominal diameter new Min 0.7492
Bracket pins 0.750 Nominal diameter worn Min 0.7380
Bracket pins fitment bore Max 0.7512

### Bushing 0.750 ID #203254

Bracket bushings 0.750 ID (fitted) new Max 0.7521
Bracket bushings 0.750 ID worn Max 0.7650
Bracket bushings fitment bore Max 0.8762



## Wear data position pins for elevator bushings BX3

### Sizes (inches)

Position Pins Top #203317 1.4961" Nominal diameter, new Min. 1.4911
Position Pins Top #203317 1.4961" Nominal diameter, worn Min. 1.4561
Pin press-fit end in Body / Door BX 3 Min. 1.4971
Pin fitment hole in Body / Door BX 3 Max. 1.4970
Position Pins Bottom #203238. 0.8660" Nominal diameter, new Min. 0.8655
Position Pins Bottom #203238. 0.8660" Nominal diameter, worn Min. 0.8460
Pin fitment hole in Body / Door BX 3 Max. 0.8710
Locating hole in Elevator bushing (Insert). BX 3 Max. 1.0500

## BX4-50&4-75

### Sizes (inches)

Position Pins Top #203234 - 0.8660" Nominal diameter, new Min. 0.8655"
Position Pins Top #203234 - 0.8660" Nominal diameter, worn Min. 0.8260"
Pin press-fit end in Body / Door Min. 0.8665"
Pin fitment hole in Body / Door Max. 0.8668"
Locating hole in Elevator bushing (Insert) Max.1.0600"
Position Pins Bottom Body #50000660: 0.8660" Nominal diameter, new Min. 0.8655"
Position Pins Bottom Body #50000660: 0.8660" Nominal diameter, worn Min. 0.8460"
Position Pins Bottom Door #50000660-1: 0.8660" Nominal diameter, new Min. 0.8655"
Position Pins Bottom Door #50000660-1: 0.8660" Nominal diameter, worn Min. 0.8460"
Pin fitment hole in Body / Door: 1.000" - 0.999"

## BX5

### Sizes (inches)

Position Pins Top #50004034. 1.2598" Nominal diameter, new Min. 1.2548
Position Pins Top #50004034. 1.2598" Nominal diameter, worn Min. 1.2148
Pin press-fit end in Body / Door BX 5 Min. 1.2601
Pin fitment hole in Body / Door BX 5 Max. 1.2608
Position Pins Bottom #203238. 0.8660" Nominal diameter, new Min. 0.8655
Position Pins Bottom #203238. 0.8660" Nominal diameter, worn Min. 0.8460
Pin fitment hole in Body / Door BX 5 Max. 0.8710
Locating hole in Elevator bushing (Insert). BX 5 Max. 1.0500

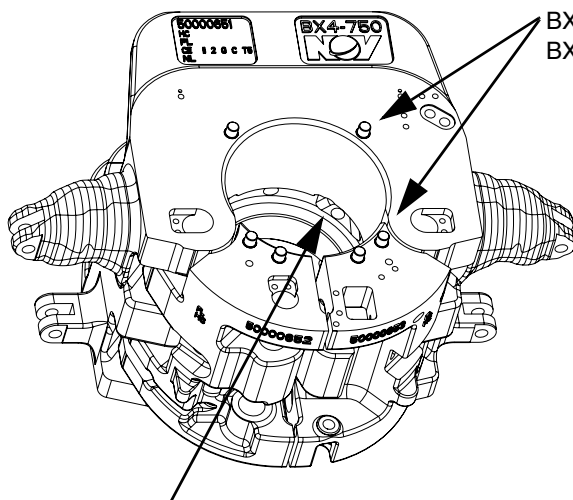
## Locating pins

### Locatings pin top

BX3: 203317

BX4: 203234

BX5: 50004034



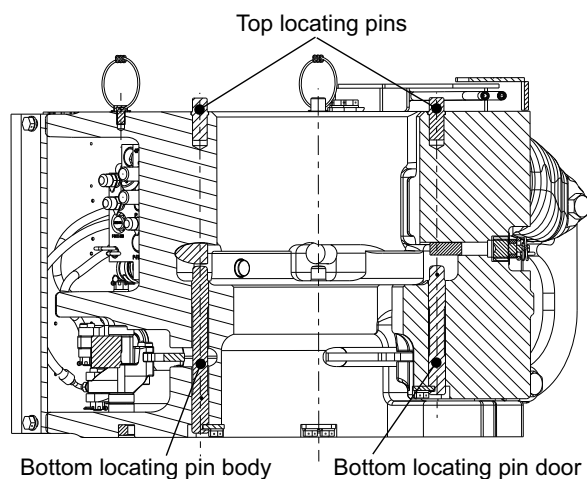
### Locating pins bottom

BX3: 203258

BX4: Body: 50000660

BX4: Door: 50000660-1

BX5: 203258



BX4 typical

## Wear data trigger shaft

### Trigger sizes (inches)

**Trigger Shaft #50004051 in trigger shaft assembly #50004051-1 in manifold**

Trigger shaft Nominal diameter new Max 0.8653"

**Trigger shaft bushing #979771-2520**

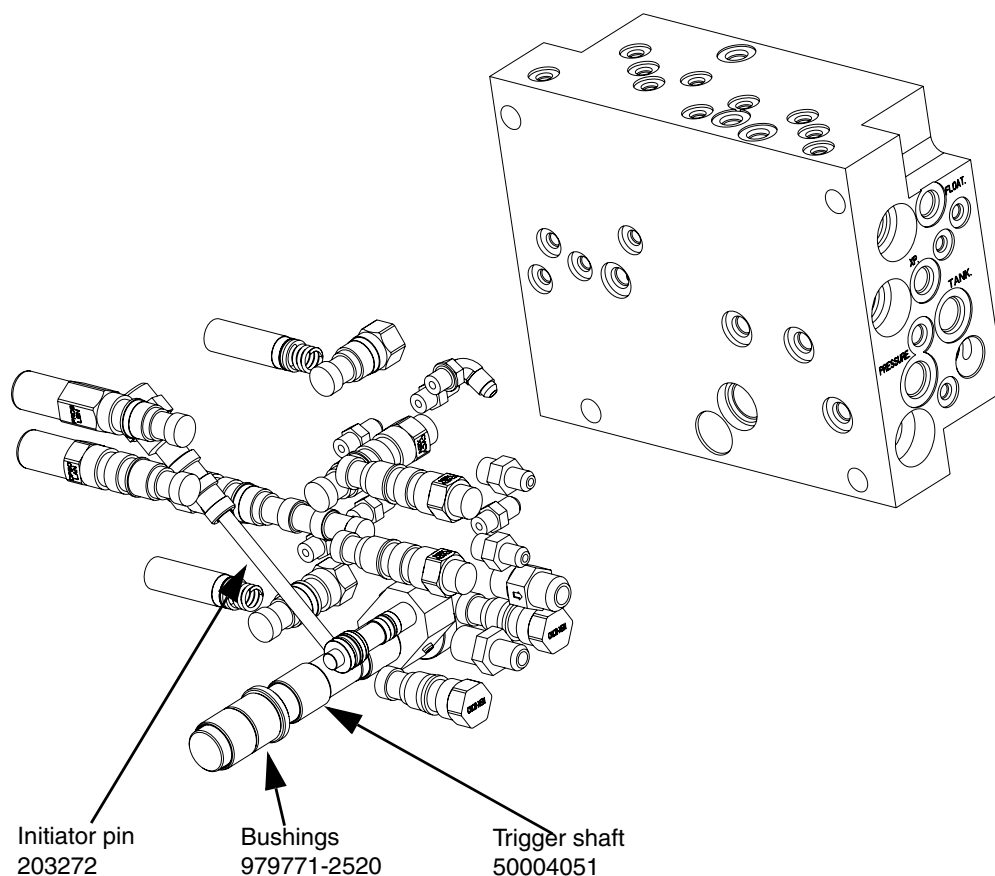
Trigger shaft bushing ID Max 0.8645" (soft surface)

Trigger shaft bushing ID worn Max 0.8661" (d1)

Trigger shaft bushing fitment bore Max 0.9851"

**Initiator pin #203272**

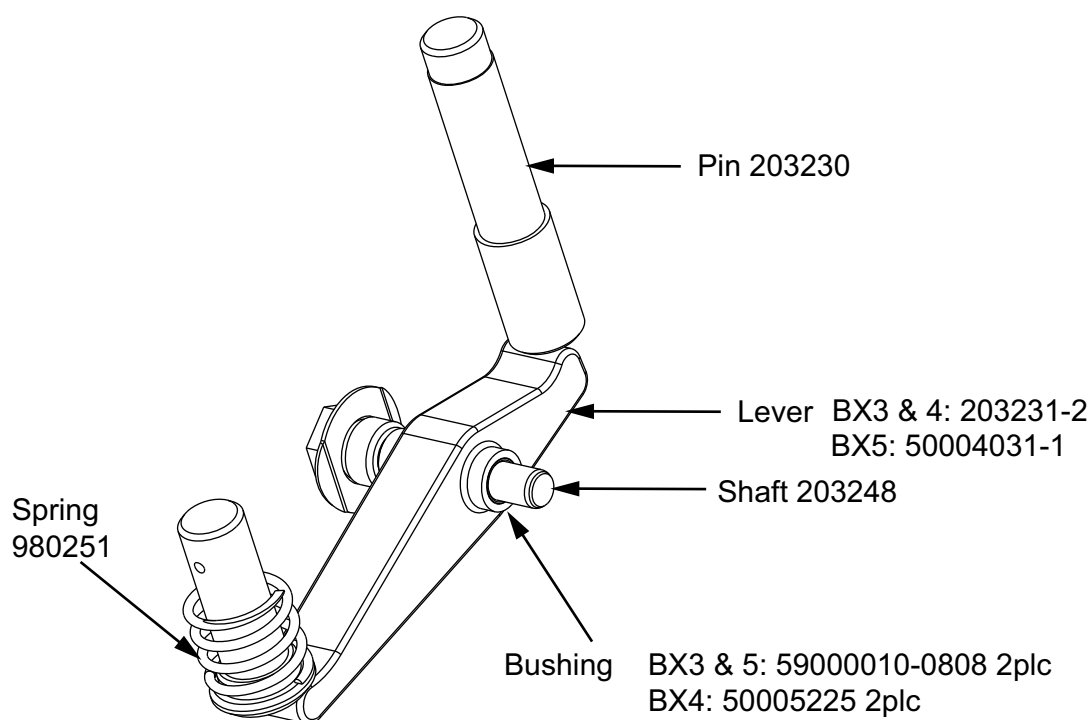
Initiator pin Diameter new Max 0.3150"



## Wear dat lock shaft

### Lock shaft bushings (inches)

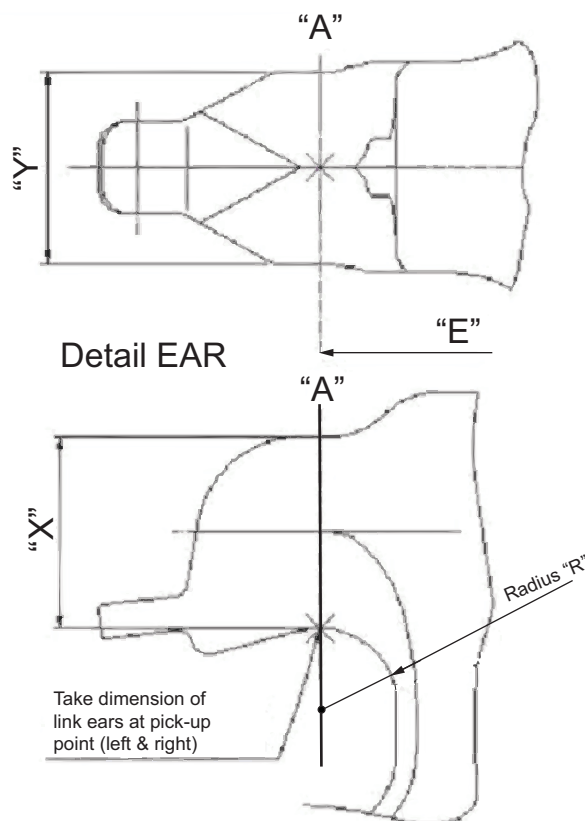
Latch lock shaft #203248 & Bushing Size (inch)
Latch Lock shaft 0.500 Nominal diameter, new Min 0.4950
Latch Lock shaft 0.500 Nominal diameter, worn Min 0.4880
Latch Lock shaft fitment bore Max 0.5050
Lock Lever bushings 0.500 ID (fitted) new Max 0.5017
Lock Lever bushings 0.500 ID worn Max 0.5035
Lock Lever bushing fitment bore Max 0.5940
Spring #980251 Length new.2.303" Min. 2.180



Repair kit latch lock:

BX3: #203231-13

BX5: #50004031-13

**Wear data link ear**

Dimension (inch)	BX3	BX4-50	BX4-75	BX5
"X" min. new	5.00	5.00	6.00	7.25
"X" min. worn	4.63	4.36	5.72	0.88
"Y" min. new	5.00	5.00	6.00	7.25
"E"	43.5	30.75	30.75	36.00
"R"	2.50	2.50	2.50	2.875



## BX3, BX4-50, BX4-75, BX5

### 4-Installation and commissioning

REFERENCE BX3, BX4-50, BX4-75, BX5	REFERENCE DESCRIPTION Hydraulic Elevators		
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		DOCUMENT NUMBER	REV
<b>50000802-MAN-001</b>			<b>B</b>





# Installation and commissioning

## General procedure

A range of control manifolds and hook up kits to control the elevator or elevator/rotator combination are available. The control manifolds also protect the elevator and rotator against overload.

## Installation



**WARNING:** Make sure that all hydraulic lines are disconnected before ANY work is performed on the elevator. When the lines are connected the elevator doors will close when the bushing / trigger mechanism is hit which can cause serious injury to personnel. It's not always sufficient to isolate the hydraulic lines by using a ball valve, since the hoses might function as an accumulator, which could generate movement of the elevator

## System requirements check

### Procedure

#### Initial checks system requirements

Check whether all tubing and hoses that connect the BX-elevators to the power unit or rig main ring have a minimum of ½" nominal diameter.	<input type="checkbox"/> OK
Check maximum system-oil temperature: Maximum 140°F (60°C).	<input type="checkbox"/> OK
Check that the maximum back-pressure on the return line does not exceed 250 psi.	<input type="checkbox"/> OK
Check availability of correct control panel & control functions	<input type="checkbox"/> OK
Check hoses on damage and free movement.	<input type="checkbox"/> OK
Check the minimum – maximum pressure: 2,000 – 2,500 psi (13,790 - 17,237 kPa) and 5 Gpm (19 l.min)	<input type="checkbox"/> OK
Check the pressure on the XP-line: When the elevator is commanded to open, the pressure should be about 200 psi (1,378 kPa) higher than in the P-line.	<input type="checkbox"/> OK

## Install instrumentation in driller's console acc. to HUK drawing.

Three different forms of instrumentation are possible:

1. Instrumentation in driller's console.
2. Certified J-box.
3. Integrated instrumentation in existing J-box.

Check the proper functioning of the control lights and switches on the control panel after electrical hooking up.



**WARNING:** Ensure the switches for operating the BX-elevator always switch back to the OFF position after being commanded. This is to prevent the elevator will be triggered to make unexpected movements after a electric or hydraulic power failure.

## Cabinets

Available are two types of Hook Up Kits, with the control manifold for BX-elevator OR the combination BX-elevator/rotator. In case of a NOV top drive a control manifold will be mounted on the top drive (no drawing added).

## Universal Rotator

Please refer to of the Universal Rotator User's Manual pn 50004130-14 for information about the Universal Rotator.

## Installing the Hook Up Kit

Drawing gives guidelines for the installation of the Hook Up Kits.

When customer has a new NOV Top Drive, the hose kit 50004140 need to be used:

### Hose kit pn50004140

NOV Part Number	Qty.	Description
50004350	1x	PRV upgrade kit BX Hook up kit
203120	1x	Hose connection from
203121	1x	Hose connection from
203122	1x	Hose connection from
203123	1x	Hose connection from
203124	1x	Hose connection
203125	1x	Hose connection



NOTE: Protect hoses against freezing when applied in circumstances below 0° C (32°F). Fit control manifold close to the hydraulic supply of the top drive on the fingerboard level.

## Commissioning

Commissioning must be carried out according the TSEL-0066 "COMMISSIONING SPECIFICATION BX-ELEVATOR & ROTATOR". This specification describes all tests and checks to be carried out by the NOV installation-engineer after rigging-up the equipment.

### Before connecting the BX

#### Before use

1.Move the Right Hand door bushing by pushing it 5 times vertically down to see whether it moves freely.	<input type="checkbox"/> OK
2.Check whether all lynch pins are correctly in place.	<input type="checkbox"/> OK
3.Apply grease to all grease points until grease is visible coming out of the bores.	
4. Put switch in "ELEVATOR CLOSE" position on control panel.	<input type="checkbox"/> OK
5. Connect the tool to the hydraulic lines (P, T and XP (and if using rotator; Float).) Install Pressure-Gauges at the gauge-connectors on the manifold.	<input type="checkbox"/> OK
6. Start Power Unit	<input type="checkbox"/> OK
7. Measure the pressure: Min 2000 psi (13,790 kPa)n at rotator and elevator QD's.	<input type="checkbox"/> OK

## After connecting the BX

### Elevator without rotator:

#### Exercise each control on the drillers console.

Put switch in "ELEVATOR OPEN" position.	<input type="checkbox"/> OK
Elevator opens (XP = 2,000 psi / 15,168 kPa) (200 psi > P)	<input type="checkbox"/> OK
Put switch in "ELEVATOR CLOSE" position (XP = 0 psi / 0 kPa)	<input type="checkbox"/> OK
Be aware of risks taken by the next step. Keep out of range of moving parts.	<input type="checkbox"/> OK
Trigger the door body bushing by pulling the bushing, standing on the manifold side of the elevator	<input type="checkbox"/> OK
Elevator closes. (When latch is closed, XP = 1000 psi / 6,895 kPa)	<input type="checkbox"/> OK
Get feedback that elevator is closed; Signal Lamp on control panel lit.	<input type="checkbox"/> OK

### Additional for elevator with rotator:

#### Exercise each control on the drillers console.

1. Open elevator.	<input type="checkbox"/> OK
2. Turn rotator to 45° angle, minimum.	<input type="checkbox"/> OK
Be aware of risks taken by the next steps. Keep out of range of moving parts.	<input type="checkbox"/> OK
3. Trigger the body bushing by pulling the bushing, standing on the manifold side of the elevator	<input type="checkbox"/> OK
4. Elevator closes.	<input type="checkbox"/> OK
5. Get feedback that the elevator is closed; Signal Lamp on control panel.	<input type="checkbox"/> OK
6. Elevator tilt will float and elevator will turn to horizontal position.	<input type="checkbox"/> OK
7. Open elevator	<input type="checkbox"/> OK
8. Turn rotator to 45° angle, minimum.	<input type="checkbox"/> OK
9. Push both rotator buttons on control panel.	<input type="checkbox"/> OK
10. Elevator tilt will float and elevator will turn into horizontal position.	<input type="checkbox"/> OK

### Final test elevator with or without rotator

1. Pick up a single lift sub.	<input type="checkbox"/> OK
2. Check locking of the latch with load in the elevator. The locking pin must prevent the latch from being opened when the elevator is under load.	<input type="checkbox"/> OK
Clear the area around the elevator. No personnel allowed on the rig floor	<input type="checkbox"/> OK
3. Shut of the hydraulic power supply (with pipe in elevator). Allow time to bleed-off pressure.	<input type="checkbox"/> OK
4. Start-up the hydraulic power supply again.	<input type="checkbox"/> OK
5. Elevator must stay closed.	<input type="checkbox"/> OK
6. The signal "elevator closed" must be visible, WITH SWITCH IN "ELEVATOR CLOSE" POSITION.	<input type="checkbox"/> OK



BX3, BX4-50, BX4-75, BX5

## 5-Operation

REFERENCE BX3, BX4-50, BX4-75, BX5	REFERENCE DESCRIPTION Hydraulic Elevators	
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DOCUMENT NUMBER <b>50000802-MAN-001</b>		REV <b>B</b>





## Operations

### Intended usage

The BX-elevator is designed to RUN IN HOLE (RIH) and to PULL OUT OF HOLE (POOH) of various drill-stem tubulars and casing in the oil and gas well drilling environment..



**WARNING:** Ensure that all hydraulic lines are disconnected before ANY work is performed on the elevator. It's not always sufficient to isolate the hydraulic lines by using a ball valve, as the hoses might function as an accumulator, which could generate movement of the elevator. The ball-valve is installed to ease connecting and disconnecting the QD with pressure still on the line and for disconnecting the elevator from the power source.

### Installing the elevator and rotator in the links.

#### Procedure

1. Lift the elevator by the lifting ears only
2. Bring the elevator as near to the well center as possible.
3. Remove both lock bolt assemblies
4. Lower both the link blocks
5. Push the links in position and close the link blocks.
6. Fit the lock bolt assemblies.
7. Do not forget the cotter pin



**NOTE:** Clean the hydraulic couplings thoroughly prior to connecting

8. Connect the hydraulic hoses to the elevator.

### Fitting the rotator to the elevator.

#### Procedure

1. Lift the elevator/rotator combination only by the lifting ears of the elevator and never by the rotator lifting eyes.



**NOTE:** Lift the rotator by its lifting eye only to prevent damage.



**NOTE:** Check if the correct size wear guide is fitted in the link clevis.



**NOTE:** For the rotators to fit on 500 Ton links, the rubber liners should be removed.

2. Bring the rotator to the drill-floor.
3. Remove the original link block from the elevator and replace it by the rotator link block BX3 & BX4-50 & BX4-75: p/n 50004100-340, for BX5 pn 50004100-50.
4. Remove lock bolt assembly

5. Hook a tugger line in the rotator lifting eye bolt
6. Bring rotator into position
7. Install the upper bolt
8. Install the lower bolt
9. Connect the elevator and rotator hoses (picture shows loose rotator actuators without
10. Check quick disconnect couplings for proper positioning links and hoses.
11. Lift elevator from the drill floor.

## Selecting the correct bushing

### Procedure

1. Verify the load to be run.
2. Select the correct bushing segment (load rating stamped in the bushing), e.g. 203213Y201 has a load rating of 500 sTons / 454mTons)
3. Take into account dynamic loads applied to the bushing due to e.g. movement of the ship.
4. Install the bushing segments

## Installing bushings in elevator

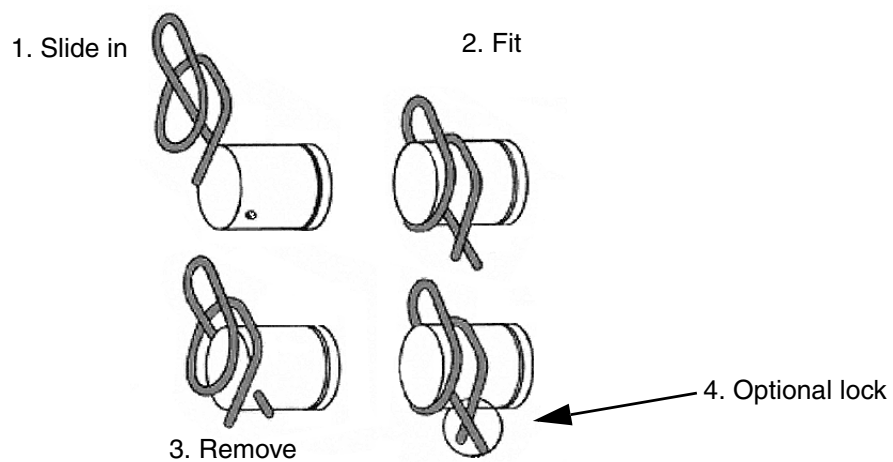
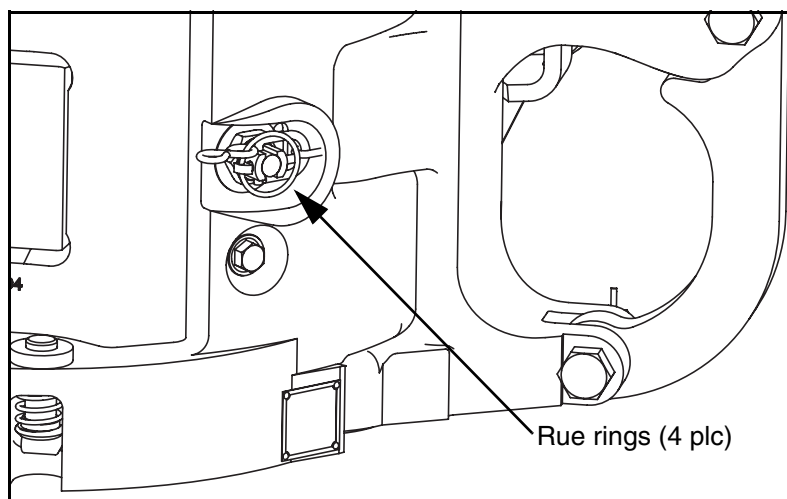
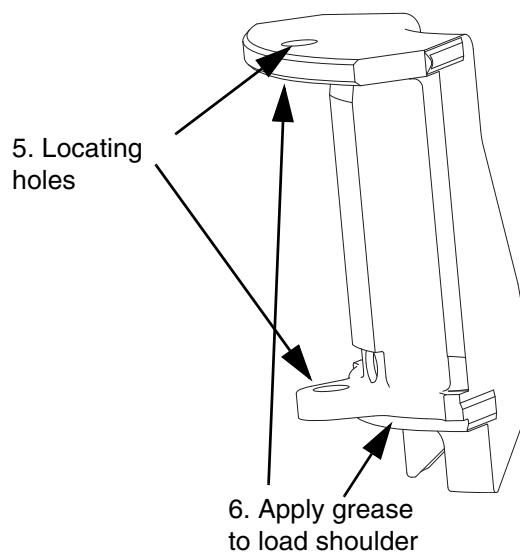
### Procedure

1. Open the doors.
2. Make sure that all hydraulic lines are disconnected before ANY work is performed on the elevator. Disconnect the lines as follows:
  - a. Give command-to-close and close elevator
  - b. Switch off the hydraulic power supply.
  - c. Close the ball valve in P line and disconnect the P-line.
  - d. Remove the XP-line



NOTE: Last (!) remove the tank line to avoid pressure build up in elevator.

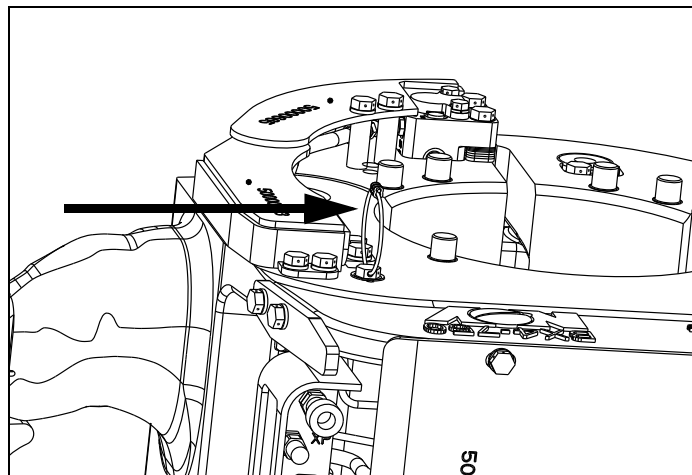
- e. It's not always sufficient to isolate the hydraulic lines by using a ball valve, since the hoses might function as an accumulator, which could generate movement of the elevator.
3. Apply grease to the back of the bushings, the locating-holes and load-shoulder.
4. Locating holes
5. Load-shoulder
6. Remove bushing-lock Rue rings (4 x).



7. Pick up a door bushing segment from the bushing support frame and place it horizontally in to the elevator.



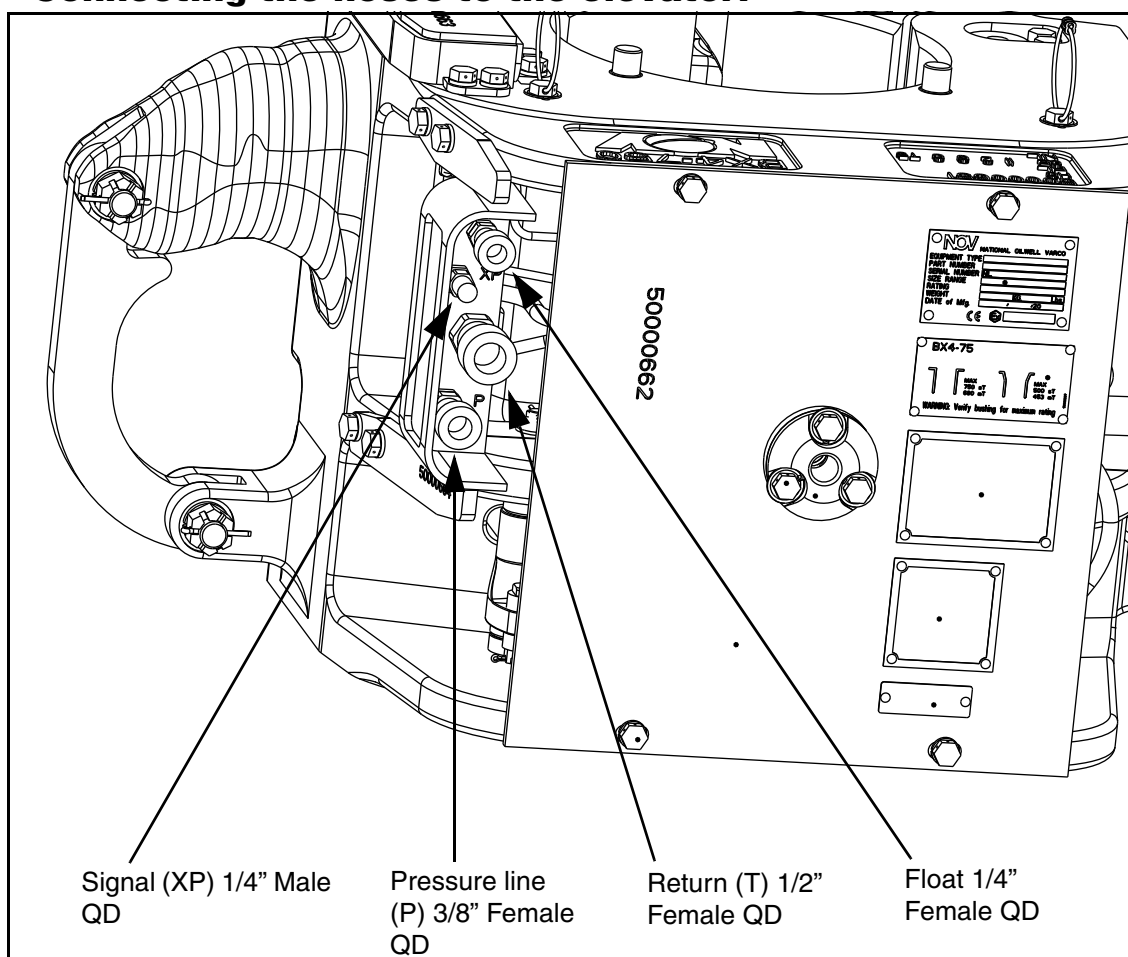
8. The bushing spring lock is pushed away when the segment is pushed into position
9. Lock the bushings with the bushing-lock rue-rings after assembly.
10. Repeat the above operation for all the bushing segments.



11. Attach the safety cables to the bushing segments (4x).

**Bushing storage frame.**

Use the storage frame to keep the bushing set complete and for safe transport.

**Connecting the hoses to the elevator.**

## Operations



**WARNING:** Never exceed the load rating of the elevator, bushings and pipe at any given time in any situation.



**WARNING:** The Driller should be checking the latch indication is on and off every time the elevator is latched and unlatched. The frequency of checking for proper functioning of the latch should be at least daily and at the beginning of every trip.

### Procedure

1. Check that the elevator, pipe/lifting tool, links and link adapter are all properly loaded and aligned to prevent unequal loading of any of these parts. Especially in case of increasing loads this may become critical, when the load is distributed in an uneven way, the stress pattern in the elevator may change. This might affect the load rating of the elevator.
2. Ensure the latch feedback indication is on and off everytime the driller latches or unlatches the elevator. This test should be carried out at least daily and at the beginning of every trip.
3. Never attempt to hoist a pipe without having received a positive signal “elevator closed”.
4. Never give the command “open elevator” while there is still load suspended in the elevator.
5. Never give the command “open slips” while there is still load suspended in the slips.
6. Use preferably a system, interlocking the BX-elevator with the Slips in the rotary in order to prevent the slips to open when the elevator is open and vice versa.
7. Releasing a load from the elevator into the Slips.
  - a. Ensure the slips in the rotary are set. Verify the presence of “Slips Set” signal
  - b. Lower the elevator. Observe hook load decrease and ensure load is transferred to slips completely.
  - c. Slightly lower hook (2 inch max) in order to release latch lock pin from elevator
  - d. Command elevator to open.
8. Picking up a load with the elevator.
  - a. Ensure elevator is commanded “armed to close”.
  - b. Engage pipe with elevator.
  - c. Elevator closes automatically.
  - d. Observe indication “elevator closed”.
  - e. Pick up weight of pipe. Observe hook load to ensure this happens.
9. Now open slips and handle the pipe.
10. The sum of the static and dynamic load in the elevator shall never exceed the lowest value of:
  - the load rating of the elevator (verify load rating plate of elevator)
  - the load rating of the bushing (verify load rating stamped in bushing)
11. Verify pipe-load shoulder area for maximum contact stresses (verify according to examples in chapter “SPECIFICATION, Load ratings”).
12. Ensure the heave-compensating system, if applicable, is in good working order.
13. Ensure all linking parts (links, block, top drive etc) are equally capable of holding the load.

## BX3, BX4-50, BX4-75, BX5

### 6-Assembly

REFERENCE BX3, BX4-50, BX4-75, BX5	REFERENCE DESCRIPTION Hydraulic Elevators	
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## Assembly and dis-assembly

### Elevator Disassembly



NOTE: Before the elevator and / or rotator can be disassembled make sure that: Doors are open, elevator is placed on a steady underground, lifting equipment is available for handling heavy parts.



**WARNING:** Ensure that all hydraulic lines are disconnected before ANY work is performed on the elevator. It's not always sufficient to isolate the hydraulic lines by using a ball valve, as the hoses might function as an accumulator, which could generate movement of the elevator. The ball-valve is installed to ease connecting and disconnecting the QD with pressure still on the line and for disconnecting the elevator from the power source.

Prior to disassembly, clean the elevator thoroughly with a steam-cleaner in order to prevent the disassembled parts from getting contaminated with dirt, mud etc.

### Removing manifold block from elevator

#### Procedure

1. Disconnect the hydraulic lines .
2. Plug-off hoses, cylinders and manifold ports.
3. Remove trigger end-cap and springs.
4. Remove the bolts of the manifold block
5. Remove the manifold block
6. Clean manifold prior to further disassembly.

### Disassembly hydraulic manifold block.



NOTE: Ensure that the work area is clean and dust free. Clean the manifold thoroughly before disassembly.

#### Procedure

- 1) Bleed off all hydraulic fluid.
- 2) Remove the cartridges, plugs and socket and nipples.
- 3) Remove the cotter pins, nuts and washers of the retracting mechanism.
- 4) Gently remove the retracting plungers on the backside of the manifold block.
- 5) Remove filter plugs, filters and filter springs



NOTE: Be aware that the spring will force the filter out of its cavity.

## Removal cylinder package

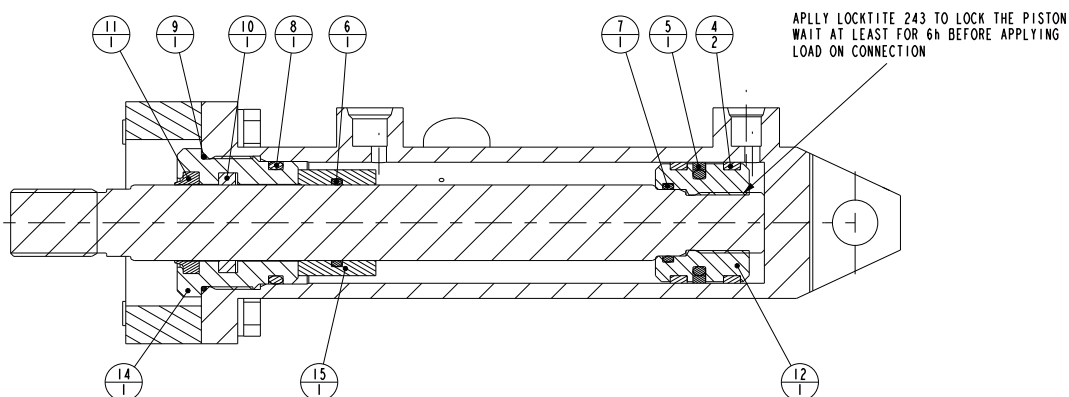
### Procedure

1. Remove cotter pins
2. Unscrew nuts
3. Remove screws, washers and bolts (3x)
4. Remove the cylinder package

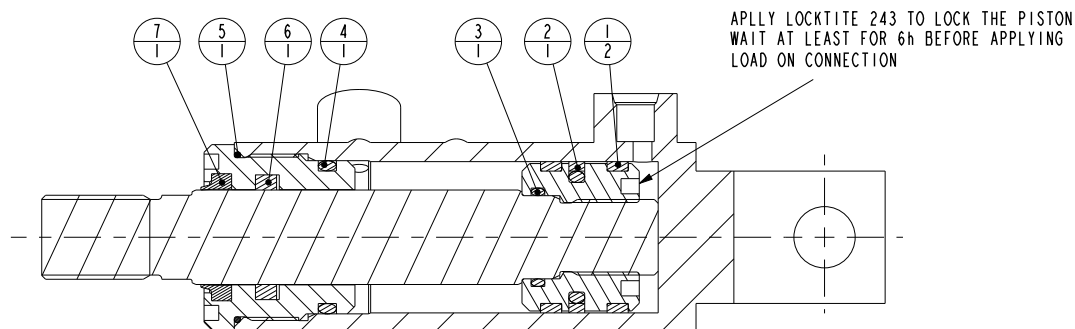
## Disassembly cylinders

### Procedure

1. Remove bolts and lockwire.
2. Remove washer and rod end.
3. Use a plastic mallet to remove the cylinder top. Remove piston and sleeve.
4. Seals should always be inspected and -when damaged- replaced before assembly of the cylinder
5. Piston: Comprises a seal-ring with "O"ring and 2 Glyd-rings and a wear ring in the inner bore.
6. Cylinder top: Comprises a dust wiper, a O-ring and a a rod-seal. The door cylinder contains an additional ring (pos 15) with O-ring (pos 8).



Door cylinder



Latch cylinder

## Exchanging seals

### Procedure

1. The O-ring seal can be replaced by hand.
2. The Glyd-rings are flexible and can be exchanged by carefully bending.



**CAUTION: DO NOT OVER STRETCH the seals. Just slip it over the piston after lubricating the seal-ring with fresh hydraulic fluid.**

## Disassembly latch-doors-lever package

### Procedure

1. Remove the back plate of the elevator
2. Remove the hinge-pin lock bars (3x)
3. Remove the bracket pins from the brackets on the rear side (3x).
4. Remove the left and right door hinge pins.
5. Pull the left door with levers and latch out of the body
6. Pull the right door with the levers out of the body.

## Disassembly latch

### Procedure

1. Remove the latch hinge pin
2. Remove the rings on top of the latch (2 plc)
3. Remove the latch with the lever
4. Remove the bolt from the latch.
5. Remove the lever-disc package

## Disassembly control brackets

### Procedure

1. Remove the lock rings, plugs and bracket pins from underneath the elevator
2. Remove the hinge pins from the brackets
3. Remove the brackets

## Disassembly bushing lock assembly

### Procedure

1. Remove the rue rings pin
2. Loosen the lock washer.
3. Turn the nut counterclockwise until it is loose.
4. TURN the assembly out of the hole.

## Disassembly latch lock assembly

### Procedure

1. Remove the lock ring, plug and pin.
2. Pull-out the latch-lock pivot-pin
3. Remove the latch-lock lever.
4. Remove the push-pin
5. Remove the lock-pin and spring

## Replacement lever wear bushings

### Procedure

1. Remove the lever-wear bushings with a hammer and proper sized drift.
2. Insert new wear bushings with a correct sized bolt or rod
3. carefully press-fit the wear bushing into place

## Replacement of hinge-pin wear bushings.



### Procedure

1. Place the bushings and a correct sized drift over the bushing journal
2. Carefully drive the bushing into place

## Elevator assembly

### General note



NOTE: Use the proper torque for assembly parts. Cartridges could be easily damaged by applying too much torque. Apply 30-36 Ft Lbs (40 - 49 Nm) on cartridges MAX.

### Procedure

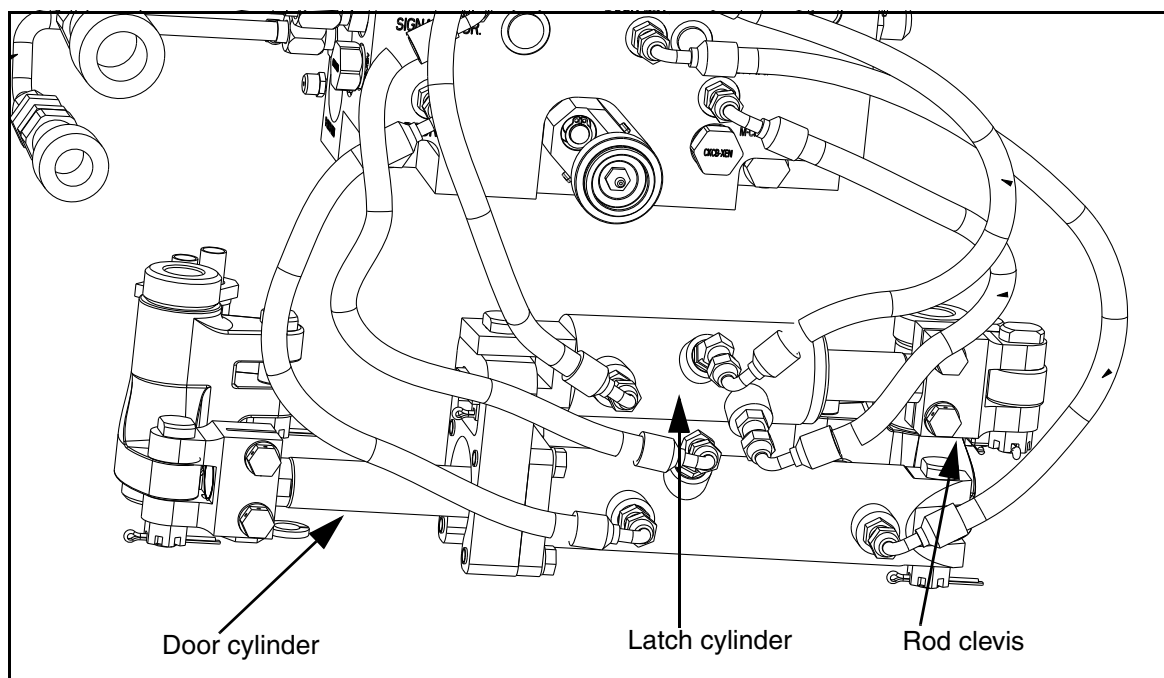
1. Assembly can be done by doing disassembly in reverse sequence.
2. Lock all parts as indicated on the assembly drawings.
3. Check the elevator according the Test Procedure (see TSEL-0048).

## Cylinder adjustment

### Procedure

After re-assembly of the elevator it might be necessary to adjust the cylinder package. When cylinders are found to be out of adjustment, follow the procedures as described below. Check first whether bolts and lockwire are still in good condition. When necessary replace bolts before doing the re-adjustment. Lockwire afterwards.

1. Hook-up the elevator to a Hydraulic Power-Unit using Varco BJ test kit #202539, or to its HUK. Connect pressure gauges to the appropriate gauge ports for 'P' and 'XP' on the elevator manifold
2. Open the doors and close again, placing a 1.1/2" thick steel bar between the doors, preventing the doors from fully closing. Connect ('Tee-off") a pressure gauge to the barrel-port of the door cylinder.
3. NO signal (equal to 'P' pressure) may occur on the barrel-port gauge. Latch may NOT start to close.
4. When a signal (equal to 'P' pressure) out of the barrel-port is present (latch will start to close) then turn the rod-clevis OUT. **(Elongate the Cylinder)**
5. Then remove the bolt or bar.
6. Power the doors to close fully.
7. When the doors are fully closed, (Tip of the doors MUST close against each other, NO gap allowed.) , a signal (equal to 'P' pressure) out of the barrel-port MUST occur. (Latch will start to close)
8. When NO signal occurs, turn the rod-end IN. (Shorten the Door-Cylinder)
9. With the elevator open, check whether doors are making contact with their Hard Stops (see picture on next page). If not, turn rod-end clevis IN. **(Shorten the Door cylinder.)**
10. REPEAT this procedure until the proper barrel-port signals occur at the correct moment.



## Latch Cylinder Adjustment.

### Procedure

1. After Door cylinder adjustment is found to be OK, the latch cylinder must be adjusted according the following procedure.
2. Power the elevator to close and latch
3. Check whether the closed latch is in contact with it's hard stop on the left-hand door. Stop is located on the inside (back) of the bottom latch strap. You may need to use marking-paint (Blue-Dye) to get a proper indication, as this hard stop is difficult to reach with a feeler gauge. When latch does not contact hard-stop IN, turn rod-end clevis OUT. (lengthen Cylinder)
4. In the condition described in item 2, the elevator closed signal on port 'XP' MUST be present. (1,000 Psi / 6,895 KPa) When NO "elevator-closed-signal" (1,000 Psi / 6,895 KPa on "XP") Is present, turn rod-end clevis IN.(Shorten Cylinder)
5. Open the elevator and check whether latch is in contact with its Hard-stop for the open position. If not turn the rod-end clevis IN. (Shorten Cylinder)
6. REPEAT these steps until OK.
7. As a final check, close the elevator with the mechanical latch lock pin in its UP position. In this condition the latch will be prevented from closing fully by the Lock-pin. NO elevator closed signal (1,000 Psi / 6,895 KPa) on line 'XP' may occur. .
8. When BOTH the door-cylinder and latch-cylinder are adjusted correctly, lock both rod ends with their lock nut and SS lock-tabs. Do not to use the same folded part of the lock-tab twice. Replace lock-tabs with cracks or other damage preventing proper locking.
9. Finally check the elevator with the test procedure (TSEL-0048) of this user manual.



**WARNING:** Ensure that all hydraulic lines are disconnected before ANY work is performed on the elevator.

## BX3, BX4-50, BX4-75, BX5

### 7-Trouble shooting

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## Trouble shooting



NOTE: When no solutions are available below, please contact an authorized NOV repair facility for further information.



**WARNING: Ensure all hydraulic lines are disconnected before any work is performed to the elevator**



NOTE: Use drawings 50004050-1 "manifold assy" & 50004050-3 "hydraulic schematic".

## Overview possible problems

Prior to trouble shooting a problematic elevator, check the following:

<b>P</b>	Check the <b>P</b> ressure to the hook up manifold is at least 2,000 psi (600 kPa).
<b>C</b>	Check that all hoses and connectors are properly <b>C</b> onected and that QD's are not blocked.
<b>P</b>	Check that electrical <b>P</b> ower is available
<b>R</b>	Check that the <b>R</b> eturn line pressure does not exceed 250 psi (1,725 kPa)
<b>O</b>	Ckeck for <b>O</b> il leakage
<b>L</b>	Check <b>L</b> ubrication status of the BX

### 1. Open elevator does not close while pipe enters the elevator (see drawing 50004050-3).

P = system pressure

T = close to 0 psi

XP = close to 0 psi (Control Switch in "Close" position.)

1. Does pipe hit the trigger / body bushings properly ?

- ☐ Check elevator rotation angle, adjust if necessary.
- ☐ Check if links are tilted sufficiently for pipe to engage body bushings, adjust if necessary.
- ☐ Check if the body bushings are properly installed and can move freely to hit trigger

2. Is the trigger valve line marked with # 5 pressurized when pipe hits body bushings?

- ☐ Check functioning of valve L.
- ☐ Cartridge pn979997

3. Does gauge on "T" gauge connector read out extremely high pressure (e.g.400 psi / 2,760kPa or higher) ?

- ☐ Tank line blocked, check QD's and replace if necessary.

4. Is the pressure on the line #6 close to system pressure ?

- ❑ Component E (108087-1OAN) probably blocks flow back to tank, check cartridge for dirt or malfunctioning, replace if necessary .

5. Is the pressure on the line #7 close to system pressure ?

- ❑ Component F (pn 979880-8) not shifted to the right despite of pressure on #5 and NO pressure on #6: Cartridge stuck, check functions and mounting torque, replace if necessary.

6. Is the pressure on the line #9 close to 0 psi ?

- ❑ Component H (pn 93547-1B75N) probably stuck in closed position, check functions and replace if necessary

## **2. Elevator will close but not latch. (NO CLOSED SIGNAL)**

P = system pressure (min 2,000 psi / 13.789kPa)

T = close to 0 psi

XP = close to 0 psi

1. Do both doors close completely to hard stops (welded on inside contact area between doors and body lugs)?

- ❑ Check if something is stuck between doors. Remove object
- ❑ Check if cylinders have sufficient stroke to close doors completely, adjust if necessary.. Lock cylinder rods with bolts and lockwire after adjustment.

2. Is the pressure on line #11 ("latch-out") close to system pressure ?

- ❑ Check cylinder signal in line #10 to be close to system pressure, adjust cylinder stroke if signals are not fully present.
- ❑ Component K (pn 107029-175N) probably stuck, replace if necessary.

3. Is the pressure on the line marked with #14 close to 0 psi ?

- ❑ If pressure reads high component M (pn 93547-1B75N) probably stuck, check and replace if necessary.

4. Does the latch cylinder mal-function , is it stuck ?

- ❑ Check Cylinder, Disassemble Replace cylinder if necessary.

5. If elevator is closed and latched & elevator "Floats", is a XP signal of 1000 psi / 6,894 kPa present?

- ❑ Check Pressure in line 12 to be close to system pressure, adjust cylinder stroke if signal not fully present. No signal at all is faulty cylinder, replace cylinder if necessary.

6. If elevator is closed and latched. & indicator- light at control Panel is ON?

- ❑ Check XP Pressure 1000 psi / 6,894 kPa at the HUK control manifold. Check pressure switch on HUK Elevator control manifold for pressure setting being too high. Check setting of bleed-off valve on HUK manifold.

### **3. Closed elevator will not open while commanded to open.**

P = system pressure.

T = close to 0 psi.

$XP = P + 200 \text{ psi (1378 kPa) = Max 2,500 psi (17236 kPa)}$

1. Is tool joint/coupling set on the spring-loaded door bushing and so activating the mechanical elevator latch lock?

- ❑ Lower the elevator until the spring loaded door bushing releases the latch lock and allows the latch to open.

2. Is the moveable door-bushing stuck? Or is the latch locking mechanism stuck (broken spring)?

- ❑ Check latch lock mechanism for proper function.
- ❑ Take out moveable bushing and clean and grease back of bushing, reassemble

3. Is XP line pressure equal or higher than the P-line pressure, check this at the elevator manifold?

- ❑ Check 'XP' QD for correct function. Check XP-line filter for correct function. Adjust PRV "PC1" at the HUK control manifold until XP pressure is 200 psi > P line pressure, if necessary.

4. Is the pressure on the line marked with #6 equal to XP line pressure ?

- ❑ Check pressure setting of component E (pn 108087-10AN) to be 1,500 psi / 10,340 kPa, inspect it for dirt/malfunction and replace if necessary.

5. Is the pressure on the line marked with #8 equal to P line pressure ?

- ❑ Check component F (pn 979880-8), inspect it for dirt/malfunction and replace if necessary.

6. Is the pressure on the line marked with #14 equal to P line pressure ?

- ❑ Check component M (pn 93547-1B75N), inspect it for dirt/malfunction and replace if necessary.

7. Is the pressure on the line marked with #11 close to 0 psi (Tank pressure)?

- ☐ Check component K (pn 107029-175N), probably stuck in closed position, check functions and replace if necessary

#### **4. Elevator is hesitating to open.**

P = System pressure

T = close to 0 psi

XP = P + 200 psi (1378 kPa)

1. Is component E (pn 108087-10AN) set at 1,500 psi / 10,340 kPa?

- ☐ Set component E (DPBO-LAN) at 1,500 psi / 10,340 kPa.

2. Is system pressure 2,000 psi / 13,789 kPa min & 2,500 psi / 17,236 kPa max. at the elevator?

- ☐ Adjust system pressure to 2,000 psi / 13,789 kPa at the elevator.

#### **5. The elevator opening / closing operation is slow.**

1. Is the flow (partly) blocked in one of the QD's (check for damage) ?

Replace damaged QD

2. Is one of the filters A and/or B clogged with dirt

- ☐ Clean filters with a solvent.
- ☐ Replace filters if necessary.

3. Is one of the restrictors (pn 109105-08) build in in nipple 109106-4S-S in lines #7 and #11 (partly) blocked with dirt ?

- ☐ Remove dirt.

#### **6. Elevator closes immediately.**

**Elevator closes immediately when Control Switch is put into “armed to close” without (pipe) operating the trigger.**

1. Is the trigger stuck, activating valve L (PD-10-40-NS-110) continuously?

- ☐ Check proper functioning of the trigger mechanism. Check body bushing for free movement on their locating pins.
- ☐ Check pressure in line #5, should read out to 0 psi.(Tank pressure) when trigger is de-activated.

2. Is line 7 pressurized immediately after putting the Control Switch into “armed to close” position?

- ❑ Check proper functioning of valve F (DCCC-XXN) Valve probably stuck in controlled position, replace if necessary.

## **7. Rotated elevator will not close/latch.**

**Rotated elevator will not close/latch onto pipe being presented under an angle.**

Does rotator stop at an angle different from the pipe angle ?

- ❑ Adjust the stop pin's of the rotator to get a proper alignment of the elevator and the pipe
- ❑ Check whether a correct bushing size is fitted.
- ❑ Go thru item 1 of this paragraph

### **Procedure**

1. Before trouble shooting connect 4 pressure gauges to the standard gauge connectors that are mounted on the BX manifold. The connectors can be found on dwg #50004050-3 + 500004050-1.
  - ❑ “T”: Tank line, right-hand side of the manifold, middle left connector.
  - ❑ “P”: Pressure line, right-hand side of manifold, bottom right connector.
  - ❑ “XP” Signal pressure, right-hand side of the manifold, top left connector.
  - ❑ “Float” : Front side of manifold, upper right connector.
2. Check that the hydraulic power supply is providing 2,000 psi / 13,790 kPa minimum at the elevator. The hydraulic power-unit pressure may need to be set higher at the power unit to ensure that 2,000 psi / 13,790 kPa (2,500psi / 17,236 kPa MAX) is available at the BX-elevator.
3. Check hose-size to be ½” nominal diameter and flow being 5 gpm /19 l/min
4. Check Quick disconnects for dirt or malfunctioning, replace if necessary
5. Check that XP-line pressure (when elevator is commanded to open, is 200 psi > P-line pressure.
6. Check the pressure in the return (Tank) line. Pressure may not exceed 250 psi / 1,724 kPa.

## Test kit BX-elevator + power slip p/n 202539

This test kit can be used for trouble shooting and functional testing of the BX elevators and rotators and PS 21/30 power slip. Its contents will allow in line pressure measurements to determine the cause of a problem.

NOTE: Advised is to do the trouble shooting in the shop instead of the drill floor because of the possible danger of falling parts down the hole

The special hose assembly for the BX elevator will allow testing in the shop and only requires a “pressure” and “return” line from the power unit. The way the kit is designed a “Xp” signal can be generated by operating two ball valves.

### Contents:

- ❑ parts for pressure measurements
- ❑ hose assembly for testing BX elevator
- ❑ hose assembly for testing PS 21/30
- ❑ storage boxes (2x) for small parts
- ❑ storage box with complete kit in it that can be hand carried
- ❑ this document
- ❑ DRAWING and parts list of all parts in kit
- ❑ Caps, plugs, fittings, hydraulic sealant

On the DRAWING is described how the hose assembly must be hooked up to the power unit. How the elevator can be controlled is also described.

Fig.1 shows the hose assembly for testing the BX elevator and rotator. Refer to drawing 202539 sh.1 (included in kit) that shows the assembly in a schematic. On the left side you see 3 lines that must be connected to the elevator (pressure, return and signal Xp). On the right side there are 2 lines that must be connected to the power unit (pressure and return). To the top and to the right there is a PRV (pressure regulating valve) mounted. With this valve the pressure to the elevator can be set to any desired value allowed by the HPU press .

Fig 1

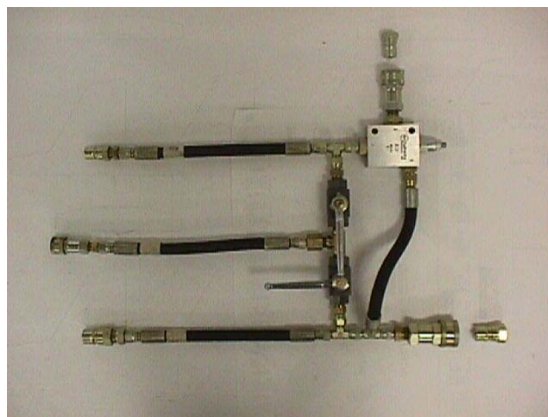


Fig 2



Fig.2 shows most of the parts that are in the kit. Ref. Drawing 202539. It has spare pressure gauges and hoses. The plate that contains 3 gauges can be used for checking the 3 pressures on the elevator that are most important (pressure, return and XP signal). The hoses need to be connected to the gauges and to the elevator standard connectors on the elevator manifold. On the assembly drawing of the manifold the location of these connectors can be found. They can also be recognized by the little cap and chain that covers the end of the connector. The plate has an extra side plate on the back which makes it easy to clamp it onto the top flange at the back of the elevator.

Fig 3



Fig.3 shows the box that contains the complete kit. The box is made of strong shock resistant material and can be locked. Weight of total kit with box is 31 lbs (14 kg). The box contains 2 smaller boxes that are used for storage of smaller hydraulic components.

Fig 4



Fig.4 shows the hose assembly that can be used for checking sagging of the slips on the power slips PS 21/30. Refer to drawing 202539 sh.2 (included in kit) that shows the hose assembly in a schematic. On the drawing itself there is a description of the testing procedure.

Fig 5



Fig.5 shows how to connect and disconnect the 2 hoses when testing has begun.

BX3, BX4-50, BX4-75, BX5

## 8-Appendixes

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## Appendixes

### Risk assessment acc. to EN14121-1

#### Conclusion Risk Assessment

In general, crew must:

- ❑ Wear personal safety protection like safety glasses, hard hat etc
- ❑ Follow instructions as stated in the manual
- ❑ Have knowledge of rig procedures
- ❑ Must have been instructed for safe use of the BX
- ❑ Always use secondary retention as established and implemented by NOV.
- ❑ Rely on signals “elevator closed and latched” on drillers console.
- ❑ Do not rely on visual signals “elevator closed and latched” from deckhand etc.

#### Applicable standards:

EN-982: Hydraulic Safety requirements for fluid power systems and their components

EN-1127-1: Explosion prevention and protection

EN-14121-1: Risk assessment

EN-13463-1 & 5: Non electrical equipment for potentially explosive atmospheres

EN-ISO 12100-1 Safety of machinery

ATEX-directive 94/9/EC

Machinery Directive: 98/37/EC & 2006/42/EC

API ISO 13535:2000 8C

### Transport, handling & preservation.

See TSEL-0194

**Torque values (US) for bolts grade 8**

		Bolts Lubricated with Light Machine Oil			Bolts lubricated with Anti-seize compound		
Dia.	Threads per inch	Min. Torque (ft lb)	Max. Torque (ft lb)	Clamp force (lb)	Min. Torque (ft lb)	Max. Torque (ft lb)	Clamp force (lb)
Coarse Thread Series, UNC							
1/4"	20	11.4	12.6	2860	8.6	9.5	2860
5/16"	18	24	26	3720	17.8	19.7	3720
3/8"	16	43	47	7000	32	35	7000
7/16"	14	67	74	9550	50	55	9550
1/2"	13	105	116	12750	78	87	12750
9/16"	12	143	158	16100	107	118	16100
5/8"	11	209	231	20350	157	173	20350
3/4"	10	361	399	30100	271	299	30100
7/8"	9	570	630	41600	428	473	41600
1"	8	855	945	54500	641	709	54400
1 1/8"	7	1216	1344	68700	912	1008	68700
1 1/4"	7	1729	1911	87200	1297	1433	87200
1 3/8"	6	2261	2499	104000	1696	1874	104000
1 1/2"	6	3002	3318	126500	2252	2489	126500

Tensile Strength = 150,000 psi to 1" dia. Proof Strength = 120,000 psi

		Bolts Lubricated with Light Machine Oil			Bolts lubricated with Anti-seize compound		
Dia.	Threads per inch	Min. Torque (ft lb)	Max. Torque (ft lb)	Clamp force (lb)	Min. Torque (ft lb)	Max. Torque (ft lb)	Clamp force (lb)
Fine Thread Series, UNF							
1/4"	28	13.3	14.7	3280	10	11	3280
5/16"	24	24	26	5220	17.8	19.7	5220
3/8"	24	48	53	7900	36	39	7900
7/16"	20	76	84	10700	57	63	10700
1/2"	20	114	126	14400	86	95	14400
9/16"	18	162	179	18250	121	134	18250
5/8"	18	228	252	23000	171	189	23000
3/4"	16	399	441	33600	299	331	33600
7/8"	14	627	693	45800	470	520	45800
1"	14	950	1050	59700	713	788	59700
1 1/8"	12	1368	1512	77000	1026	1134	77000
1 1/4"	12	1900	2100	96600	1425	1565	96600
1 3/8"	12	2584	2856	118400	1938	2142	118400
1 1/2"	12	3382	3738	142200	2537	2804	142200

Tensile Strength = 150,000 psi to 1" dia. Proof Strength = 120,000 psi

**Torque values (metric) for bolts grade 8**

		Bolts Lubricated with Light Machine Oil			Bolts lubricated with Anti-seize compound		
Dia meter	Threads per inch	Min. Torque (Nm)	Max. Torque (Nm)	Clamp force (N)	Min. Torque (Nm)	Max. Torque (Nm)	Clamp force (N)
Coarse Thread Series, UNC							
1/4"	20	15.5	17.1	12870	11.7	12.9	12870
5/16"	18	32.6	35.4	16740	24.2	26.8	16740
3/8"	16	58.5	64	32500	43.5	47.6	31500
7/16"	14	91.1	100.6	42980	68	92.5	42980
1/2"	13	143	158	57380	106	118	57380
9/16"	12	195	215	72450	145.5	160	72450
5/8"	11	284	314	91580	213.5	235	91580
3/4"	10	491	542	135450	368	407	135450
7/8"	9	775	857	187200	582	643	187200
1"	8	1163	1285	245250	872	965	245250
1 1/8"	7	1654	1828	309150	1240	1370	309150
1 1/4"	7	2351	2598	382400	1764	1949	392400
1 3/8"	6	3075	3398	468000	2306	2549	468000
1 1/2"	6	4082	4512	569250	3062	3385	569250

		Bolts Lubricated with Light Machine Oil			Bolts lubricated with Anti-seize compound		
Dia meter	Threads per inch	Min. Torque (Nm)	Max. Torque (Nm)	Clamp force (N)	Min. Torque (Nm)	Max. Torque (Nm)	Clamp force (N)
Fine Thread Series, UNF							
1/4"	28	18.1	20	14760	13.6	15	14760
5/16"	24	32.6	35	23490	24.2	26.8	23490
3/8"	24	65.3	72	35550	49	53	35550
7/16"	20	103	114	48150	77.5	86	48150
1/2"	20	155	171	64800	117	129	64800
9/16"	18	220	239	82130	165	182	82130
5/8"	18	310	343	103500	232	257	103500
3/4"	16	542	600	151200	406	450	151200
7/8"	14	853	943	206100	639	707	206100
1"	14	1292	1428	268650	970	1071	268650
1 1/8"	12	1860	2056	346500	1396	1542	346500
1 1/4"	12	2584	2856	434700	1938	2128	434700
1 3/8"	12	3514	3884	532800	2635	2913	532800
1 1/2"	12	4599	5083	639900	3450	3813	639900

Tensile Strength = 1,034,214KPa to 1" dia. Proof Strength = 827,370 kPa

## **Frequently asked questions**

### **What is the weight of an BX-elevator?**

This depends on the type of bushing, the heaviest bushing bout 70 kg (155 Lbs),.

Guideline:

BX 4-50 Elevator without bushings	2,039 lbs / 924 kg
BX 4-75 Elevator without bushings	2,047 lbs / 928 kg
BX 4-50 Elevator with bushings	Up to 2,239 lbs / 1,015 kg
BX 4-75 Elevator with bushings	Up to 2,247 lbs / 1,019 kg

A rotator weights appr. 150 kg (330 Lbs).

### **How does a BX-elevator function?**

The basic idea is to give the elevator a possibility to close ONLY when the trigger is hit by a pipe. This will start the closing cycle. When the latch is properly closed the elevator will give a high pressure signal generated by the supply line, through the signal line. This will generate the signal "elevator closed and latched". When the elevator starts lifting the spring powered bushing will be pushed down and will power the mechanical latch lock. As long as weight is in the elevator, the elevator CANNOT be opened.

### **Is it safe working on an elevator without disconnecting the hoses?**

The hoses could function as an accumulator and supply enough energy to start the closing cycle when the trigger is hit (e.g. by the man working on the elevator). This could result in injury of death. Hence it is required to disconnect hoses before starting any work on the BX.

### **What should I do when the elevator doesn't functions well?**

Start with conducting the possible causes as outlined in the chapter trouble shooting. When no solutions at hand PLEASE contact an authorized NOV repair facility. They will help you with finding a solution. When you start adjusting the elevator without exactly knowing what you are doing, you might increase the problem, even when the basic problem is a very simple one.

### **Why can't I use parts from NOV origin ?**

All NOV parts are tested and are traceable on vendor, material, strength etc. When using not original parts one might use parts which are not strong enough for the purpose, which might result in breaking of parts from the elevator.

### **I know how to operate an elevator. Do I need to read this manual ?**

It's highly recommended to read this manual as the elevator, even though you feel you have sufficient knowledge on how to operate one. It can be used to prevent problems and solve problems when they occur. When following the maintenance advice you will have a reliable tool with a long operational life.

### **Why can't I use tool joint compound/pipe-dope as a lubricant ?**

Tool joint compound is a sealant to prevent fluids from escaping out off the drill-pipe. This means it is a sticky compound with basically the opposite result as required: It sticks parts, but doesn't make parts break loose easily (except from tool joints).

BX3, BX4-50, BX4-75, BX5

9-Spare parts

REFERENCE BX3, BX4-50, BX4-75, BX5	REFERENCE DESCRIPTION Hydraulic Elevators		
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		DOCUMENT NUMBER	REV
		<b>50000802-MAN-001</b>	<b>B</b>





## Spare parts

### Spare parts BX Manifold #50004050-11

Part number	Description	Qty
53201	Fitting,grease,straight	1
50004051-1	Trigger shaft ass'y.	1
203272	Initiator pin manifold	1
979997	Piloted 3-way spool, external vent	1
980252	COMPRESSION SPRING D-253	2
108087-1OAN	Sun dir. control valve cartridge	1
107029-175N	Pilot to open check valve	3
109858-1BN	Pressure reducing valve,	1
51300-110-B	O-ring I.D. 357/.367 thick.100/.106	1
51300-113-B	O-ring I.D. 544/.554 thick	1
51301-110	Ring,back up-O-ring	1
51301-113	Ring,back up-O-ring	2
56529-4-4-S	Connector, O-ring Boss /37'	6
979798-1	Pressure gauge connector	4
93547-1B75N	Sun pilot to open check valve	3
94536-130N	Sun check valve cartridge	1
979512-10	Plug 7/8" -14" UN O-ring socket typ	3
979796-25-S	Filter element for BX Manifold	2
979880-8	Sun 3/4 cartridge	1
50004056	Support ring, trigger spring	1
50004054	Trigger retract plunger	1
979771-2225	Trigger bushing manifold	2

### BX3 Commissioning spares #203300-12

Part number	Name	Quantity
979796-25-S	Filter element for BX	2
203251	Lock ring 0.875" x 1.625"	3
203313	Lock bar	3
203268	Lock ring 0.75" x 1.50"	2
51402-12	Pin, cotter	8
51435-14	Pin, cotter	4
979785-10	Tab washer, long tab and wing	4
979785-12	Tab washer, long tab and wing	4
979855-4	Snap, standard with closed eye	2
979878-66	Chain, fishing	2
980293-4	Connection link 1/4" Crosby	2
7903	Pull loop	2
203239	Pull loop	4
203240	Lock ring 1.19" x 2.13"	4
948042-85	Machine chain straight	4
948051-2	S-hook	4

**BX3 Operational spare parts #203300-11**

Part number	Name	Quantity
53201	Grease fitting	7
203268	Lock ring 0.75" x 1.50"	4
979770-62	50x55x40 mm plain bearing	4
979770-64	50x55x60 mm plain bearing	2
979770-65	55x60x40 mm plain bearing	16
979796-25-S	Filter element for BX	2
980252	Compression spring D-253	1
980292	Compression spring D311	1
51425-8	Pin, cotter	2
203239	Pull loop	4
203240	Lock ring 1.19" x 2.13"	4
980250	Compression spring D210	4
948042-85	Machine chain straight	4
948051-2	S-hook	4
203251	Lock ring 0.875" x 1.625"	3
980251	Compression spring D-294	1
203313	Lock bar	3
203261	Link Bock Bolt	4
50514-C	Nut, Hex slotted 7/8-9 UNC	4
51435-14	Pin, cotter	4
979771-2520	Trigger bushing	1
203254	Bushing 3/4"	4
51402-12	Pin, cotter	8
979785-10	Tab washer, long tab	4

**BX4 Commissioning spare parts #50000640-12**

Part number	Description	Qty
979796-25-S	Filter element for BX Manifold	2
203251	Lock ring 0.875" X 1.625"	3
50000218	Lockplate hinge pin latch BX	3
51402-12	Pin, cotter	8
51435-14	Pin, cotter	4
979855-4	Snap standard with closed eye S.S	2
979438-3	WIRE ROPE 7X7 DIA.3MM BR.LOAD 500KG	4
979437-3	WIRE CLAMP	10
50002646	Safety cable, ass'y	4
979485-13	Lock washer SS. din 432 - 13 - A2	4
55908-4-4	Valved coupler, quick disconnect in	2
55909-4-4	Valved nipple, quick disconnect/ in	2
55908-6-6	Valved coupler, quick disconnect in	1
55909-6-6	Valved nipple, quick disconnect/ in	1
55908-8-8	Valved coupler, quick disconnect/ i	1
55909-8-8	Valved nipple, quick disconnect/in	1

**BX4 Operational spare parts #50000640-1 1**

<b>Part number</b>	<b>Description</b>	<b>Qty</b>
53201	Fitting,grease,straight	7
979770-64	50X55-60mm hinge/ latchpin bushing	2
979770-65	55X60-40mm hinge/ latchpin bushing	2
979770-66	55X60-50MM HINGE/LATCH PIN BUSHING	6
979796-25-S	Filter element for BX Manifold	2
980252	COMPRESSION SPRING D-253	2
203251	Lock ring 0.875" X 1.625"	1
980251	Compressionspring D-294	1
203261	Link block bolt	4
50514-C	Nut, Hex.-slotted (UNC-2B)	4
51435-14	Pin, cotter	4
979771-2520	Trigger bushing	2
203254	Bushing 3/4"	4
51402-12	Pin, cotter	8
50508-C	Nut, Hex.-slotted (UNC-2B)	9
55908-8-8	Valved coupler, quick disconnect/ i	1
55909-8-8	Valved nipple, quick disconnect/in	1
55908-6-6	Valved coupler, quick disconnect in	1
55909-6-6	Valved nipple, quick disconnect/ in	1
55908-4-4	Valved coupler, quick disconnect in	2
55909-4-4	Valved nipple, quick disconnect/ in	2
979855-4	Snap standard with closed eye S.S	2
980293-4	CONNECTING LINK 1/4" CROSBY G-335	2
203276-1	Hydraulic hose	6
50005337	Hydr. hose, steel fittings 1/4"	2
980474	Compressionspring D-270	1
980475	Compressionspring D-320	1
979485-13	Lock washer SS. din 432 - 13 - A2	10
50002646	Safety cable, ass'y	6
979437-3	WIRE CLAMP	10
203246	Bracket lever pin	6
50000673	Pin latch cylinder BX4-50/75	1
50000669	Busch BX4-50/75	1
50000669-1	Busch BX4-50/75	2
50000667-1	Seal Kit BX cylinders	2
203234	Position pin bushing lock top	6
50005325	Alu/bronze journal bearing L=0.472	14
50005326	Alu/bronze journal bearing L=0.750	3
50004056	Support ring, trigger spring	1
979438-3	WIRE ROPE 7X7 DIA.3MM BR.LOAD 500KG	4

**BX5 commissioning spares #50004000-12**

<b>Part number</b>	<b>Part Description</b>	<b>Qty</b>
979796-25-S	Filter element for BX Manifold	2
203251	Lock ring 0.875" X 1.625"	3
51402-12	Pin, cotter	8
51435-14	Pin, cotter	4
979785-12	Tab washer, long tab and wing	4
979785-10	Tab washer with long tab and wing	4
979485-13	Lock washer SS. din 432 - 13 - A2	8
979855-4	Snap standard with closed eye S.S	2
980293-4	CONNECTING LINK 1/4" CROSBY G-335	2
979856-2	Ring welded 1/4" - 1.1/4"	2
979860-2	Lynch pin 6mm	4
203239	Pull loop	4
203240	Lock ring 1.19" X 2.13"	4
59001008-5	Chain, straight link, short, dia 5	0.44
948051-2	S-hook	4
980254	Polon PTFE piston seal ass'y. BX	2
948042-85	5 links-0.11M	4
948051-2	S-hook	4
203240	Lock ring 1.19" X 2.13"	4
203239	Pull loop	2
51403-12	Pin, cotter	4
980251	Compressionspring D-294	1
948038-19	S HOOK ACCO#63-15/16 I.LG	2
979770-6030	60X65-30mm hinge/ latchpin bushing	1
980474	Compressionspring D-270	2
203276-1	Hydraulic hose	6
980250	Compressionspring D-210	4
979855-4	Snap standard with closed eye S.S	2
55909-4-4	Valved nipple, quick disconnect/ in	2
50508-C	Nut, Hex.-slotted (UNC-2B)	8
979770-6040	60X65-40mm hinge/ latchpin bushing	7
980293-4	CONNECTING LINK 1/4" CROSBY G-335	2
979856-2	Ring welded 1/4" - 1.1/4"	2
55909-8-8	Valved nipple, quick disconnect/in	2
980249-7	Nut,bulkhead 1.3/16"-12" UNF	4
979785-10	Tab washer with long tab and wing	12
51402-12	Pin, cotter	9
203254	Bushing 3/4"	4
979771-2520	Trigger bushing	2
51435-14	Pin, cotter	2
948042-416	14 links-0.24M	2
55908-4-4	Valved coupler, quick disconnect in	2
55908-6-6	Valved coupler, quick disconnect in	1
51425-8	Pin, cotter	1
979485-13	Lock washer SS. din 432 - 13 - A2	16
979785-12	Tab washer, long tab and wing	4
203251	Lock ring 0.875" X 1.625"	3
979796-25-S	Filter element for BX Manifold	1
979860-2	Lynch pin 6mm	6

55909-6-6	Valved nipple, quick disconnect/ in	1
979878-611	11 links-0.5M	2
980252	COMPRESSION SPRING D-253	2
53201	Fitting,grease,straight	6
979770-7050	70X75-50mm hinge/ latchpin bushing	16
980475	Compressionspring D-320	1
50506-C	Nut, Hex.-slotted (UNC-2B)	2

**BX5 Operational spare parts #50004000-11**

Part number	Part Description	Qty
948042-416	14 links-0.24M	2
979878-611	11 links-0.5M	2
979860-2	Lynch pin 6mm	6
979785-12	Tab washer, long tab and wing	4
979796-25-S	Filter element for BX Manifold	2
203251	Lock ring 0.875" X 1.625"	3
51402-12	Pin, cotter	8
51435-14	Pin, cotter	2
979785-10	Tab washer with long tab and wing	12
980293-4	CONNECTING LINK 1/4" CROSBY G-335	2
203239	Pull loop	4
948042-85	5 links-0.11M	4
51403-12	Pin, cotter	4
948038-19	S HOOK ACCO#63-15/16 I.LG	2
948051-2	S-hook	4
979855-4	Snap standard with closed eye S.S	2
203240	Lock ring 1.19" X 2.13"	4
979856-2	Ring welded 1/4" - 1.1/4"	2



# BX3, BX4-50, BX4-75, BX5

## 10-Drawings

REFERENCE BX3, BX4-50, BX4-75, BX5	REFERENCE DESCRIPTION Hydraulic Elevators	
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DOCUMENT NUMBER <b>50000802-MAN-001</b>		REV <b>B</b>





## Drawings & test procedures

### Test procedures

Number	Name
PSEL-0012	Pre installation sheet
TSEL-0140	Test specification manifold BX3,4-50, 4-75, 5
TSEL-0066	Test specification frame + rotator
TSEL-0194	Handling, storage and preservation

### Dimensional drawings

Number	Name
DD-203300-30	Dimensional drawing BX3
DD-50000640	Dimensional drawing BX4-50
DD-50000650	Dimensional drawing BX4-75
DD-50004000-30	Dimensional drawing BX5
DD-50004130-7	General Arrangement BX + rotator

### Drawings

Number	Name
203300-30	BX3 final assembly
50000640	BX4-50 final assembly
50000650	BX4-75 final assembly
50004000-30	BX5 final assembly
203206-1	Hinge pin assembly door BX3
203207-1	Hinge pin assembly latch BX3
50000670-1	Hinge pin assembly door BX4
50000671-1	Hinge pin assembly latch BX4
50004006-1	Hinge pin assembly door BX5
50004007-1	Hinge pin assembly latch BX5
50000682	Door cylinder assembly BX3
50000667	Door cylinder assembly BX4
50000680	Door cylinder assembly BX5
50000668	Latch cylinder assembly BX3
50000668	Latch cylinder assembly BX4
50000681	Latch cylinder assembly BX5
203236-1	Bushing lock assembly BX4
50004036-1	Bushing lock assembly
203200-1	Pressure shut valve
50004050-1	Manifold BX Frame 4
50000553-1	Diagram BX + Rotator
50000520-1	Mountingplate BX&Rotator EEXD 24V/DC ATOS
50004050-3	Hydraulic schematic BX-frame 4
50000538	Installation schematic BX-elevator & rotator 3 free ports on TDRH
50000538-1	General hook-up kit drawing BX-elevator with rotators
202539	Test kit BX elevator + PS
50004051-1	Trigger shaft assembly
CA-251	Critical areas body BX - elevator

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CA-252	Critical areas doors BX - elevator
CA-253	Critical areas latch BX - elevator
CA-254	Critical areas bushings BX - elevator

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# PRE-INSTALLATION SHEET

## HOOK-UP KIT BX-elevator

To operate the BX Hydraulic Elevator a hook up kit is required. In order to define the requirements we request this PSEL be completed by either the customer or project team and returned to NOV, Etten-Leur, the Netherlands, preferably ahead or together with customer purchase order.

This information helps to ensure that our customers and NOV are working with the same information and will help avoid that nothing is overlooked or assumed prior to installation.

Drilling Company name : \_\_\_\_\_

Rig name : \_\_\_\_\_

Oil Company name : \_\_\_\_\_

Surveyor name : \_\_\_\_\_

Date of survey : \_\_\_\_\_

***In event further clarification or contact required:***

NOV Project Manager:

E-mail address:

Mobile phone no.:

Or:

Rig Manager:

Tool Pusher:

Rig Maintenance Supervisor:

Company Man:

Casing Company:

ORIGINAL DOCUMENT		LATEST REVISION		
Name:	L. Sonneveld	Name	L. Sonneveld	
Date:	11 June 07	Date	11 June 07	
Drawing type:	PS	ECN	700414	
National Oilwell Varco Varco B.J. B.V. Nijverheidsweg 45 4879 AP Etten-Leur The Netherlands Tel: +31-76-5083000 Fax: +31-76-5046000		Revision:	Document No.: <b>PSEL-0012</b>	Description: <b>Hook-up Kit BX-elevator</b> Sheet: <b>1 of 2</b>

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1) Type of Drilling rig:

- 2) Type of Equipment: ☐ BX Elevator 3/4/5 without Rotator Actuator  
☐ BX Elevator 3/4/5 to be used with Rotator Actuator  
☐ BXS Elevator only without Rotator Actuator  
☐ BXS Elevator to be used with Rotator Actuator

*Are other BX Elevators installed/in use on rig*

☐ Yes ☐ No

3) Type/Brand Top Drive:

4) Number of free hydraulic ports on Top drive Swivel:

5) Type and Thread size of free hydraulic ports on Top Drive Swivel:

6) Operating control system in Drillers Cabin (planned or available) for BX-elevators:

Remote I/O-controlled interface: ☐ Cyber base; ☐ V-ICIS; ☐ Amphion;

☐ Other brand I/O-controlled interface:

*If above box is checked then NOV Etten-Leur will not supply the controls for the Drillers cabin*

If no operating/control system, NOV Etten-Leur can supply the following, check box required:

☐ Control Switch Box.

☐ Control Plate to integrate in existing operating console.

- 6.1) Electric Power Supply: ☐ 24 V/DC  
☐ 110-120 V/AC  
☐ 220-240 V/AC

6.2) Is BX Elevator operation with existing Air Operation Elevator control valve required:

☐ Yes ☐ No

7) Electric cable

Is NOV Etten-Leur to supply the Electrical cables: ☐ YES ☐ NO

If yes specify required cable lengths.

Cable from control plate to control switch box in "Drillers cabin", (10 cores, 1.5mm<sup>2</sup>): L=.....

Power cable for control switch box, (3 cores, 1.5mm<sup>2</sup>): L=.....

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Revision:

—

Document  
 No.:

**PSEL-  
 0012**

Description:

**Hook-up Kit  
 BX-elevator**

Sheet:

**2 of 2**



# TEST SPECIFICATION

## BX-Elevators

### # 3, 4 & 5

**Configuration** :

**Part Description** : BX-elevator\_\_\_\_\_

**Part Number** :

**Serial Number** : NL

**Shop Order** : \_\_\_\_\_

**3rd Party Witness Agency** : \_\_\_\_\_

**3rd Party Witness Name** : \_\_\_\_\_

**3rd Party Witness Signature** : \_\_\_\_\_

**Test Date** : \_\_\_\_\_

ORIGINAL DOCUMENT		LATEST REVISION		
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Date:	23 July 04	Date	19 Jun 09	
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Varco BJ B.V. Nijverheidsweg 45 4879 AP Etten-Leur The Netherlands Tel: +31-76-5083000 Fax: +31-76-5046000	Revision: <b>C</b>	Document No.: <b>TSEL-0140</b>	Description: <b>Inspection criteria for (name product)</b>	Sheet: <b>1 of 11</b>
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This specification defines the production testing of the BX elevators. Each unit is to be tested according to the following procedure. Any defect is cause for stopping the test until the defect has been eliminated. All defects found during the test will be noted and signed off by the test-technician on the front page of this test-sheet. In the event of a major defect whose repair would affect items previously inspected or tested, these affected items shall also be re-tested or re-inspected after the defect has been eliminated.

## 1.0 SEMI-FINISHED BEFORE LOAD-TEST

Initials:

1. Check symmetric closing of doors. Hard-Stops \_\_\_\_\_
2. Push doors fully closed; check that latch clears the the latch lug and can open freely. \_\_\_\_\_
3. Place wedges between closed doors, verify position of the doors by measuring bore diameter. Check that latch does not interfere with right door. \_\_\_\_\_
4. Check latch / latch lug for 75 % surface contact. Use Blue Dye. \_\_\_\_\_
5. Check symmetric door-opening by measuring at the top between both doors. Door-opening should be:
 

		drawing
BX3	: 22 1/2" - 23 1/2"	203300-30-AS
BX4-35	: 9" – 9 3/8"	50005300-AS
BX4-50&-75	: 12 3/8" - 12 5/8"	50000640-AS/50000650-AS
BX5	: 12 3/8" - 12 7/8"	50004000-30-AS

 \_\_\_\_\_
6. Check minimum door-opening by measuring at the bottom of the Bushing bore between both doors in the front, and by the hinge points. Door-opening should be:
 

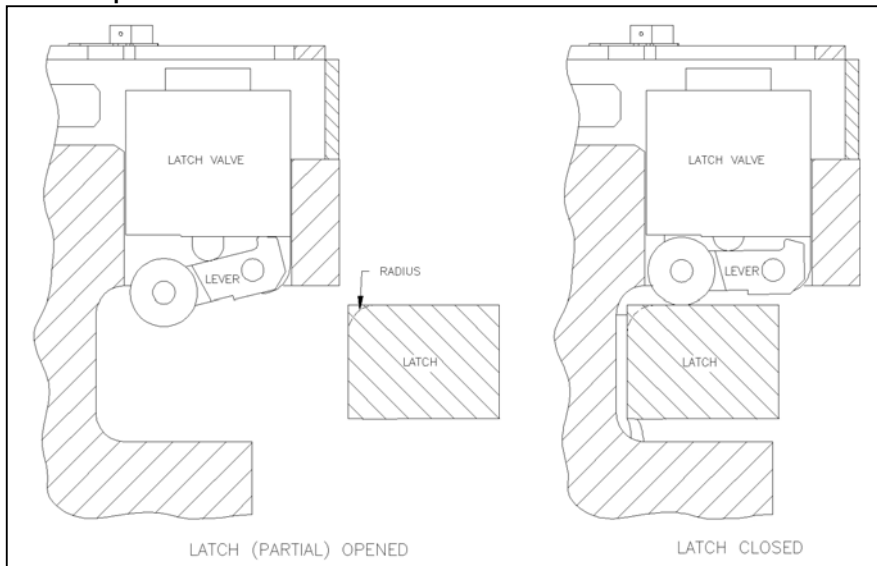
BX3	: 20 1/4" - 21 1/2"
BX4-35	: 7 3/8" – 7 5/8"
BX4-50 & -75	: 9 7/8" - 11"
BX5	: 11 1/4" - 11 5/8"

 \_\_\_\_\_

7. Open and close latch, check for smooth operation and correct contact with Hard-Stops. \_\_\_\_\_
8. Open and close both doors; check for smooth operation and correct contact with Hard-Stops. \_\_\_\_\_
9. Install test-bushing segment in elevator.  
Check for body and both doors, that bushing is in contact with the elevator load-shoulder (note: frame V has two load-shoulders (top & bottom), use 0.006" feeler-gauge. \_\_\_\_\_
10. Check that both body test-bushing segments can fully hinge around their position pins. \_\_\_\_\_  
For BX 5 check that body-bushing can be pulled towards the centerline of the elevator the full length of the slotted hole in the lower lug of the test bushing. \_\_\_\_\_
11. Fill in the table for Heat-numbers, Part-number and Elevator Serial number on page 8 \_\_\_\_\_
12. **Before Load-Test**; verify that semi-finished elevator is assembled according to assy' drawing "SEMI-FINISHED" and that TSEL items 1.1 thru 1.10 have been checked \_\_\_\_\_
13. Check that elevator has been load tested. \_\_\_\_\_
14. Check that elevator has been MPI inspected. \_\_\_\_\_

## 2.0 Latch (valve) adjustment.

1. Unblock tank line, so pressure in BX can bleed of (otherwise latch won't open manually).
2. Open latch (manually).
3. Close latch (manually) and check if the latch valve is set at correct height. See picture below.



4. Again close latch (manually) and check where latch valve is activated by latch.  
At this point grind radius (max. 0.25") at latch.
5. Make sure Latch valve lever has no interference with latch.

### 3.0 FINAL ASSEMBLY INSPECTION.

1. Check smooth functioning of the 4 bushing lock pins  
(see page 9). \_\_\_\_\_
2. Functioning of the mechanical latch-lock (page 10).  
Check height of pushpin in elevator-bore 0.24" min / 0.3"max.  
Install test-bushing and push fully down.  
Check engagement of lock-pin in front of latch 0.32" min.  
Check latch-lock spring is not "coil-bound" (end-of-stroke)  
Release and check latch clears lock-pin. \_\_\_\_\_
3. Check functioning of moveable door bushing (see page 10). \_\_\_\_\_
4. Functional inspection of lever-mechanism:  
Check that no lever-mechanism parts act as  
a stop for doors and latch.  
1/8" minimum clearance with casting \_\_\_\_\_
5. Check that doors and latch, in open and closed position,  
are in contact with their hard stops.  
(Cylinders should not be end of stroke) \_\_\_\_\_
6. Place both body bushings in the elevator. After controlling  
each body bushing segment, the trigger-shaft should retract  
completely in the body (when hooked up to the hydr. power-unit).  
Check this for both body-bushings. \_\_\_\_\_
7. With the elevator hydraulically commanded to open.  
Check for clearance between bushings and trigger-shaft.  
(reference-height of the trigger-shaft into the elevator-bore.  
0.26"min. / 0.30"max. measured at the centerline of the elevator bore)  
For BX5 pull bushing forward towards elevator-centerline.  
Use a 0.006" feeler gauge.(minimum thickness) \_\_\_\_\_

## 8. Pressure Test.

**Grease all greasing points before (cycle)testing!**

- 1: Hinge pins.
- 2: Latch pin.
- 3: Latch Lock pin and Push-pins
- 4: Trigger shaft manifold.

Hook-up elevator to Power Unit. Set system-pressure to 2000psi and flow-rate at 3 GPM. (11L/min)

The hydraulic elevator shall be tested in 4 different conditions  
(Reference document: Hydraulic schematic drawing 50004050-3):

Test Port	1.	2.	3.	4.
<b>1 = P</b>	X	X	X	X
<b>2 = T</b>	NP	NP	NP	NP
<b>3 = XP</b>	X	NP	1000 psi	X
<b>4 = FLOAT</b>	NP	NP	2000 psi	NP
<b>TRIGGER</b>	-	-	controlled	controlled
Result :	elevator open	elevator open	elevator closed	elevator open
Initials :				

X = add system pressure (2000 psi)

NP = measure no pressure (50 psi back pressure max.)

TRIGGER controlled = pipe in elevator

Note: if XP signal-elevator-closed is not 1000 psi, adjust PRDB-LBN

Check setting of adjustable cartridge E, DPBO-LAN, for elevator open cycle. Start with a closed elevator. Verify 1500 psi pressure setting by starting with a low (1000psi) system pressure command-to-open on XP. Slowly increase HPU system-pressure. Once pressure is increased to 1500 psi the closed elevator shall open.

9. If not, adjust valve DPBO-LAN, repeat this until OK.

10. Hammer a wedge between doors (check latch/latch-lug contact)  
Check 1000psi XP signal-elevator-closed. \_\_\_\_\_

Remove wedge and open elevator.

Trigger elevator to close, prevent full closing with obstacle placed between the doors. Start with  $\frac{3}{4}$ " size and increase with  $\frac{1}{4}$ " increments each time, 1  $\frac{1}{2}$ " max, until latch does not close (no XP elevator-closed-signal).

11. Which obstacle-size prevents latch to close (no XP signal)?  
If obstacle size is over 1  $\frac{1}{2}$ ", re-adjust door-cylinder, repeat test item 10. \_\_\_\_\_ inch

Response Time. At 3 GPM.(11L/min) and 2000 psi, the elevator must respond as follows:

12. Elevator cycle-to-open: 3-6 sec. max. BX 3  
3-6 sec. max. BX 4  
3-6 sec. max. BX 5  
\_\_\_\_\_

13. Elevator cycle-to-close: 3-6 sec. max. BX 3  
3-6 sec. max. BX 4  
3-6 sec. max. BX 5  
\_\_\_\_\_

#### Cycle Test.

The elevator shall be opened / closed for 250 times minimum.

Hydr. system pressure set at 2000 psi, flow-rate 3 GPM (11 l/min).

Each cycle the elevator needs to open, close and latch completely in proper order.

Closing must be initiated by operating the body bushings.

If elevator fails during cycle-test, the test must be restarted after the defect has been eliminated.

14. Check for loose parts, cotter pins, lock-tabs etc. \_\_\_\_\_

15. Inspect for wear on movable parts / hoses after cycle test. \_\_\_\_\_

16. When check items 3.9 thru 3.15 are OK.  
 Increase system-pressure to 3000 psi and keep elevator closed for 5 minutes minimum.  
 Repeat this with elevator opened for 5 minutes minimum.  
 No leakage shall occur. \_\_\_\_\_

17. Verify NAS class 8 oil cleanliness \_\_\_\_\_

#### **4.0 FINAL INSPECTION**

1. Verify that the elevator is assembled according to the latest revision of the final assembly drawings. \_\_\_\_\_
2. Verify that all bolts and nuts are tightened to the correct torque-value and secured by lock wire, lock tabs or cotter pins. \_\_\_\_\_
3. Verify that all grease points are greased. \_\_\_\_\_
4. Verify that latch and hinge pins are properly locked. \_\_\_\_\_
5. Verify that correct Quick Disconnects are installed. \_\_\_\_\_
6. Verify presence and correctness of markings. \_\_\_\_\_



## 5.0 SERIALNO's, PARTNO's and HEATNO's.

Elevator NL number: \_\_\_\_\_ Partno: \_\_\_\_\_

	Part Number:	Foundry:	Heat Number:	Heat Code:
Body	_____	_____	_____	_____

Left Door	_____	_____	_____	_____
-----------	-------	-------	-------	-------

Right Door	_____	_____	_____	_____
------------	-------	-------	-------	-------

Latch	_____	_____	_____	_____
-------	-------	-------	-------	-------

Back Plate	_____	_____	_____	_____
------------	-------	-------	-------	-------

Hinge Pin	_____			_____
-----------	-------	--	--	-------

Hinge Pin	_____			_____
-----------	-------	--	--	-------

Latch Pin	_____			_____
-----------	-------	--	--	-------

Manifold Part No.	_____	Manifold Serial Number	_____
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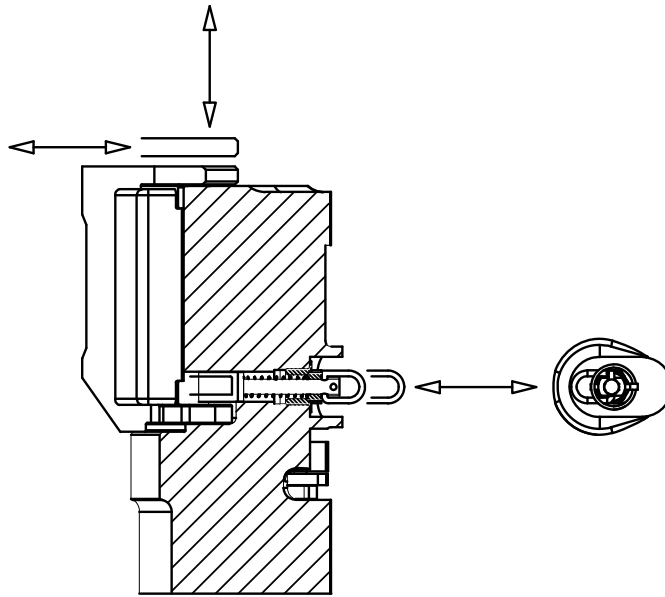


fig 1. Check functioning of bushing lock-pins and proper fitting of bushings.

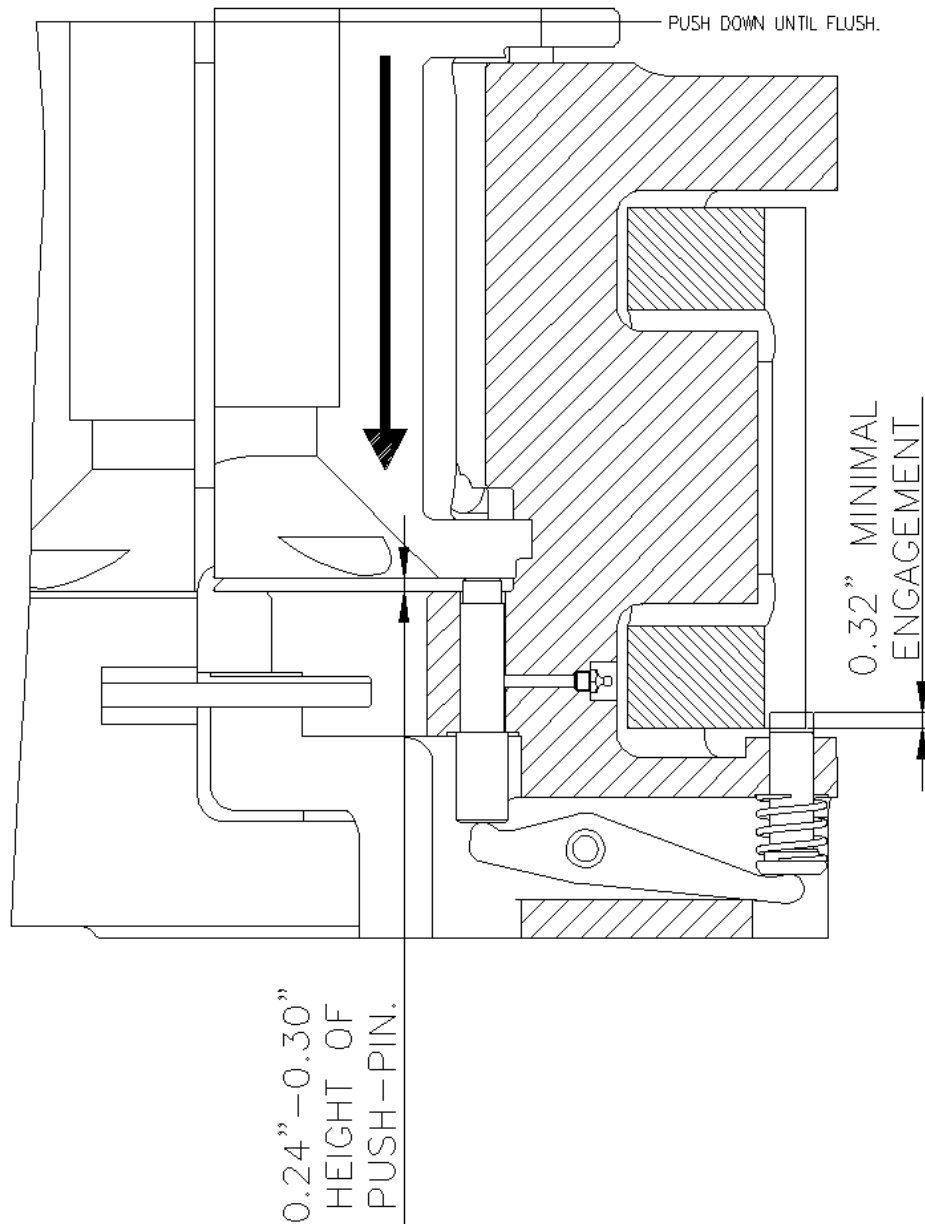


fig 2. Check functioning of moveable door-bushing and proper functioning of latch-lock.





Rig name : \_\_\_\_\_

Part Description : \_\_\_\_\_

Part Number : \_\_\_\_\_

Serial Number : \_\_\_\_\_

Customer ref. Number : \_\_\_\_\_

Varco BJ sales order Number : \_\_\_\_\_

Varco BJ rep. Name/ Job title : \_\_\_\_\_

Varco BJ Witness Signature : \_\_\_\_\_

Reviewed manual revision/ Date : \_\_\_\_\_

Commissioning date : \_\_\_\_\_

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

\_\_\_\_\_

## TEST SPECIFICATION ( Field Commissioning and Instruction procedure )

	Name:	Date	D	701048	L.Sonneveld	July 10 <sup>th</sup> 2009	N. de Keijzer
Prepared	P. Dekker	July 5 <sup>th</sup> 99	B	589301	P. Dekker.	May 2 <sup>nd</sup> 2000	A. Krijnen
Checked	A. Dekkers	July 5 <sup>th</sup> 99	A	545001	P. Dekker.	July 5 <sup>th</sup> 1999	A. Dekkers
Approved	L. Sprey	July 5 <sup>th</sup> 99	Rev.	ECN	Name	Date	Checked
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- During commissioning, all of the following rig personnel need to be present for witnessing. Please check and have them signed for their presence during the complete commissioning procedure.

Rig company man : \_\_\_\_\_.

O.I.M : \_\_\_\_\_.

Tool pusher : \_\_\_\_\_.

Rig mechanic : \_\_\_\_\_.

(Assistant) Driller(s) : \_\_\_\_\_.

After successful completion of the commissioning procedure,  
the following people need to sign for approval:

Rig company man : \_\_\_\_\_.

O.I.M : \_\_\_\_\_.

Tool pusher : \_\_\_\_\_.

**After final approval, hand over copies of the completed  
TSEL to all attendees.**

*( FIELD COMMISIONNING ROTATOR SEE TSEL-0089 latest Revision.)*



## General Warnings:

- **MAKE SURE A SAFE WORKING ENVIRONMENT IS PROVIDED WHEN FIELD COMMISSIONING THE BX ELEVATOR.**
- **CLEANING REQUIREMENT OF THE SYSTEM BEFORE CONNECTING SYSTEM 21 PRODUCTS.**  
Clean, purge and pickle all hydraulic piping during and after installation and prior to hooking up Varco System 21 equipment. The installation's hydraulic pressure line from the hydraulic power unit is to be looped to the installation's hydraulic return line back to the hydraulic power unit and hydraulic fluid is to be run through this loop for a period of 1 hour minimum, before hooking up pressure and return lines to system 21 equipment.
- **REQUIRED (PLC input) FUNCTIONS IN DRILLERS CONSOLE AS SUPPLIED BY DRILLERS CONSOLE MANUFACTURER.**

Operating the BX Elevator.

On the driller's console the following control functions need to be provided;

- "Open" BX Elevator.
- "Armed-to-Close" BX Elevator.

These functions can for instance be controlled with a two-position switch, One position of the switch being the "Open" function, the other position being "Armed-to-Close".

Another option can be a spring-return push button. Releasing the push-button acts as "Armed-to-Close" position for the BX elevator. To help prevent inadvertently opening the Elevator it is recommended to program the PLC function so, that two pulses, ("double-click"), from the BX control button are needed to generate a (timed, ~10secs duration) open command to the BX control manifold. After timed function resets, BX Elevator returns to "Armed-to-Close" state.

The (PLC outputs) Output function controls a solenoid operated Hydraulic valve Situated on the Top-drive or inside the Hydraulic BX control cabinet situated in the derrick at finger board level.

This valve is designated "DV1" and the line designation is "S2"  
(see general HUK schematic #203447 in (BX) manual)

S2	Pressurized @2000	BX Open command
S2	De-Pressurized	BX Armed to close command
S2	Pressurized @1000	BX closed and latched feed-back signal

Closed-Feedback Signal from BX Elevator is converted into Electrical signal input for PLC or Drillers console indicating light, through a pressure switch mounted near the BX control Manifold.



## **PROCEDURE**

### **1. General.**

- After unpacking BX Elevator verify presence of all parts and size components of the Elevator, necessary to fully hook-up to the Top-drive and BX controls (see manual) OK
- Go through section 4 "Elevator Inspection" prior to bringing the equipment to the rig-floor. This can aid in saving time on the rig-floor during commissioning. Before proceeding with other tests. (See User manual Universal Rotator.) OK
- Review BX Elevator Manual with customer representatives, as mentioned on page 2, during commissioning procedure. Show all attendees the Operations part of the Elevator, as a minimum. Get agreement on the manual's contents. OK
- Show the location of the BX Elevators Instruction chart in the driller's cabin and get agreement on the content. OK
- Show location of;
  - BX Elevator OK
  - Hook up Control manifold and Solenoids OK
  - Controls in driller's cabin OK

### **2. Hydraulic controls:**

- Explain general functioning of the BX Elevator and its controls using the Varco installation and hook-up drawings and general schematic inside manual. OK
- Verify that pressure, and tank lines from the Hook Up manifold are connected to the hydraulic power unit. And verify that hydraulic lines from this manifold are connected the right way with the correct QD's to the BX Elevator according the Varco installation and hook up drawings. Minimum is ½" nominal hose size, for all lines. OK
- Verify that a ball-valve is fitted into Hydr. Pressure-Line near the BX Elevator. OK
- Verify that any Steel hoist cables, Hoses etc. hanging in the derrick structure do not interfere with the Hydraulic hoses and Quick disconnects to the BX Elevator. This to prevent these items rubbing against each other and causing damage / malfunction. (A tugger-line rubbing against the sliding ring of a Quick disconnect can cause this to disconnect and block oil-flow to and from the tool!) OK



- Point out the location of these items (valves, Q-D's, pressure switches/junction boxes, etc.) shown in these drawings, to Driller, Tool-pusher and Rig-Mechanic.

OK

- Hand over these Drawings and Operations Manual to the Rig-Mechanic / Tool-pusher, get signature for receipt:

Rig Mechanic Drawing / Manual receipt: \_\_\_\_\_.

- Verify oil quality meets NAS class 8 requirements. Take a sample from the pressure line between ring line and inlet on control manifold. In case not, prior to continuation of the commissioning, continue the process cleaning, purging and pickling of the hydraulic circuit until all requirements are met.
- Demonstrate how to clean hydraulic quick disconnects prior to connection. Explain that non-removed dirt on the quick disconnects will enter the hydraulic circuit and clog up the filters, resulting in a malfunctioning system.
- Demonstrate that malfunctioning Quick disconnects can work as a check-valve preventing flow in one direction. Emphasize the risks of severe equipment damage and possible personnel injury, due to uncontrolled overpressure, should this occur!
- Verify that the hydraulic flow to the hook up kit manifold is sufficient to get the adequate response times for the BX Elevator. ( 5GPM at BX QD's )
- System Pressure at the BX Elevators Quick disconnects must be between 2,000 psi and 2,500 psi.

OK

OK

OK

OK

OK

System- Pressure is;  
:.....psi.

Pressure on "P"-line must be slightly lower than the pressure on "XP" line for this a Pressure reduce kit #50004350 is available to place in-line with "P" to the BX elevator.

XP- Pressure is;  
:.....psi.

- Check all quick-disconnects are opening easily and are not damaged or leaking. If not, replace these with items out of the Spare parts kit for Commissioning

OK



### 3. Electrical controls.

- Let the rig mechanic/electrician verify that all electrical wiring is connected according to the Varco Installation and Hook-Up drawings. OK

### 4. BX Elevator Inspection.

**Before bringing the BX Elevator to the rig-floor.**



Make sure that all hydraulic lines are disconnected before ANY repair or inspection work is performed on the elevator. When the lines are connected the elevator doors will close when the bushing / trigger mechanism is hit, which can cause serious injury to personnel.

*The following tests can be done with the BX Elevator as "stand-alone" and disconnected from it's controls, provided the elevator is placed OPEN. Before doing these checks.*

- Verify that all bolts, nuts and pins are locked with lock tabs or cotter pins, and latch and hinge pins are properly locked. OK
- Verify that all lynch pins, safety chains / cables and secondary bushing shackles are (or can be) correctly installed. OK
- Verify that all grease points are greased. OK
  - 1: Hinge pins.
  - 2: Latch pin.
  - 3: Latch Lock pins and Push-pins
  - 4: Trigger shaft manifold.
  - 5: Elevator bore and back of bushings
  - 6: Rotator Link-blocks and Bail contacts.
- Functioning of the mechanical latch-lock (page 6).  
Install bushing segment in right-hand door and push fully down.  
Check engagement of lock-pin in front of latch 0.32" min.  
Release and check latch clears lock-pin. OK
- Install all 4 bushing segments in elevator. Check for body and both doors, that bushing can be properly seated onto elevator load-shoulder. OK
- Check that both body bushing segments can fully hinge around their locating pins. For BX 5 pull bushing towards centerline of elevator-bore. OK



- With the elevator open. Check for clearance between body bushings and trigger-shaft. Use 0.006" feeler gauge. BX 5; pull bushing towards centerline of elevator-bore. OK
- After controlling each body (trigger) bushing segment, the elevator's trigger must be pushed in until flush with elevator bore, no interference or 'malfunction' of bushing and trigger may occur. Check this for both segments. OK
- With the elevator open. Check for clearance between body bushings and trigger-shaft. Use 0.006" feeler gauge. BX 5; pull bushing towards centerline of elevator-bore. OK
- With the elevator's doors fully opened; Check "Pipe-Opening" of the Door Bushings, Verify for each bushing set that the correct pipe can enter the elevator, without interfering the door-bushing. OK
- **Repeat these items for all delivered bushing sets.** OK



## 5. FUNCTION TESTING. (See Manual Section Operation)

Bring BX elevator to the rig-floor fitted with an insert set and Hook it up to the elevator's controls.

- Connect the Hydraulic hose(s) to the BX Elevator's Quick-disconnects. Verify adequate free play in the length of each hose as it runs down the length of the Link.

No interference with other equipment or stretching of the hoses may occur when the Link-tilt function is used forward and backward, full stroke.

OK



Make sure that all hydraulic lines are disconnected before ANY repair or inspection work is performed on the elevator. When the lines are connected the elevator doors will close when the bushing / trigger mechanism is hit, which can cause serious injury to personnel.

### • Pressure Tests.

The elevator shall be tested in 4 different conditions.

Reference documents: Hydraulic diagram 50004150-3 & 50000553-1:

Condition► Control Port▼	1.	2.	3.	4.
1 = P	X	X	X	X
2 = T	NP	NP	NP	NP
3 = XP	X	NP	1000 psi	X
4=FLOAT	NP	NP	X-out	NP
TRIGGER	-	-	ACTIVATED	ACTIVATED
CONTROL SWITCH	OPEN	CLOSE	CLOSE	OPEN
CLOSED INDICATOR LIGHT	OFF	OFF	ON	OFF
Result :	Elevator open	Elevator open & "armed to close"	Elevator closed & latched. "Floating"	Elevator open
Initials :				

X = add system pressure (2000-2500 psi)

X-out = system pressure out signal

NP = measure no pressure (Tank-line pressure max. ~75psi)

TRIGGER controlled = pipe in elevator



*Depending on circumstances it may be wise to start with the commissioning tests for the BX Rotator at this point, before going further with the tests for the Elevator.*

- **Response Times.**

Elevator cycle-to-open: 3-6 sec.

\_\_\_\_\_sec.

OK

Elevator cycle-to-close: 3-6 sec.

\_\_\_\_\_sec.

OK

- Command elevator to close, leave closed and hydraulically pressurized for 15 minutes minimum. After this, elevator must open without hesitation i.e. normal response times.

OK

- With hydraulics pressurized: Check for oil leakage.

OK

- With complete system hooked up, check correct functioning of the "Closed-feedback Signal" feature of the BX elevator (and "Float" for Universal rotator, see TSEL-0089) as controlled by the BX Control Manifold mounted at the Top-drive or near Fingerboard level.

Start with BX (and Rotator) fully hooked-up, hanging in the vertically positioned Links

Steps to take to verify this function;

- Open BX Elevator.
- Rotate BX Elevator Doors UP full rotation. (If rotators installed)
- Set BX in "armed to close" (close) mode.
- Close the BX Elevator manually.
- Verify "Closed-feedback-Signal" functions correct.
- Verify the manual "FLOAT" function when BX elevator is opened by using the Rotator controls Located in the driller's console.  
(Only if rotators installed)

OK

OK

OK

OK

OK

OK

After completing it's close sequence the BX puts out a high pressure (1000psi ) signal via line XP (S2) to the control manifold for signaling / interlocking purposes.



At the same time the BX elevator sends out a high pressure (equal to system pressure) signal to the "Float-manifold located at / near the Pipe handler frame via line B5, to port. "X" in the Float manifold.

This B5 "Float" Signal will activate valves inside the Float Manifold that will overrule all Manual Rotate commands given by the Operator.

So after the last step of the "Closed-Signal" (and "Float") test sequence is done, i.e. "Elevator closed and latched", the Rotator will start Floating the BX Elevator to it's normal near level position. OK

- Verify correct functioning of Elevator - Power-slip Interlock. OK
- If not installed, inform customer that this is recommended, details available at nearest Varco BJ office. OK

## 6. Operational Test.

After successful completion of all above mentioned items and after successful completion of all commissioning tests for the BX Rotator (TSEL-0089) proceed with this tests, have all attendees a mentioned on the first page of this document available for witnessing this test.

- Have BX ( and Universal Rotator) hooked-up and operational.
- Have a stand/joint of tubular (preferably 18degr drillpipe) available to run tests with.
- Present tubular to BX.
- When Rotators installed, Rotate BX to angle of presented pipe. Adjust rotation angle if necessary.
- Pick up pipe with BX .
- After BX is closed and latched around pipe, verify "Closed" (& "FLOAT") function.
- Hoist pipe into derrick, with TDS / Blocks
- Reverse this sequence to LD pipe. OK

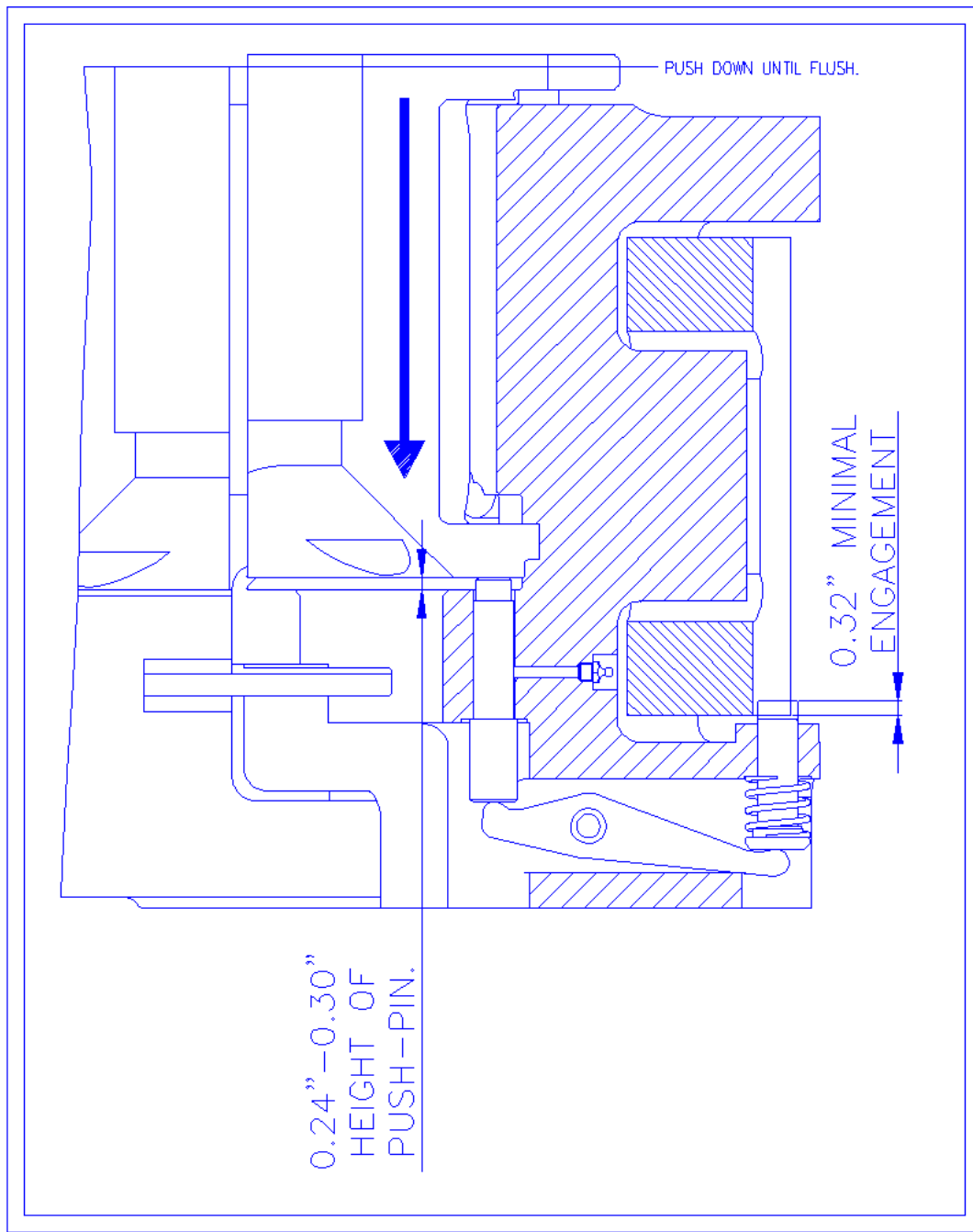


fig 1. Check functioning of moveable door-bushing and proper functioning of latch-lock.



This document can be used for any VarcoBJ B.V. tool except the RST rotary support tables. Refer to TSEL-0191 for the RST preservation procedure.

## Preservation Procedure.

TOOL DESCRIPTION: \_\_\_\_\_

SERIAL NUMBER: \_\_\_\_\_

SHOP ORDER: \_\_\_\_\_

WITNESS by: \_\_\_\_\_

WITNESS DATE + SIGNATURE: \_\_\_\_\_

REMARKS: \_\_\_\_\_

REFERENCE	REFERENCE DESCRIPTION
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<p>DOCUMENT NUMBER</p> <p><b>TSEL-0194</b></p>	<p>REV</p> <p><b>C</b></p>



## **REVISION HISTORY**

C	21.10.2010	For what tools applicable added	P.F.	R.M.	NdK
B	14.04.2009	Preservation changed, Tool data info	R.M.	P.F.	A.K.
A	13.01.2009	Name changed	R.M.	P.F.	A.K.
-	15.11.2008	First issue	PGF	RM	AK
Rev	Date (dd.mm.yyyy)	Reason for issue	Prepared	Checked	Approved

## **CHANGE DESCRIPTION**

Revision	Change description
-	n/a
A	Name/Title changed
B	Presevation changed, Tool data Info block added
C	For what tools applicable added

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## 1 INTRODUCTION

### 1.1 Purpose

The purpose of this procedure is to provide information involving handling, storage and preservation of the PRODUCT.

All the outlined procedures in this Preservation Record shall be governing for the entire period from manufacturing until installation.

### 1.2 Definition

- **Shop-Preservation:** Preservation in the manufacturer's plant during final assembly and before transport.
- **Re-preservation:** Any preservation carried out AFTER **Shop-Preservation**.
- **De-preservation:** Removal of any preservative materials.
- **Preservation record:** The Preservation log + the log of any Re-preservation carried out.
- **Preservation label:** The label attached to the PRODUCT to be filled in when preservation activities are carried out.
- **Preservation period:** The period AFTER shipping the PRODUCT from manufacturer's plant.

### 1.3 Procedure

- This document must be kept with the PRODUCT at final assembly.
- The Preservation record shall be filled in by assembly-crew.
- Prior to shipment from manufacturer's plant, a copy of this document must be attached to the PRODUCT, ensuring availability at receipt of the PRODUCT.
- The original document shall be filed in the DATA book at manufacturers Document Control Dept.
- Prior to shipment from manufacturer's plant, a Preservation label shall be attached to the PRODUCT. The label reflects the most recent preservation work carried out.

#### **PURCHASERS RESPONSIBILITY:**

- After shipment, any preservation action must be logged in the preservation-log.

### 1.4 Safety

- Handling of the PRODUCT involves lifting operations. Only certified lifting gear shall be used. To avoid any injury of personnel and damage to the PRODUCT, the lifting procedure must be followed.
- Forklift handling may be used when the PRODUCT is in it's wooden crate.
- Personnel familiar with PRODUCT-handling procedures are the only personnel that shall be allowed to enter the lifting operation area.
- Shop-Preservation, re-preservation and de-preservation may involve usage of solvents that may be harmful. Personnel performing this type of work should be wearing personnel protection equipment.

## **2 SHOP-PRESERVATION & RE-PRESERVATION**

### **2.1 Shop-Preservation during manufacturing.**

- The preservation-records will be signed off by the assembly crew, indicating that the checks are carried out. The PRODUCT leaves the factory in undamaged and new condition.
- It is recommended the consignee organisation checks the PRODUCT after reception.

### **2.2 Optional: Long term storage.**

- Optional long term storage preservation can be ordered from NOV; this will guarantee the correct preservation for a period of 12 months.
- Procedure in case long term preservation is ordered:
  - Check PRODUCT immediately after reception.
  - Carry out interval checks according to preservation.
  - If found required, re-preservation shall be carried out. Use the check records in this document.

### **2.3 Re-Preservation**

Carry out according to the preservation-records. Any anomaly shall be rectified.

- The hydraulic piping system on the PRODUCT is sealed off by the manufacturer. All fittings shall remain plugged or capped to avoid ingress of material that may contaminate the piping and the fluid in the system.
- Non metallic plugs shall not be used. All hydraulic components are flushed with clean hydraulic oil prior to storage and transport.
- All non-terminated cable ends shall be fitted with shrinking shroud.
- IN CASE DENSO-TAPE PROTECTION ORDERED BY CUSTOMER: All fittings, as well as any extended rod end are covered with Denso tape to avoid corrosion. They shall be checked for damage of the Denso tape. The Denso tape must not be allowed to dry. If the Denso tape oil/grease vapourizes the result is corrosion underneath the tape. Replace the Denso tape or add oil/grease to the tape.

### 3 INSTALLATION

#### 3.1 Welding

- The PRODUCT must be protected from spatter of welding and grinding with suitable protective sheets.
- Any black steel spatter on stainless steel material shall be removed with suitable method to avoid pitting corrosion and to re-establish Pre surface quality.

#### 3.2 Installation period

- The procedures as outlined in this document shall continue during installation and after installation onboard until taken into operation.

### 4 RECOMMENDED PRESERVATIVES (OR EQUIVALENT):

1. Castrol Rustilo DWX 32: For medium to long term protective for use in severe conditions where a high degree of protection is required: Leaves a **soft** greasy protective film (to be used on dynamic surfaces e.g. cylinder rods & static surfaces e.g. blank steel surfaces)
2. Dow Corning Molykote® 1000 Paste: Anti-seize compound for application on bolts and nuts (to be used when bolts/nuts have to be released on a regular basis, e.g. hatches).
3. Denso Ltd, Densotape: Flexible anti corrosion tape (to be used for application on hydraulic fittings, e.g. sockets)
4. Autol Top 2000 grease: Lubricant for general purpose, OLF-compliant (to be used mandatory for all bowls and slips lubrication applications).
5. Paint repairs: Frame & top cover acc. to NOV paint specification P-002, except scratch marks, small damages surface < 5 cm<sup>2</sup>, for which NOV paint specification P-001 is acceptable. All other parts acc. to P-001.
6. Castrol Hyspin AWH-M 32: Hydraulic fluid (to be used for the hydraulic system, see also user's manual for details).
7. Plugs / caps: Plastic/steel plugs/caps (to be used for plugging/capping open fittings/QD's)
8. EP2: General multi purpose grease
9. Eoniromonpastax: Anti-galvanic corrosion paste (to be used on stainless steel threads).

## 5 PRESERVATION SPECIFICATION RECORDS

Record page 1 of 2		Serial No:.....	Shop-preservation				Customer's responsibility		
Activity No.:	Intervals (Months)	Description	Standard Preservative	Standard Shop-Preservation (sign)	Long term Preservative (optional)	Long term Shop-Preservation (sign)	Date/Sign Re-Preserved (1)	Date/Sign Re-Preserved (2)	Date/Sign Re-Preserved (3)
1	4	All unpainted static steel surface and flanges.	Rustilo DWX 32		Rustilo DWX 32				
2	4	All unpainted dynamic steel surfaces.	Rustilo DWX 32		Rustilo DWX 32				
3	4	Extended cylinder rods	Rustilo DWX 32		Rustilo DWX 32 + Denso Tape				
4	4	Bolts and nuts (head )	-		Rustilo DWX 32				
5	4	Bolts and nuts (threads; removable): e.g. Hatches, retainers, adjustment rods etc	Molykote® 1000		Molykote® 1000				
6	na	Bolts and nuts (threads; non removable)	EP2		EP2				
7	4	Hydraulic/pneumatic/grease fittings (open-end).	Plugs / caps		Plugs / caps + Denso tape				
8	4	Hydraulic/pneumatic/grease fittings (non open-end).	-		Denso tape				
9	4	Stainless steel threads e.g fittings	Eoniromon-pastax		Eoniromon-pastax				
10	na	Bearings	EP2		EP2				
11	na	Hydraulic system; pre-filled and drained	Hyspin AWH-M 32		Hyspin AWH-M 32				
Comments:									
Shop-Preservation Performed by: Date/Sign:									

## 6 PRESERVATION CHECKS RECORDS

Record page 2 of 2		Serial No:.....	Shop-preservation				Customer's responsibility		
Activity No.:	Intervals (Months)	Description	Standard Shop-Preservation (sign)				Date/Sign Re-Preserved (1)	Date/Sign Re-Preserved (2)	Date/Sign Re-Preserved (3)
12	na	All non-terminated cable ends fitted with shrinking shroud.							
13	na	J-boxes seals present and correctly fitted							
14	na	J-boxes checked for proper closing							
15	na	Inspect internals for moisture (must be dry)							
16	na	All spare cable entrances plugged							
17									
18									
19									
20									
21									
22									
Comments:									
Shop-Preservation Performed by: Date/Sign:									

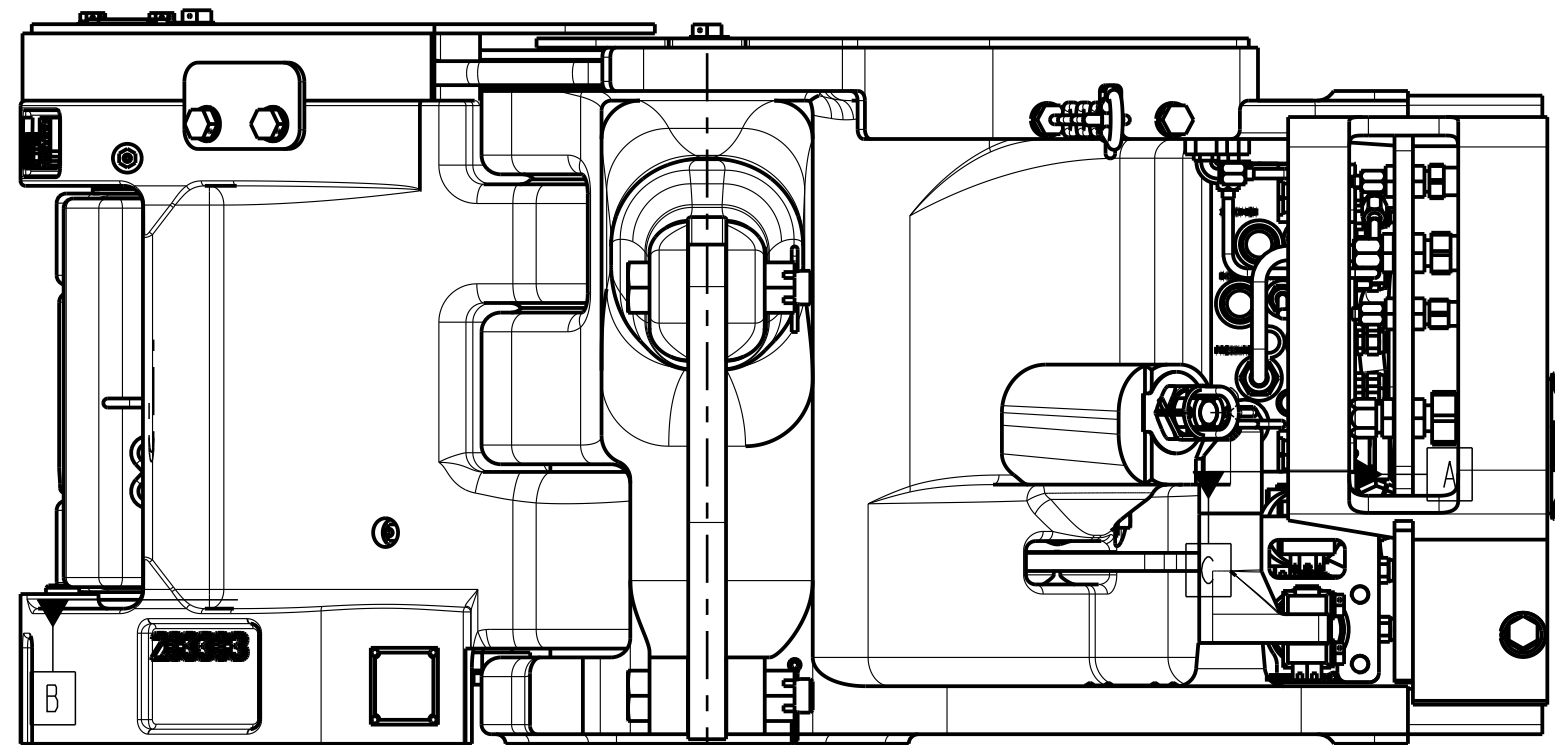
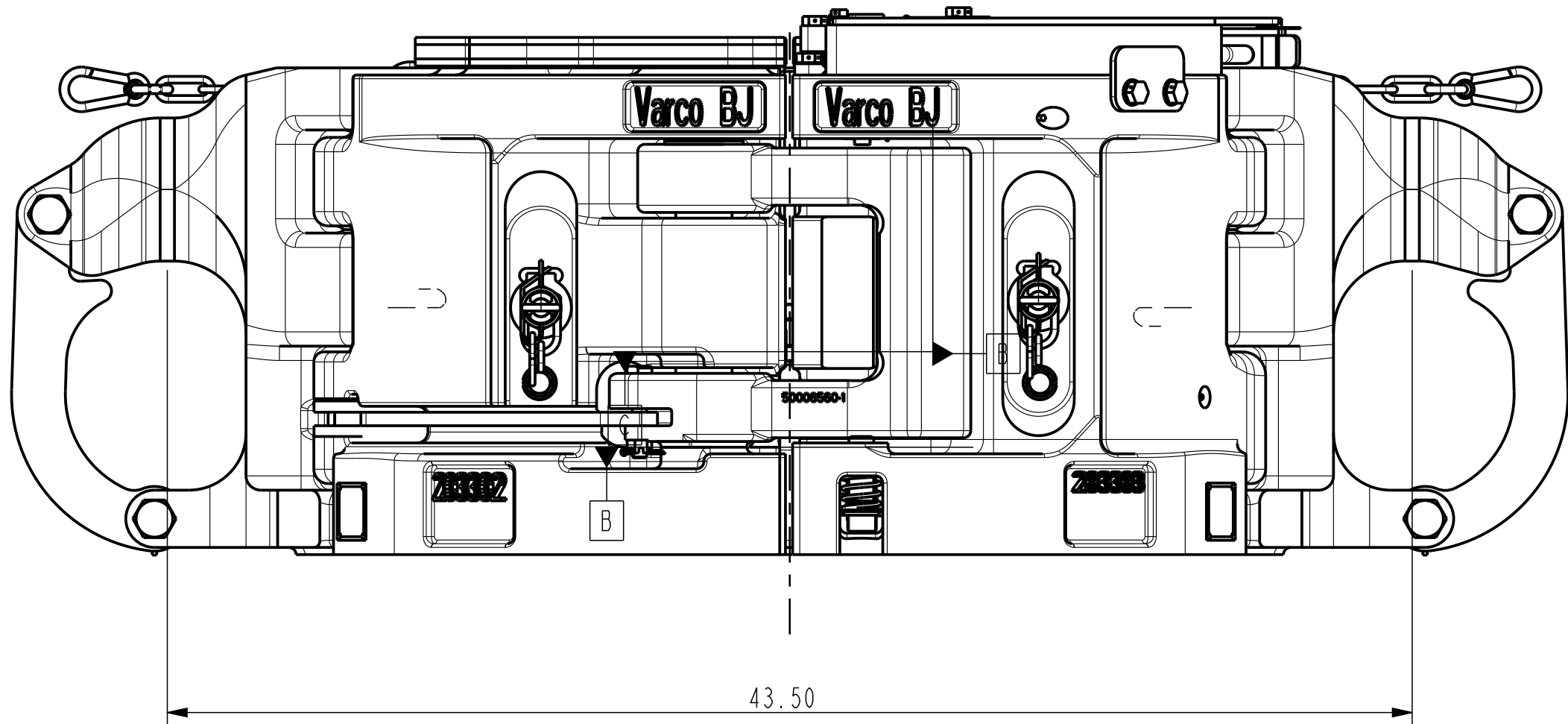
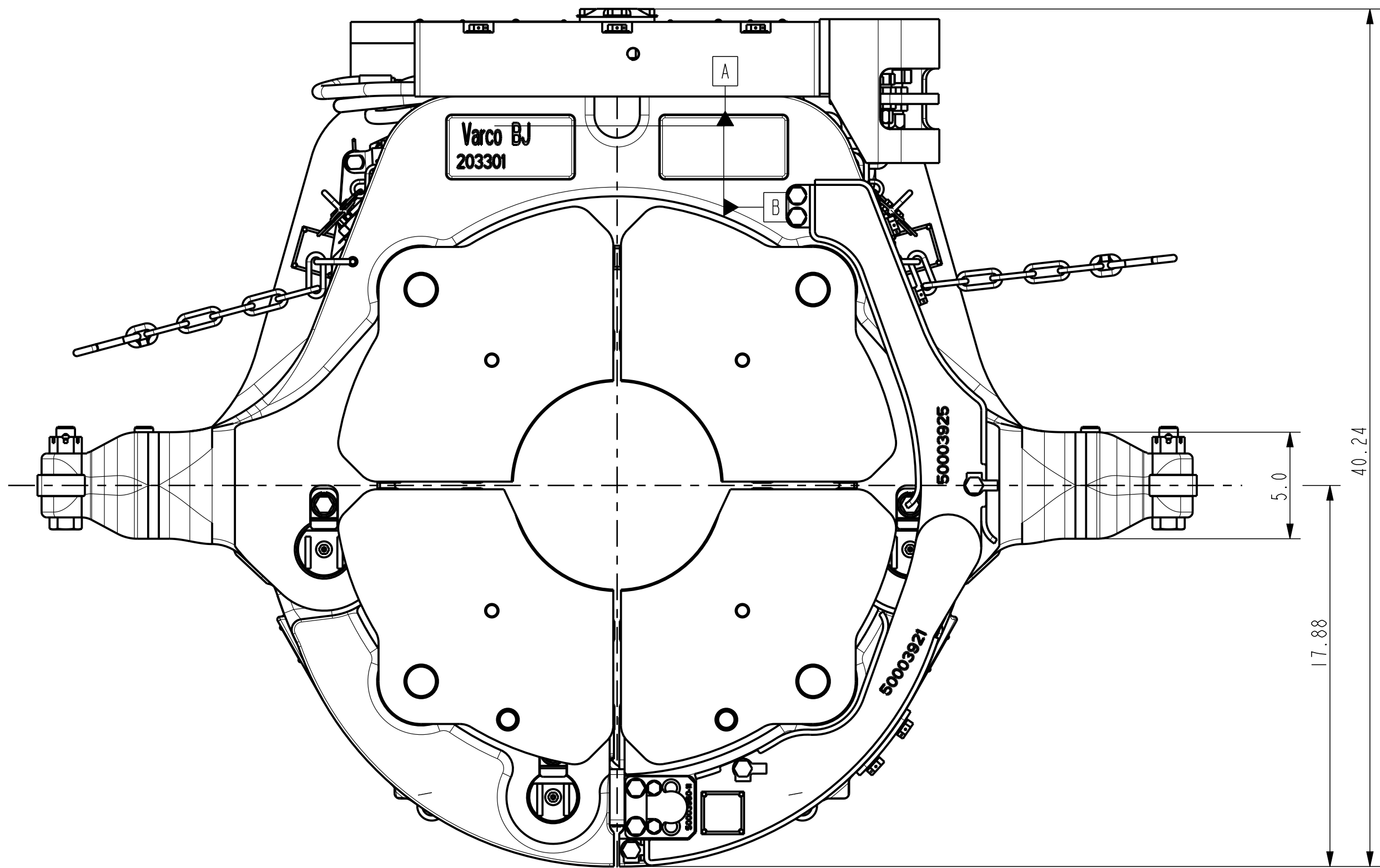
## 7 DE-PRESERVATION


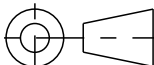
De-preservation must be done after installation and prior to commissioning. The commissioning activities comprise checking, functional activities and operational activities.

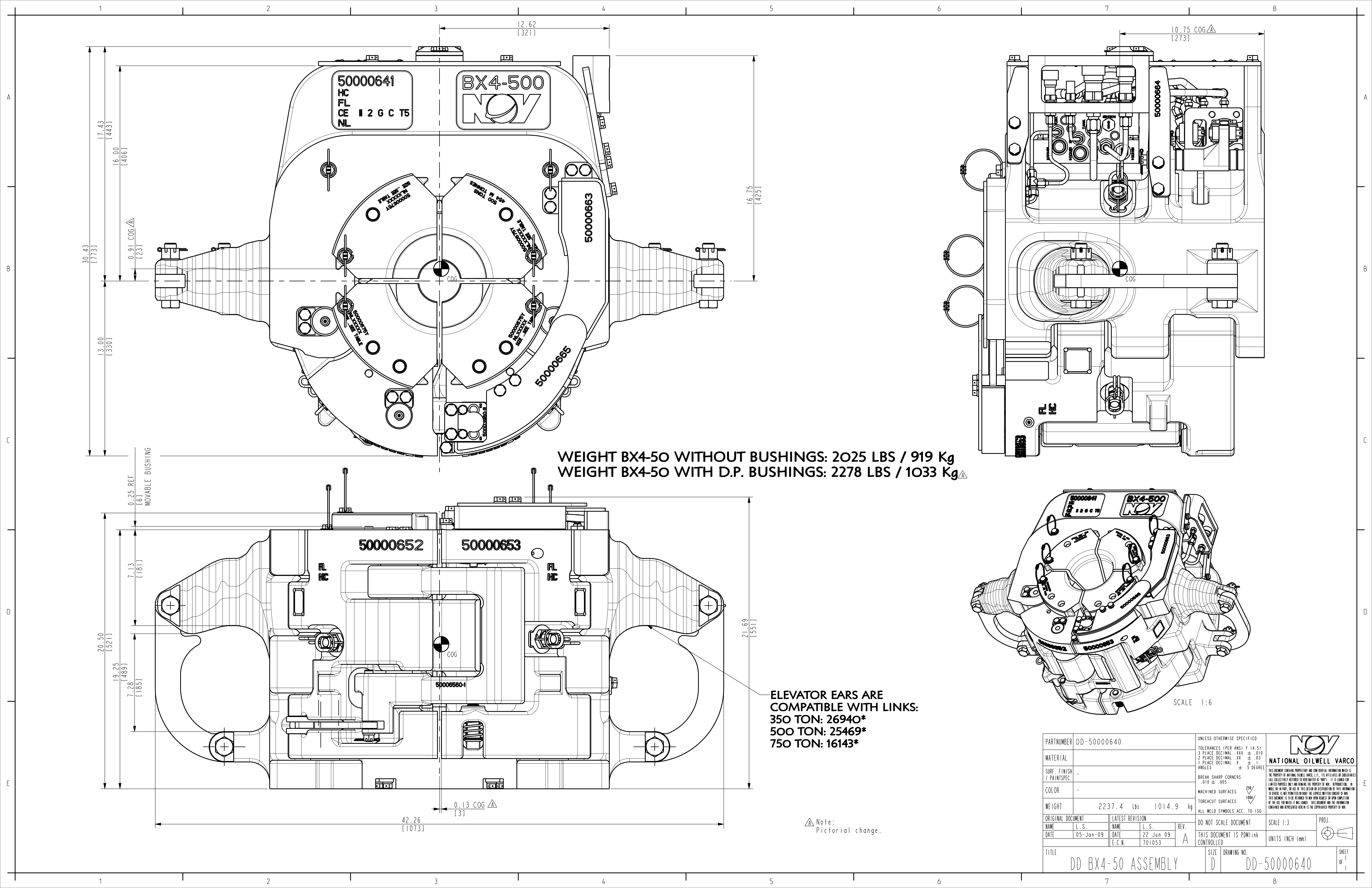
The following activities shall be performed to achieve de-preservation:


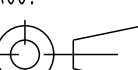
- Remove all protection structure and protective cloths.
- Extended cylinder rods to be washed with dissolving agent to remove preservation.
- Remove preservative from all unpainted steel surfaces and flanges.
- Remove (if applicable) Denso-tape of all parts necessary.
- Remove plugs or caps for all open-end fittings, which shall be available during operation.

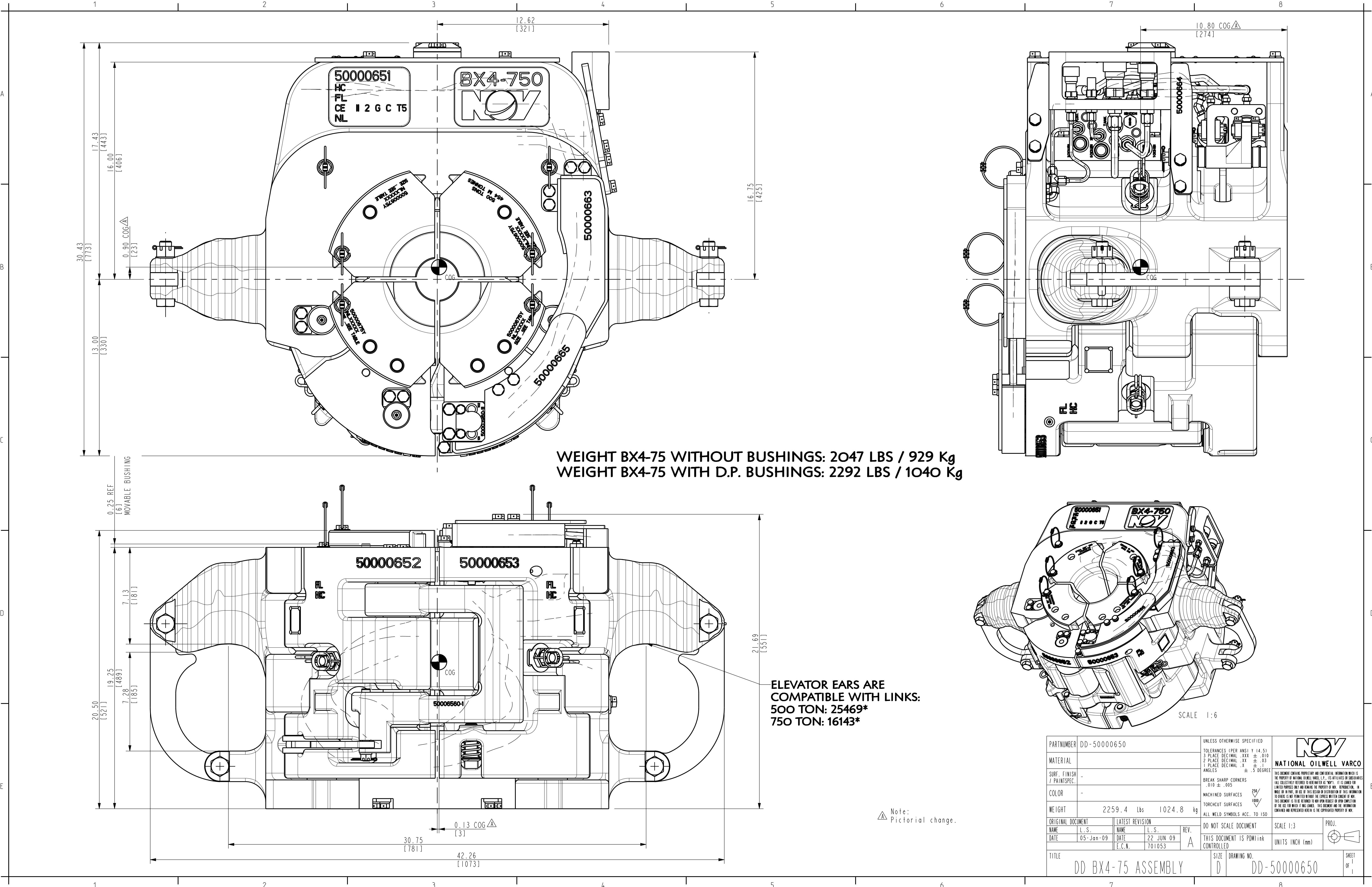



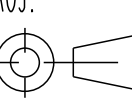


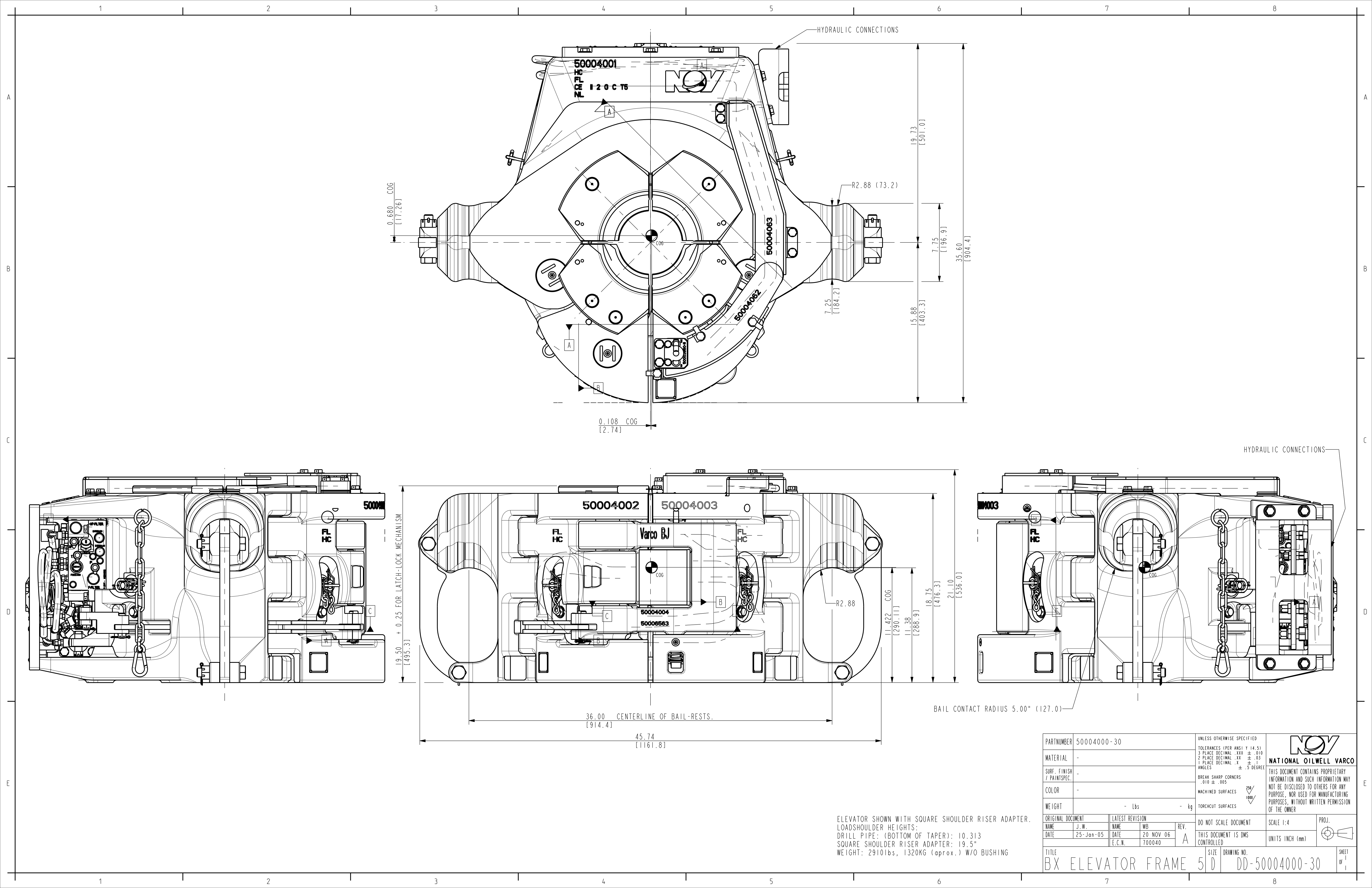
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MATERIAL -							
SURF. FINISH / PAINTSPEC. -							
COLOR -							
WEIGHT - Lbs - kg							
ORIGINAL DOCUMENT		LATEST REVISION		<div>DO NOT SCALE DOCUMENT</div> <div>THIS DOCUMENT IS PDMink CONTROLLED</div> <div>SCALE 1:5</div> <div>UNITS INCH (mm)</div> <div>PROJ. </div>			
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DATE	31-Aug-06	DATE	31-AUG-06			-	
		E.C.N.					
TITLE		SIZE		DRAWING NO.		SHEET	
BX ELEVATOR FRAME III		C		DD-203300-30		1 OF 1	



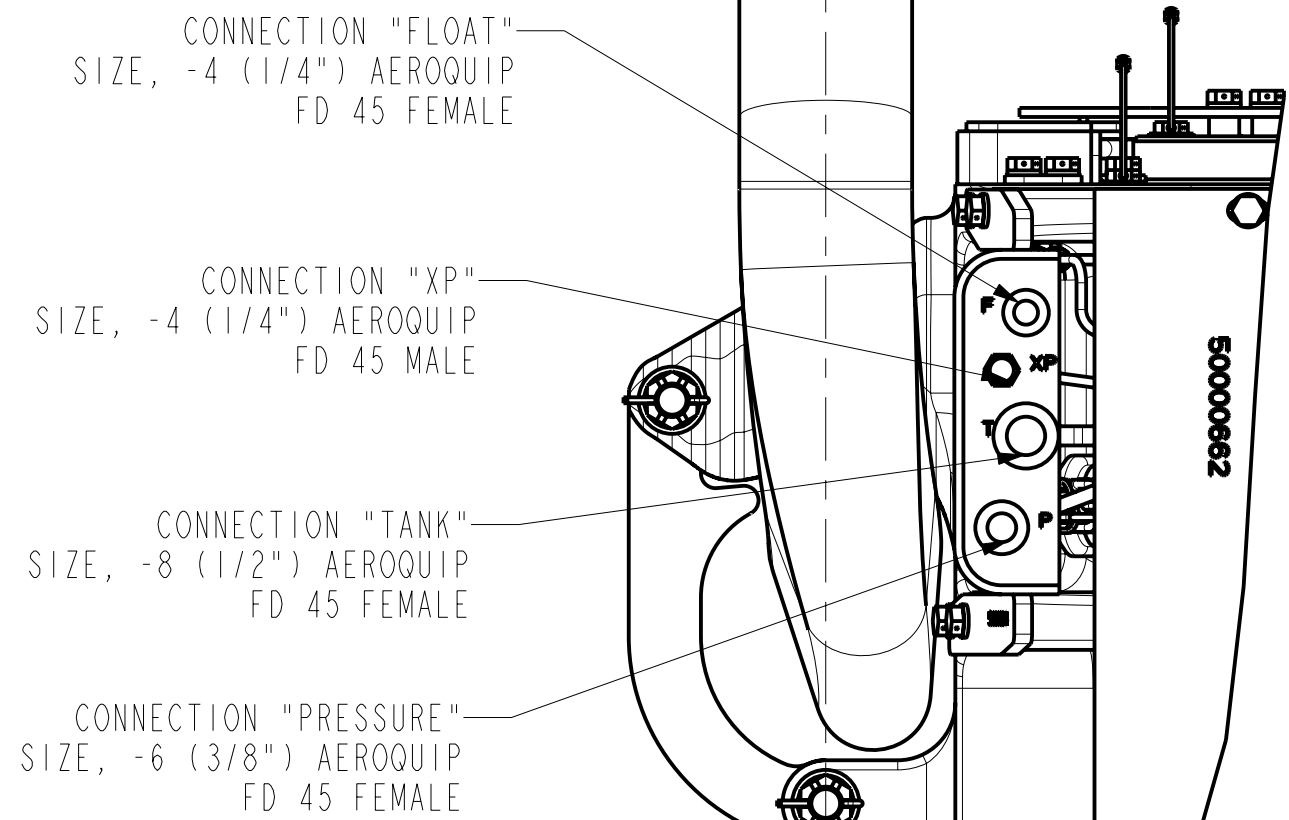
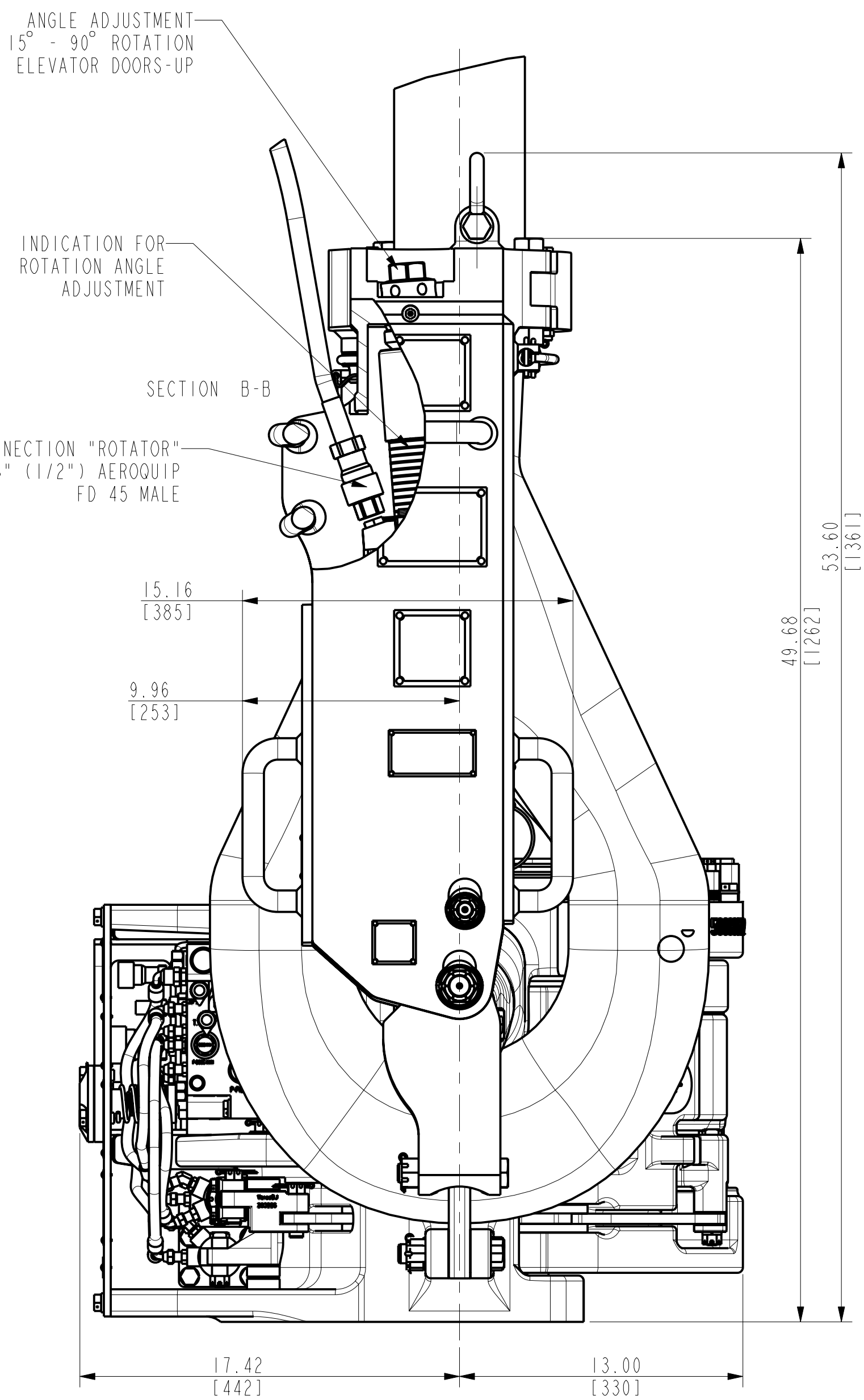
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SURF. FINISH / PAINTSPEC.		BREAK SHARP CORNERS .010 ± .005			
COLOR -		MACHINED SURFACES TORCHCUT SURFACES			
WEIGHT 2237.4 lbs 1014.9 kg		ALL WELD SYMBOLS ACC. TO ISO		<div><div>250/ 1000</div><div></div></div>	
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NAME L.S.		NAME L.S.		SCALE 1:3	
DATE 05-Jan-09		DATE 22 Jun 09		UNITS INCH (mm)	
E.C.N.		701053		A	
TITLE DD BX4-50 ASSEMBLY		SIZE D		DRAWING NO. DD-50000640	
				SHEET 1 OF 1	



PARTNUMBER DD-50000650		UNLESS OTHERWISE SPECIFIED		 <b>NATIONAL OILWELL VARCO</b>
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SURF. FINISH / PAINTSPEC. -		BREAK SHARP CORNERS .010 ± .005		THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES. IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.
COLOR -		MACHINED SURFACES TORCHCUT SURFACES		
WEIGHT 2259.4 lbs 1024.8 kg		ALL WELD SYMBOLS ACC. TO ISO		DO NOT SCALE DOCUMENT SCALE 1:3 PROJ. 
ORIGINAL DOCUMENT		LATEST REVISION		
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DATE 05-Jan-09	DATE 701053	E.C.N.		
TITLE DD BX4-75 ASSEMBLY		SIZE D		UNITS INCH (mm)
		DRAWING NO. DD-50000650		
				SHEET 1 OF 1

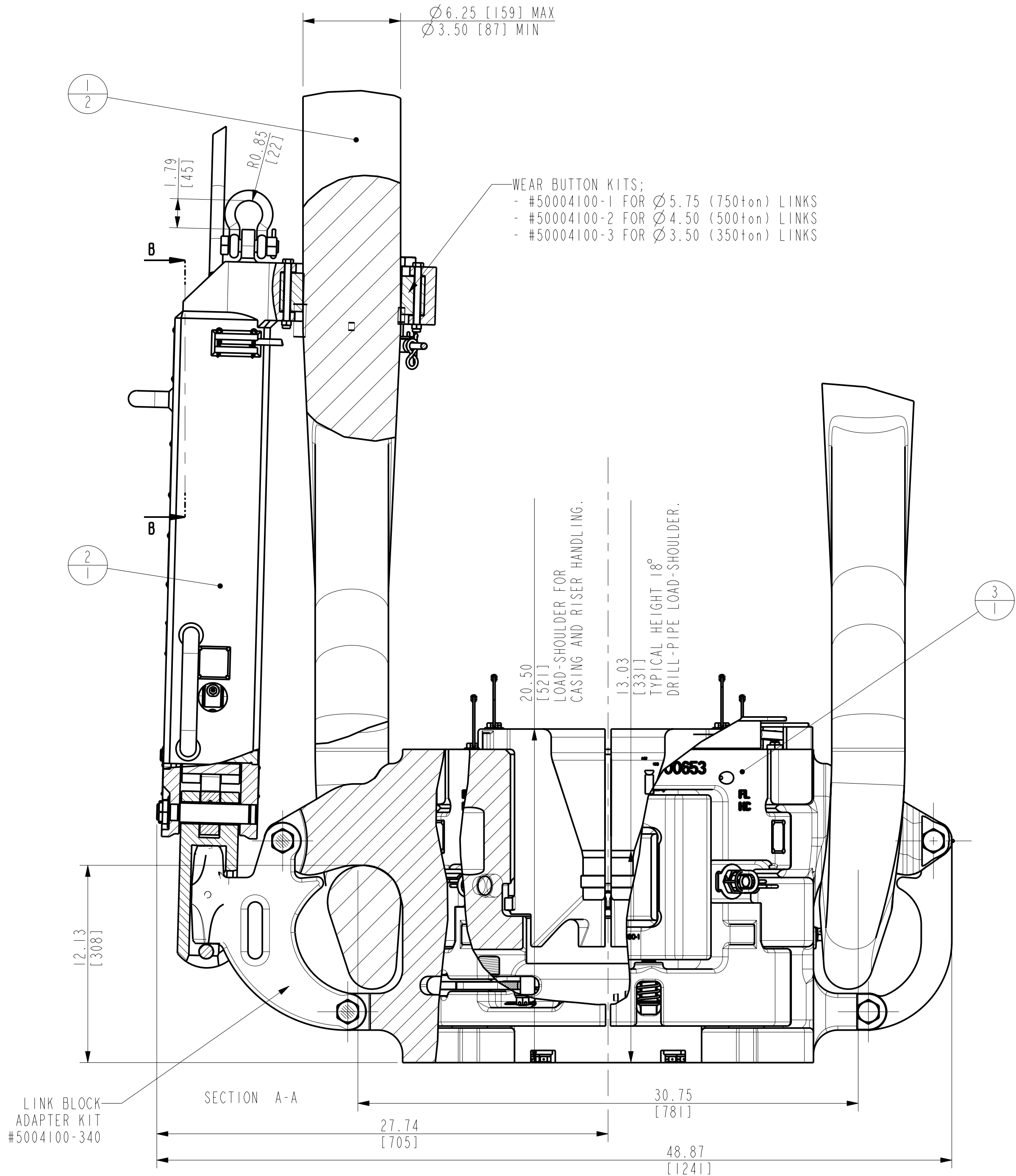




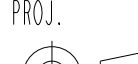
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1	2	16143-144	BAIL 750 TON, 144" LONG
2	1	50004130	UNIVERSAL ROTATOR BX
3	1	DD-50000640	DD BX4-50 ASSEMBLY

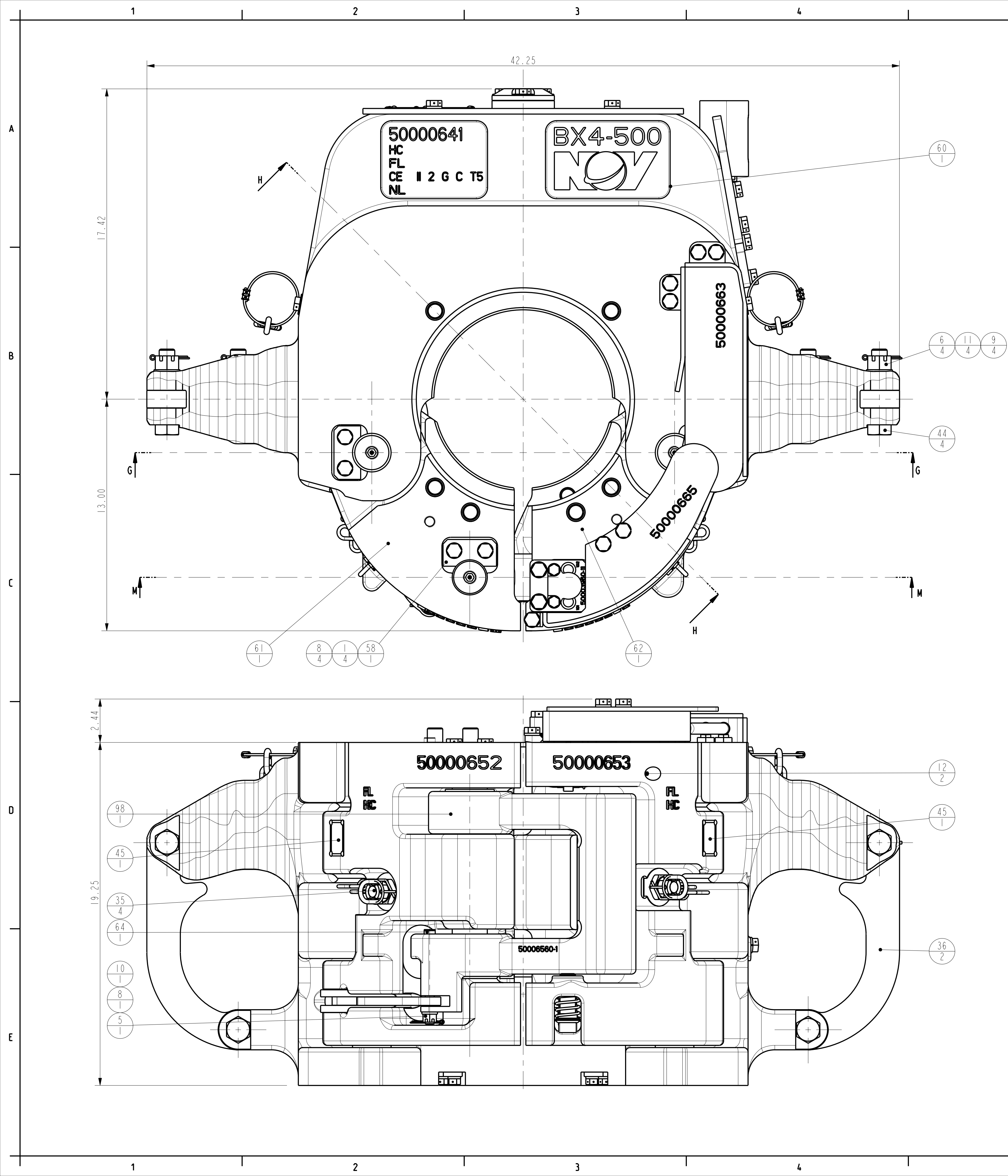


NOTE;

- ROTATION ANGLES 90° "DOORS-UP", INFINITE ADJUSTMENT BETWEEN 15° AND 90°
- 55° "DOOR-DOWN" FLOATING.
- COMBINATION AS SHOWN IS BX4-50 50000640Y WITH 750TON VARCO LINKS #16143Y144
- WEIGHT OF ROTATORS IS APPROX. 3301bs [150Kg]
- WEIGHT OF BX4-50/75 WITH HEAVIEST BUSHINGS FITTED IS APPROX. 2292 LBS (1040kg)
- DIMENSIONS AND WEIGHTS APPLY TO BOTH BX4-50 50000640Y AND BX4-75 50000650Y
- PRE-INSTALLATION SPECIFICATION/CHECKLIST; PSEL-0002
- ELEVATOR EARS OF THE BX4-50 50000640Y ARE COMPATIBLE WITH LINKS:  
350 TON: 26940\*, 500 TON 25469\* & 750 TON: 16143\*
- ELEVATOR EARS OF THE BX4-75 50000650Y ARE COMPATIBLE WITH LINKS:  
500 TON 25469\* & 750 TON: 16143\*
- COMMISSIONING TEST SPECIFICATION ROTATOR; TSEL-0089
- COMMISSIONING TEST SPECIFICATION BX 4; TSEL-0066
- OPERATIONAL ONE YEAR SPARES BX 4; 50000640-11
- COMMISSIONING SPARES BX 4; 50000640-12
- OPERATIONAL ONE YEAR SPARES ROTATOR; 50004130-11
- COMMISSIONING SPARES ROTATOR; 50004130-12




PARTNUMBER DD-50004130-7				UNLESS OTHERWISE SPECIFIED				 NATIONAL OILWELL VARCO	
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES .5 DEGREE					
SURF. FINISH / PAINTSPEC. -				BREAK SHARP CORNERS .010 ± .005					
COLOR -				MACHINED SURFACES					
				TORCHCUT SURFACES					
WEIGHT 6255.9 lbs 2837.6 kg				ALL WELD SYMBOLS ACC. TO ISO					
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT				SCALE 1:5	
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DATE 22-Jun-09		DATE 23 Jun 09		THIS DOCUMENT IS PDWlink CONTROLLED				UNITS INCH (mm)	
		E.C.N. 701053							
TITLE				SIZE		DRAWING NO.		SHEET 1 OF 1	
General Arrangement BX-4 with Rotator				D		DD-50004130-7			

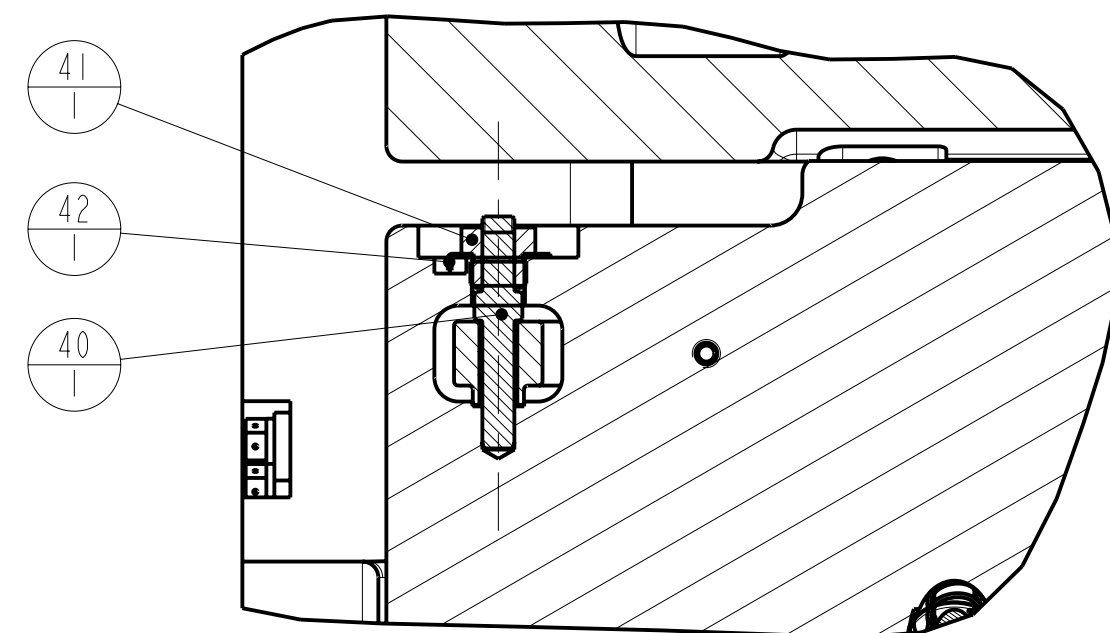
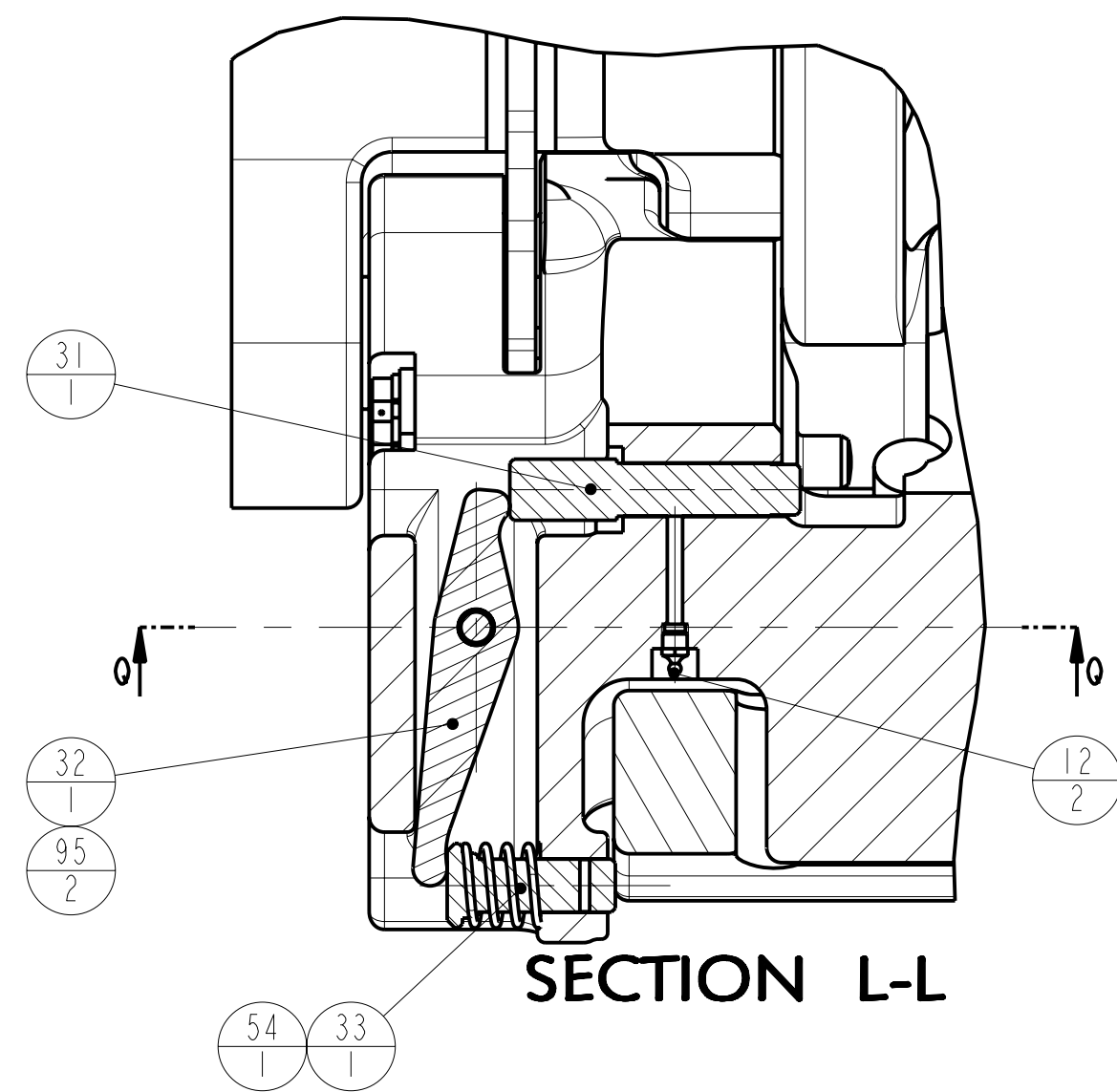
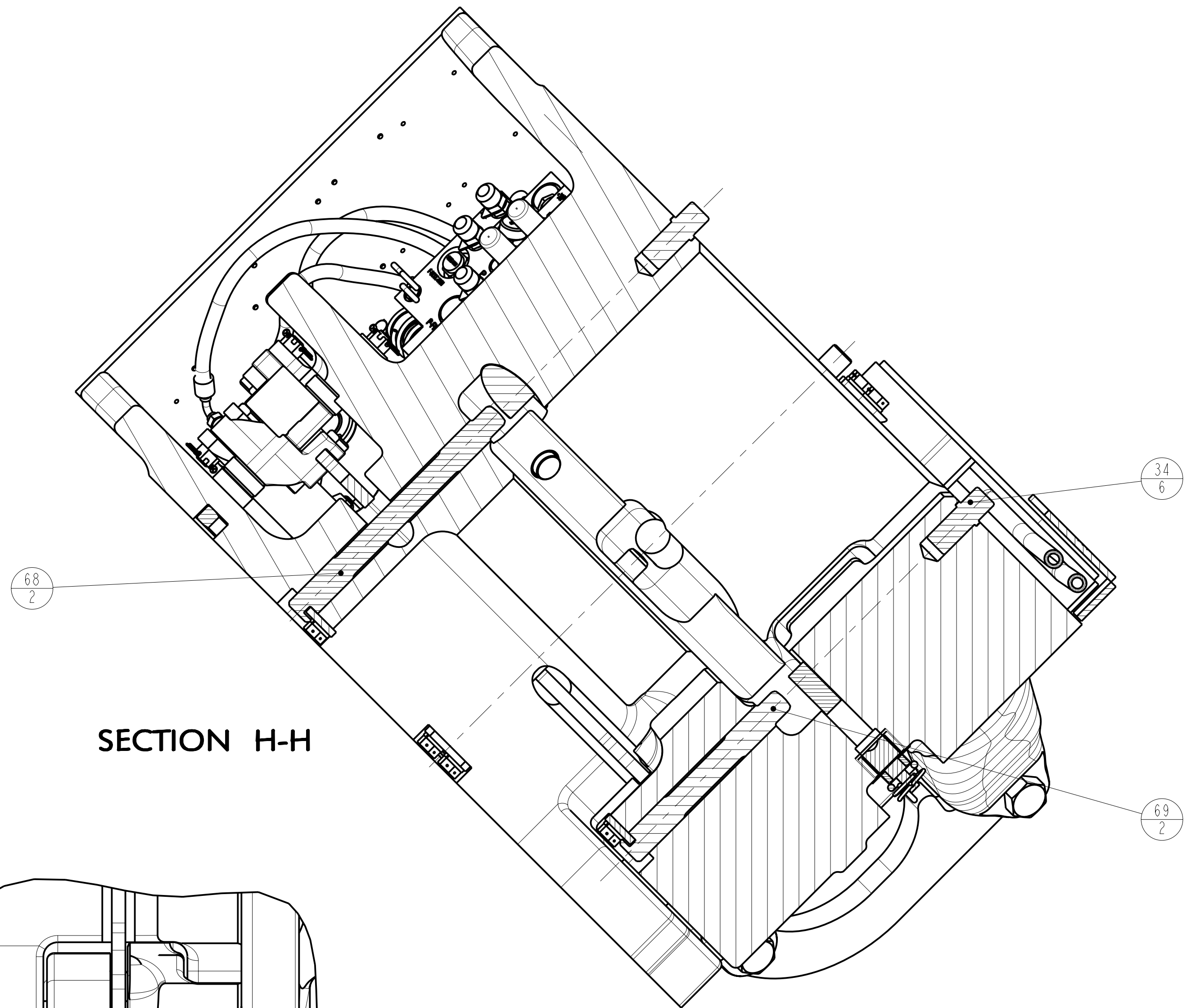
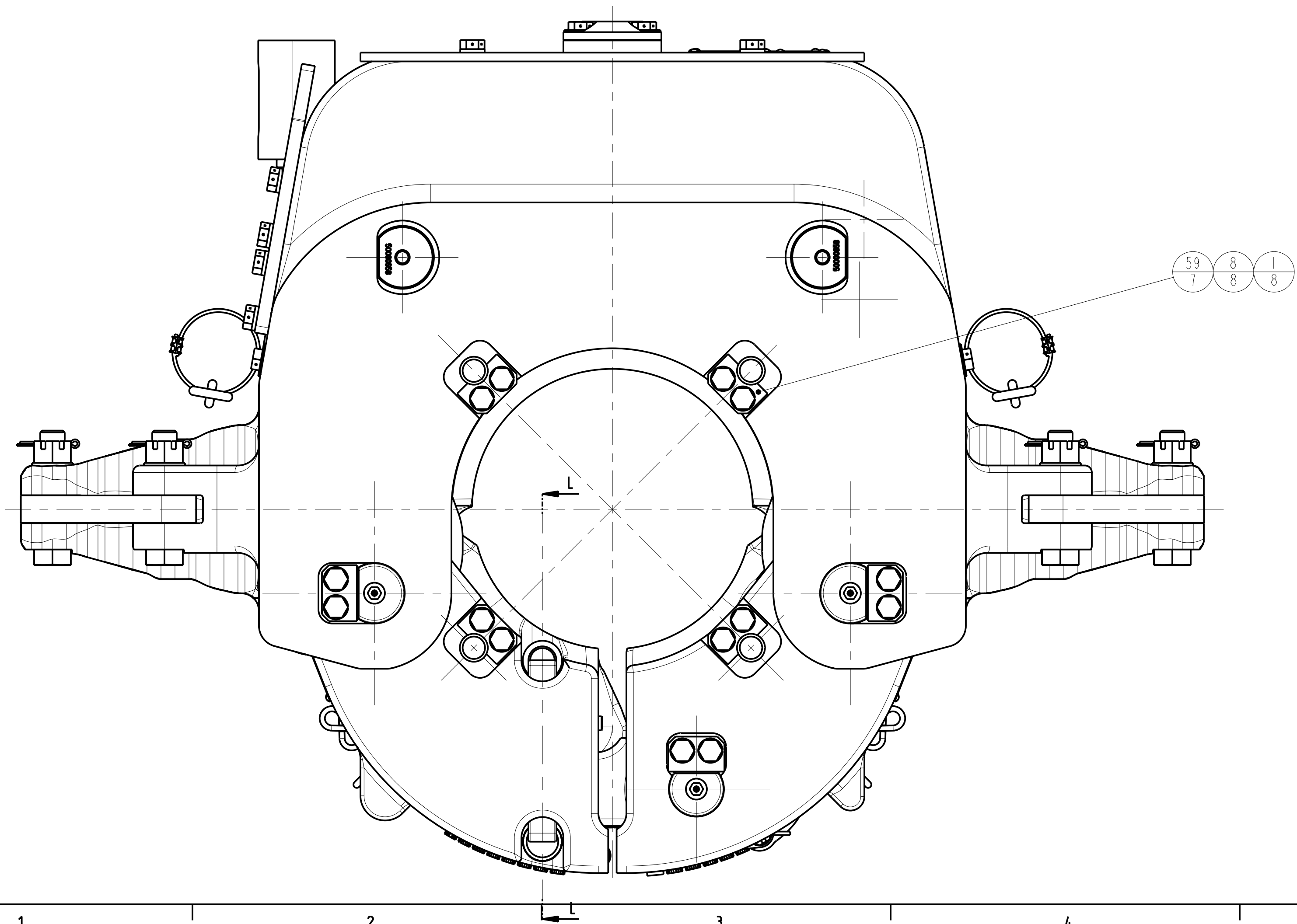
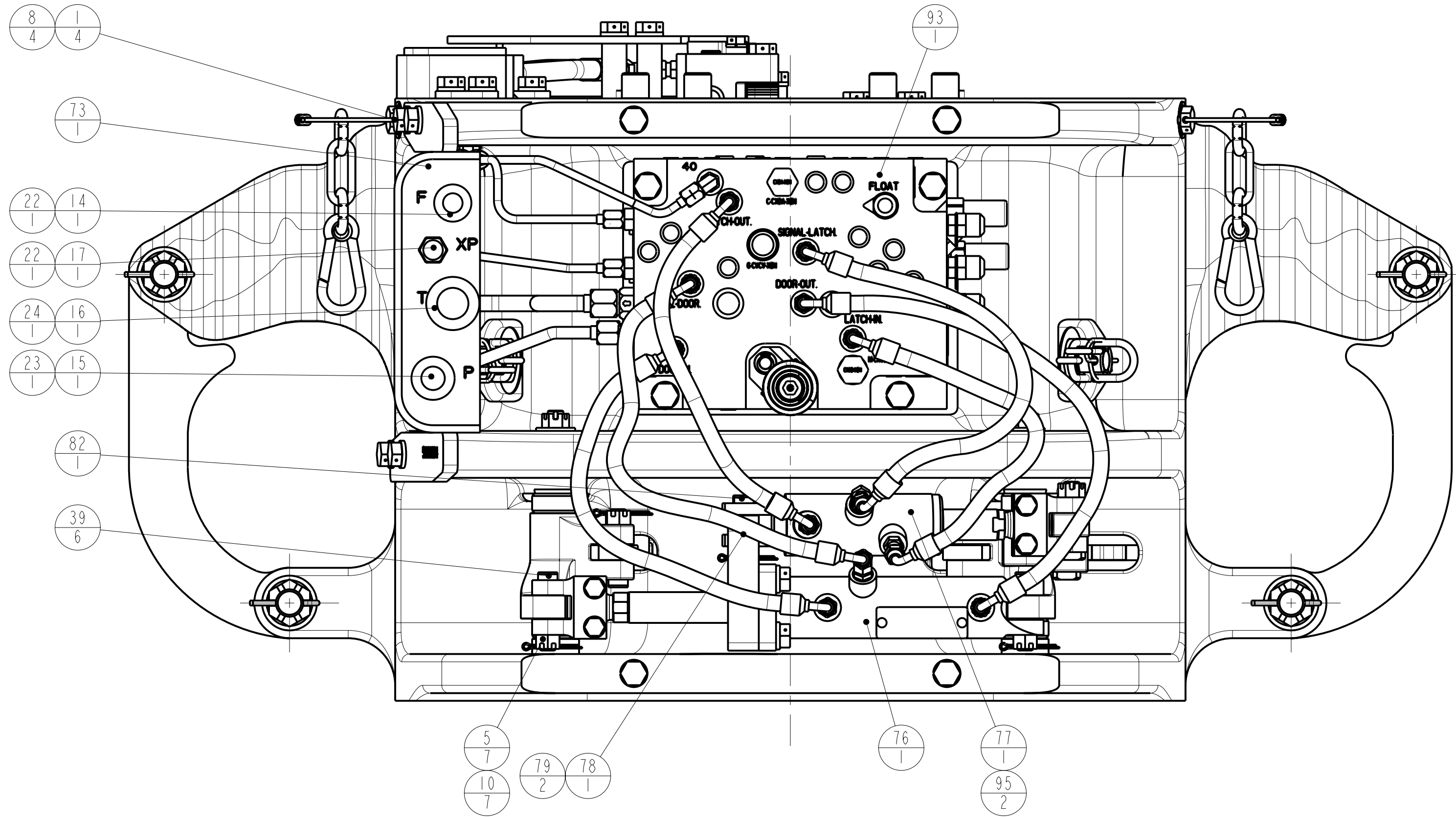



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
57	1	980475	COMPRESSION SPRING D-320	1	33	50008-08-C8D	SCREW,CAP-HEX HD (UNC 1/2")
58	3	50000217	LOCKPLATE HINGE PIN DOOR BXS	2	3	50008-10-C8D	SCREW,CAP-HEX HD (UNC 1/2")
59	7	50000218	LOCKPLATE HINGE PIN LATCH BXS	3	2	50008-18-C8D	SCREW,CAP-HEX HD (UNC 1/2")
60	1	50000641	BODY MACHINING BX4-500	4	6	50008-22-C8D	SCREW,CAP-HEX HD (UNC 1/2")
61	1	50000652	LEFT DOOR MACHINING BX4	5	9	50508-C	NUT, HEX-SLOTTED 1/2-13
62	1	50000653	MACHINING RIGHT DOOR BX4	6	4	50514-C	NUT, HEX-SLOTTED 7/8-9
63	1	50000654	LATCH LEVER BX4-50/75	7	2	50808-R-C	WASHER, FLAT 1/2" REGULAR
64	1	50000655	LATCH LEVER PIN BX4-50/75	8	42	50908-C	WASHER, LOCK-REGULAR 0.500
65	3	50000657	DOOR LEVER BX4-50/75	9	4	50914-C	WASHER, LOCK-REGULAR 0.875
66	2	50000658	Bracket pin for BX4-50/75	10	9	51402-12	COTTER PIN 0.125X1.5
67	4	50000659	BUSH BX4-50/75	11	4	51435-14	COTTER PIN 0.156 X 1.75
68	2	50000660	POSITION PIN BUSHING BODY BX4-50/75	12	4	53201	GREASE FITTING, STRAIGHT
69	2	50000660-1	POSITION PIN BUSHING DOOR BX4-50/75	13	26	53301-10-6	SCREW, DRIVE 0.179 DIA X 3/8
70	1	50000661	Trigger shaft for BX4-50/75	14	1	55908-4-4	FEMALE QUICK DISCONNECT FD45 -4
71	1	50000662	Backplate, Machining BX4-50/75	15	1	55908-6-6	FEMALE QUICK DISCONNECT FD45 -6
72	1	50000663	Hose protection (Body) for latch valve BX4-50/75	16	1	55908-8-8	FEMALE QUICK DISCONNECT FD45 -8
73	1	50000664	QD Bracket, Machining for BX4-50/75	17	1	55909-4-4	MALE QUICK DISCONNECT FD45 -4
74	1	50000665	Hose protection (Door) for latch valve BX4-50/75	18	4	56519-4-4-S	ELBOW 90 deg O-RING EXT.7/16UNF TO EXT.7/16 JIC
75	1	50000666	Hydraulic tubes BX4-75	19	1	56525-4-4-S	TEE-SWIVEL, 7/16"-20 JIC
76	1	50000667	Door cylinder BX4	20	2	56529-4-4-S	CONNECTOR SAE O-RING -4 TO 37 JIC -4
77	1	50000668	Latch cylinder BX3,4 & S	21	1	56548-4-4-S	ELBOW 45°, SWIVEL INT 37°/37°
78	1	50000669	BUSH BX4-50/75	22	2	56558-4-4-S	BULKHEAD ADAPTER, 1/4"-18NPT-7/16"JIC
79	2	50000669-1	BUSH BX4-50/75	23	1	56558-6-6-S	BULKHEAD ADAPTER, 3/8"-18NPT-9/16"JIC
80	2	50000670-1	HINGE PIN ASSEMBLY DOOR BX ELEVATOR FRAME 4-75	24	1	56558-8-8-S	BULKHEAD ADAPTER, 1/2"-14NPT-1/2"JIC
81	1	50000671-1	HINGE PIN ASSEMBLY LATCH BX4-75	25	1	201647	WARNING PLATE, GENERAL OVERHEAD LOAD
82	1	50000673	PIN LATCH CYLINDER BX4-50/75	26	1	202829	WARNING PLATE, GENERAL READ MANUAL
83	1	50000674	USE 1x 50005336, 1x 50003977 & 6x 203267-1	27	1	203224-1M	RIGHT DOOR BRACKET MACHINING
84	1	50000686	Rating Plate BX4-50	28	1	203225-1M	LEFT DOOR BRACKET MACHINING
85	1	50001003	Universal nameplate NOV	29	1	203226-1-M	CONTROL BRACKET LATCH
86	2	50002646	CABLE-BOLT FOR BX-BUSHINGS	30	2	203227	DISC
87	1	50003960-11	LATCH VALVE, ASS'Y FOR BX FRAME IV	31	1	203230	CONTROL SHAFT LATCH LOCK
88	4	50003968-1	SHIM 1MM FOR LATCH VALVE BX-IV	32	1	203231-2	LEVER, LATCH LOCK
89	3	50003968-2	SHIM 2MM FOR LATCH VALVE BX-IV	33	1	203232	LOCK SHAFT LATCH LOCK, BX
90	1	50003968-3	SHIM 3MM FOR LATCH VALVE BX-IV	34	6	203234	POSITION PIN BUSHING LOCK
91	1	50003977-BX4	HOSE, ASS'Y FOR LATCH VALVE BX-IV	35	4	203236-1	BUSHING LOCK ASSEMBLY
92	2	50003981	ADAPTER, STRAIGHT FOR LATCH VALVE	36	2	203241	LINK BLOCK
93	1	50004050-1	Ass'y Manifold BX frame 3, 4 & 5	37	2	203244	DOOR LEVER PIN
94	1	50004056	TRIGGER SPRING, SUPPORT RING.	38	2	203245	DISC LEVER PIN
95	12	50005325	Bushing, Aluminium/Bronze for BX Elevators	39	6	203246	BRACKET LEVER PIN
96	3	50005326	Bushing, Aluminium/Bronze for BX Elevators	40	1	203248	PIN LEVER LATCH LOCK
97	1	50005336-BX4	Hose SAE-4 for latch valve BX4	41	1	203249	LOCK PLUG LATCH LOCK
98	1	50006560-1	LATCH MACHINING BX FRAME IV	42	1	203251	LOCK RING 0.875 x 1.625
				43	4	203254	BUSHING 0.750
99	2	979878-61	CHAIN, NO 6, 1 LINK	44	4	203261	LINK BLOCK BOLT
100	1	50000125	INFO & READ MANUAL PLATE	45	2	203263	WARNING PLATE
				46	1	203265	RING, LATCH
				47	1	203280	END-CAP TRIGGERSHAFT
				48	5	979485-13	LOCKWASHER S.S. DIN432-
				49	2	979770-64	50X55X60 MM PLAIN BEARING
				50	3	979770-65	55X60X40 MM PLAIN BEARING
				51	5	979770-66	55X60X50 MM PLAIN BEARING
				52	2	979771-2520	GLACIER BEARING MB2520DU
				53	2	979855-4	SNAP HOOK STANDARD WITH CLOSED EYE
				54	1	980251	COMPRESSION SPRING D-294
				55	4	980293-4	CONNECTING LINK 1/4" CROSBY G-335
				56	1	980474	COMPRESSION SPRING D-270

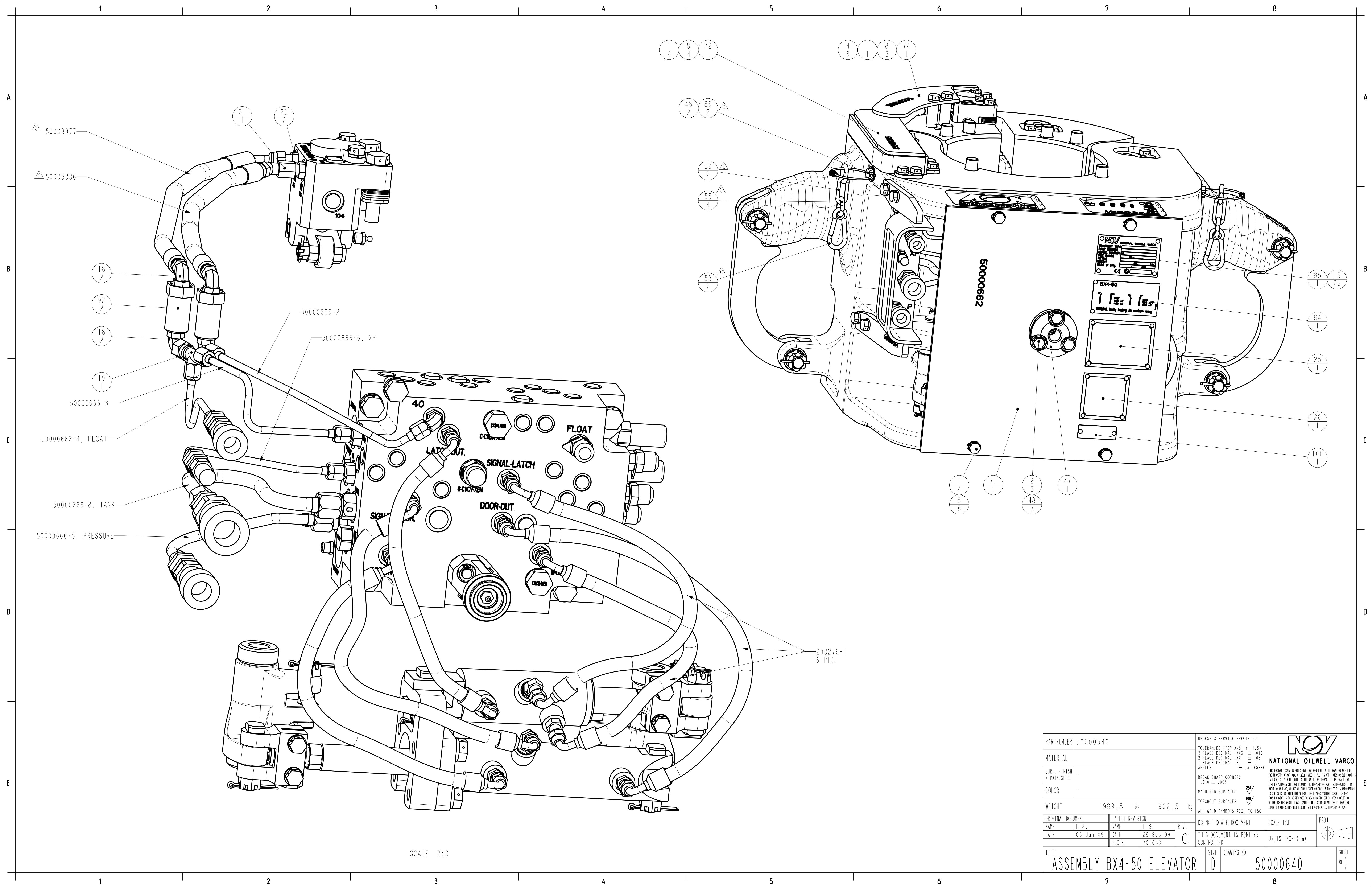
TEST ACCORDING TSEL-140

PARTNUMBER 50000640		UNLESS OTHERWISE SPECIFIED		 <b>NATIONAL OILWELL VARCO</b>	
TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE					
MATERIAL		BREAK SHARP CORNERS .010 ± .005		THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P. ITS AFFILIATES OR SUBSIDIARIES AND COLLECTIVELY REFERRED TO HEREIN AFTER AS "NOV". IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISSEMINATION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.	
SURF. FINISH 7 PAINTSPEC.		MACHINED SURFACES TORNCUT SURFACES			
COLOR -		ALL WELD SYMBOLS ACC. TO ISO		DO NOT SCALE DOCUMENT	
WEIGHT 1989.8 lbs 902.5 kg		NAME L.S. DATE 05 Jan 09		SCALE 1:3	
ORIGINAL DOCUMENT		LATEST REVISION		PROJ.	
NAME L.S. DATE 05 Jan 09		NAME L.S. DATE 28 Sep 09		THIS DOCUMENT IS PDWink CONTROLLED	
DATE 05 Jan 09		E.C.N. 701053		UNITS INCH (mm)	
TITLE ASSEMBLY BX4-50 ELEVATOR		SIZE D		DRAWING NO. 50000640	
				SHEET 1 OF 4	





PARTNUMBER 50000640		UNLESS OTHERWISE SPECIFIED		 NATIONAL OILWELL VARCO
MATERIAL		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		
SURF. FINISH / PAINTSPEC.		BREAK SHARP CORNERS .010 ± .005		THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES AND COLLECTIVELY REFERRED TO HEREIN AFTER AS "NOV". IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISSEMINATION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.
COLOR		MACHINED SURFACES TORNCUT SURFACES		
WEIGHT 1989.8 lbs 902.5 kg		ALL WELD SYMBOLS ACC. TO ISO		DO NOT SCALE DOCUMENT THIS DOCUMENT IS PDWink CONTROLLED
ORIGINAL DOCUMENT		LATEST REVISION		
NAME L.S.	NAME	L.S.	REV.	SCALE 1:3 UNITS INCH (mm)
DATE 05 Jan 09	DATE 28 Sep 09	E.C.N. 701053	C	
TITLE ASSEMBLY BX4-50 ELEVATOR		SIZE D		DRAWING NO. 50000640



50003977

50005336

18  
2

92  
2

18  
2

19  
1

50000666-3

50000666-4, FLOAT

50000666-8, TANK

50000666-5, PRESSURE

50000666-2

50000666-6, XP

40

DOOR-IN

DOOR-OUT

FLOAT

LATCH-OUT





SIGNAL-LATCH

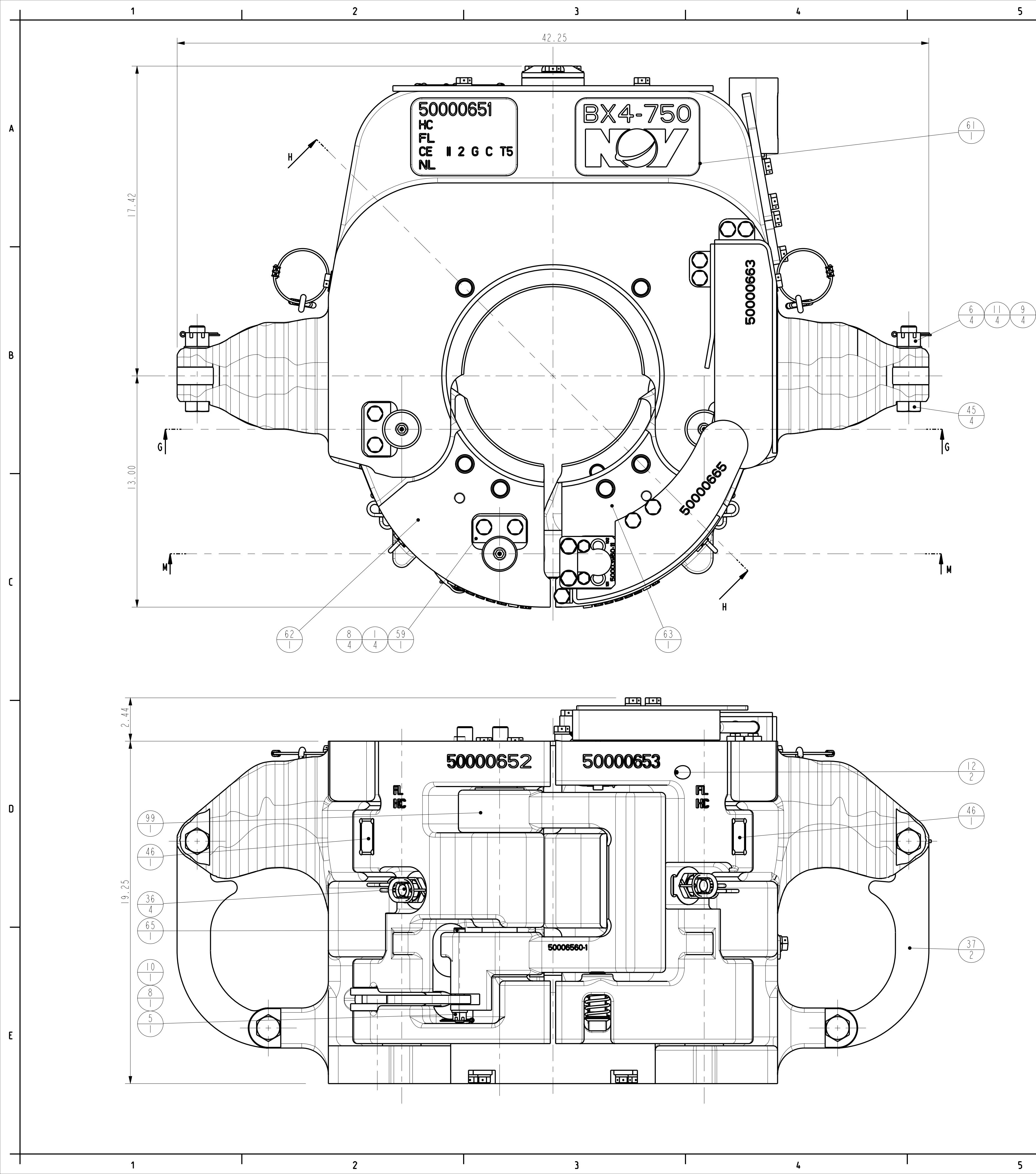
6 CYCLES

DOOR-OUT

203276-1  
6 PLC

SCALE 2:3

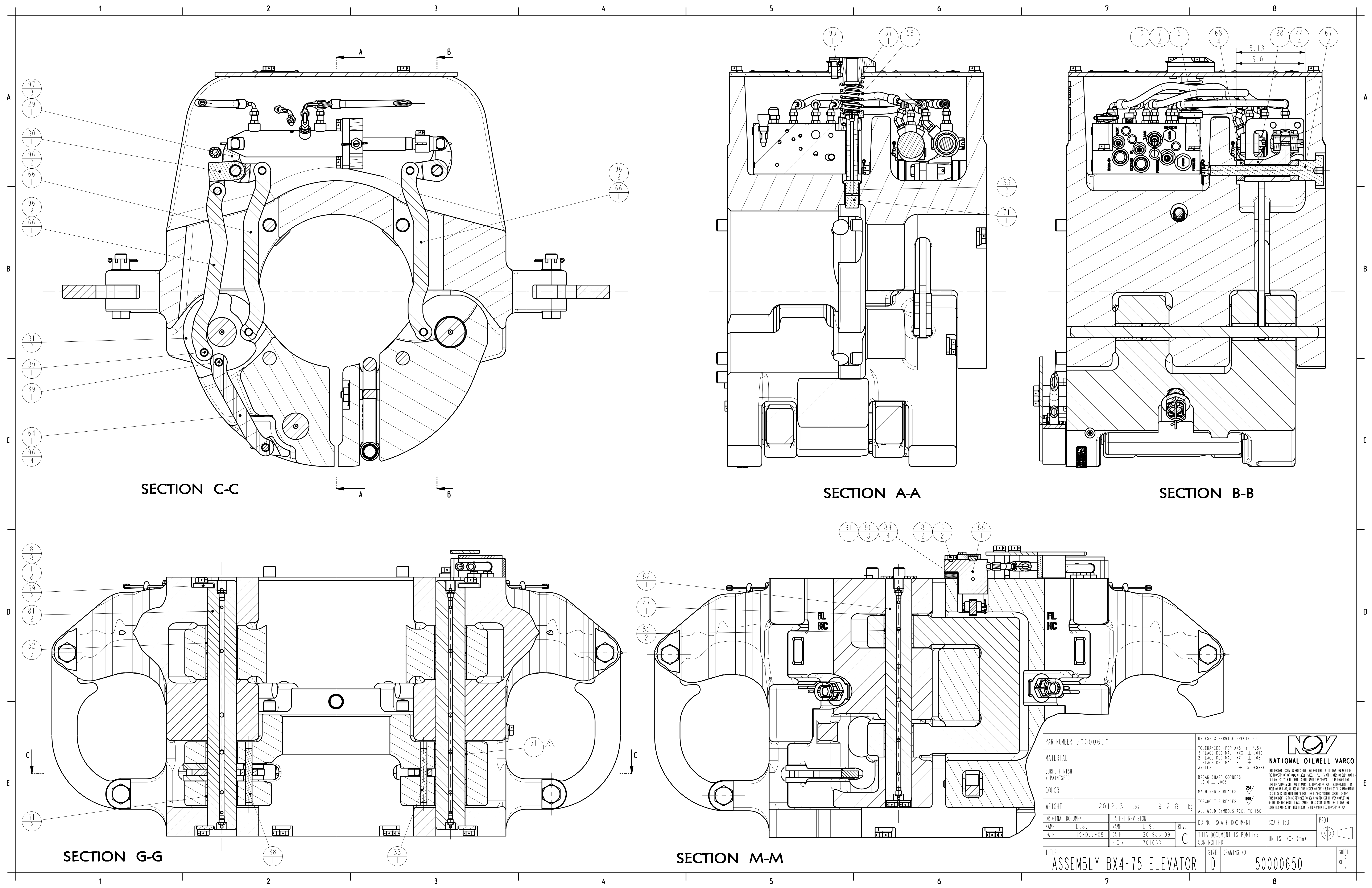
PARTNUMBER 50000640		UNLESS OTHERWISE SPECIFIED		<div> NATIONAL OILWELL VARCO</div> <div><small>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P. ITS AFFILIATES OR SUBSIDIARIES AND IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISSEMINATION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.</small></div>	
MATERIAL		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE			
SURF. FINISH / PAINTSPEC.	-	BREAK SHARP CORNERS .010 ± .005		<div></div>	
COLOR	-	MACHINED SURFACES		<div></div>	
WEIGHT	1989.8 lbs 902.5 kg	TORCHCUT SURFACES		ALL WELD SYMBOLS ACC. TO ISO	
ORIGINAL DOCUMENT	LATEST REVISION	DO NOT SCALE DOCUMENT		SCALE 1:3	PROJ.
NAME L.S.	NAME L.S.	THIS DOCUMENT IS PDWink CONTROLLED		UNITS INCH (mm)	<div></div>
DATE 05 Jan 09	DATE 28 Sep 09	REV. C			
	E.C.N. 701053				
TITLE ASSEMBLY BX4-50 ELEVATOR		SIZE D	DRAWING NO. 50000640	SHEET 4 OF 4	

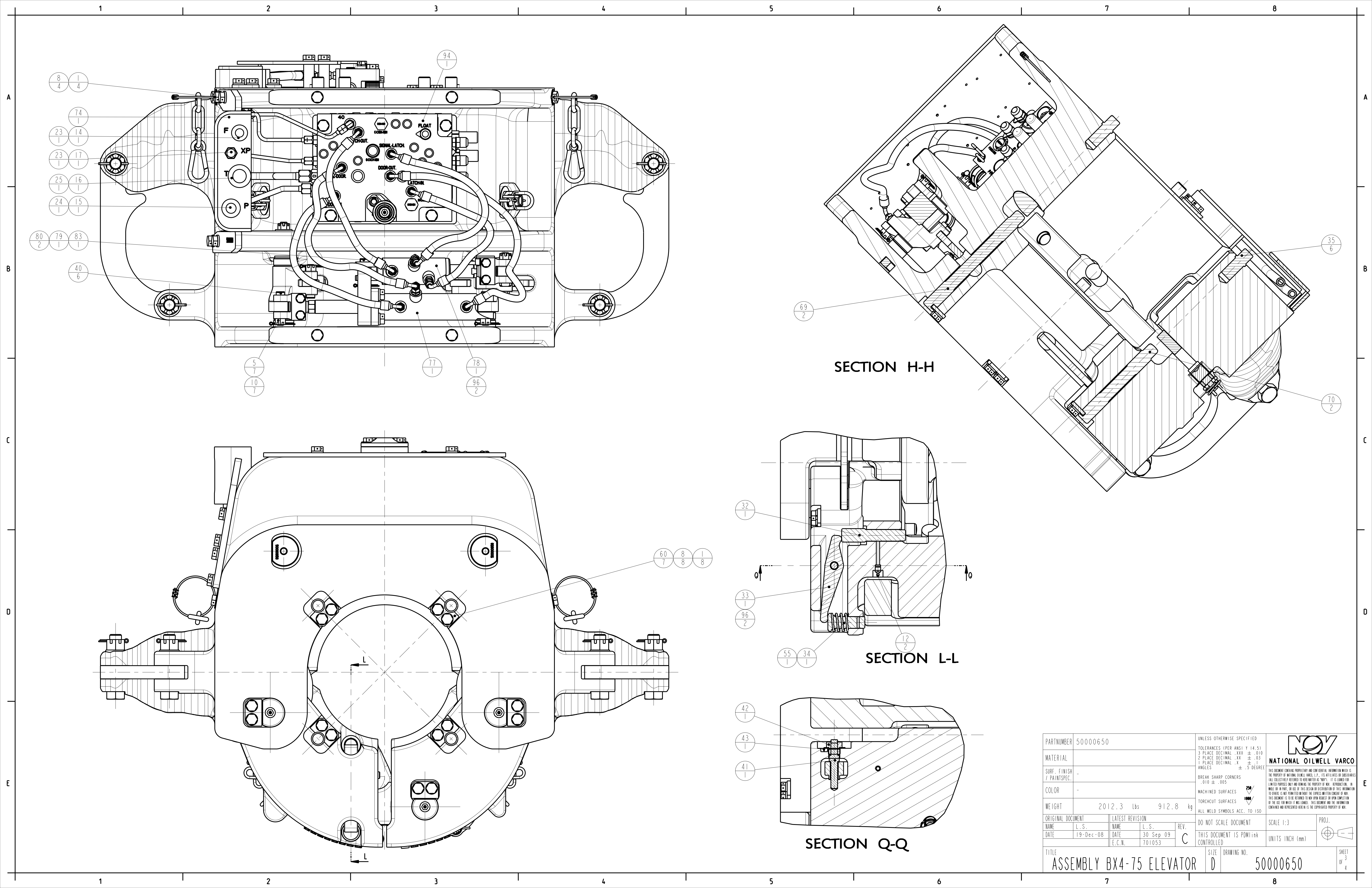





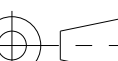
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
57	1	980474	COMPRESSION SPRING D-270	1	33	50008-08-C8D	SCREW,CAP-HEX HD (UNC 1/2")
58	1	980475	COMPRESSION SPRING D-320	2	3	50008-10-C8D	SCREW,CAP-HEX HD (UNC 1/2")
59	3	50000217	LOCKPLATE HINGE PIN DOOR BXS	3	2	50008-18-C8D	SCREW,CAP-HEX HD (UNC 1/2")
60	7	50000218	LOCKPLATE HINGE PIN LATCH BXS	4	6	50008-22-C8D	SCREW,CAP-HEX HD (UNC 1/2")
61	1	50000651	BODY MACHINING BX4-75	5	9	50508-C	NUT, HEX-SLOTTED 1/2-13
62	1	50000652	LEFT DOOR MACHINING BX4	6	4	50514-C	NUT, HEX-SLOTTED 7/8-9
63	1	50000653	MACHINING RIGHT DOOR BX4	7	2	50808-R-C	WASHER, FLAT 1/2" REGULAR
64	1	50000654	LATCH LEVER BX4-50/75	8	42	50908-C	WASHER, LOCK-REGULAR 0.500
65	1	50000655	LATCH LEVER PIN BX4-50/75	9	4	50914-C	WASHER, LOCK-REGULAR 0.875
66	3	50000657	DOOR LEVER BX4-50/75	10	9	51402-12	COTTER PIN 0.125X1.5
67	2	50000658	Bracket pin for BX4-50/75	11	4	51435-14	COTTER PIN 0.156 X 1.75
68	4	50000659	BUSH BX4-50/75	12	4	53201	GREASE FITTING, STRAIGHT
69	2	50000660	POSITION PIN BUSHING BODY BX4-50/75	13	26	53301-10-6	SCREW, DRIVE 0.179 DIA X 3/8
70	2	50000660-1	POSITION PIN BUSHING DOOR BX4-50/75	14	1	55908-4-4	FEMALE QUICK DISCONNECT FD45 -4
71	1	50000661	Trigger shaft for BX4-50/75	15	1	55908-6-6	FEMALE QUICK DISCONNECT FD45 -6
72	1	50000662	Backplate, Machining BX4-50/75	16	1	55908-8-8	FEMALE QUICK DISCONNECT FD45 -8
73	1	50000663	Hose protection (Body) for latch valve BX4-50/75	17	1	55909-4-4	MALE QUICK DISCONNECT FD45 -4
74	1	50000664	OD Bracket, Machining for BX4-50/75	18	4	56519-4-4-S	ELBOW 90 deg O-RING EXT.7/16UNF TO EXT.7/16 JIC
75	1	50000665	Hose protection (Door) for latch valve BX4-50/75	19	1	56525-4-4-S	TEE-SWIVEL, 7/16"-20 JIC
76	1	50000666	Hydraulic tubes BX4-75	20	2	56529-4-4-S	CONNECTOR SAE O-RING -4 TO 37 JIC -4
77	1	50000667	Door cylinder BX4	21	1	56548-4-4-S	ELBOW 45°, SWIVEL INT 37°/37°
78	1	50000668	Latch cylinder BX3,4 & S	22	1	56557-4-4-S	ELBOW, 45DEGR. O-RING BOSS / 37 JIC MALE
79	1	50000669	BUSH BX4-50/75	23	2	56558-4-4-S	BULKHEAD ADAPTER, 1/4"-18NPT-7/16"JIC
80	2	50000669-1	BUSH BX4-50/75	24	1	56558-6-6-S	BULKHEAD ADAPTER, 3/8"-18NPT-9/16"JIC
81	2	50000670-1	HINGE PIN ASSEMBLY DOOR BX ELEVATOR FRAME 4-75	25	1	56558-8-8-S	BULKHEAD ADAPTER, 1/2"-14NPT-1/2"JIC
82	1	50000671-1	HINGE PIN ASSEMBLY LATCH BX4-75	26	1	201647	WARNING PLATE, GENERAL OVERHEAD LOAD
83	1	50000673	PIN LATCH CYLINDER BX4-50/75	27	1	202829	WARNING PLATE, GENERAL READ MANUAL
84	1	50000674	USE 1x 50005336, 1x 50003977 & 6x 203267-1	28	1	203224-1M	RIGHT DOOR BRACKET MACHINING
85	1	50000687	Rating Plate BX4-75	29	1	203225-1M	LEFT DOOR BRACKET MACHINING
86	1	50001003	Universal nameplate NOV	30	1	203226-1-M	CONTROL BRACKET LATCH
87	2	50002646	CABLE-BOLT FOR BX-BUSHINGS	31	2	203227	DISC
88	1	50003960-11	LATCH VALVE, ASS'Y FOR BX FRAME IV	32	1	203230	CONTROL SHAFT LATCH LOCK
89	4	50003968-1	SHIM 1MM FOR LATCH VALVE BX-IV	33	1	203231-2	LEVER, LATCH LOCK
90	3	50003968-2	SHIM 2MM FOR LATCH VALVE BX-IV	34	1	203232	LOCK SHAFT LATCH LOCK, BX
91	1	50003968-3	SHIM 3MM FOR LATCH VALVE BX-IV	35	6	203234	POSITION PIN BUSHING LOCK
92	1	50003977-BX4	HOSE, ASS'Y FOR LATCH VALVE BX-IV	36	4	203236-1	BUSHING LOCK ASSEMBLY
93	2	50003981	ADAPTER, STRAIGHT FOR LATCH VALVE	37	2	203241	LINK BLOCK
94	1	50004050-1	Ass'y Manifold BX frame 3, 4 & 5	38	2	203244	DOOR LEVER PIN
95	1	50004056	TRIGGER SPRING, SUPPORT RING.	39	2	203245	DISC LEVER PIN
96	14	50005325	Bushing, Aluminium/Bronze for BX Elevators	40	6	203246	BRACKET LEVER PIN
97	3	50005326	Bushing, Aluminium/Bronze for BX Elevators	41	1	203248	PIN LEVER LATCH LOCK
98	1	50005336-BX4	Hose SAE-4 for latch valve BX4	42	1	203249	LOCK PLUG LATCH LOCK
99	1	50006560-1	LATCH MACHINING BX FRAME IV	43	1	203251	LOCK RING 0.875 x 1.625
				44	4	203254	BUSHING 0.750
100	2	979878-61	CHAIN, NO 6, 1 LINK	45	4	203261	LINK BLOCK BOLT
101	1	50000125	INFO & READ MANUAL PLATE	46	2	203263	WARNING PLATE
				47	1	203265	RING, LATCH
				48	1	203280	END-CAP TRIGGERSHAFT
				49	5	979485-13	LOCKWASHER S.S. DIN432-
				50	2	979770-64	50X55X60 MM PLAIN BEARING
				51	3	979770-65	55X60X40 MM PLAIN BEARING
				52	5	979770-66	55X60X50 MM PLAIN BEARING
				53	2	979771-2520	GLACIER BEARING MB2520DU
				54	2	979855-4	SNAP HOOK STANDARD WITH CLOSED EYE
				55	1	980251	COMPRESSION SPRING D-294
				56	4	980293-4	CONNECTING LINK 1/4" CROSBY G-335

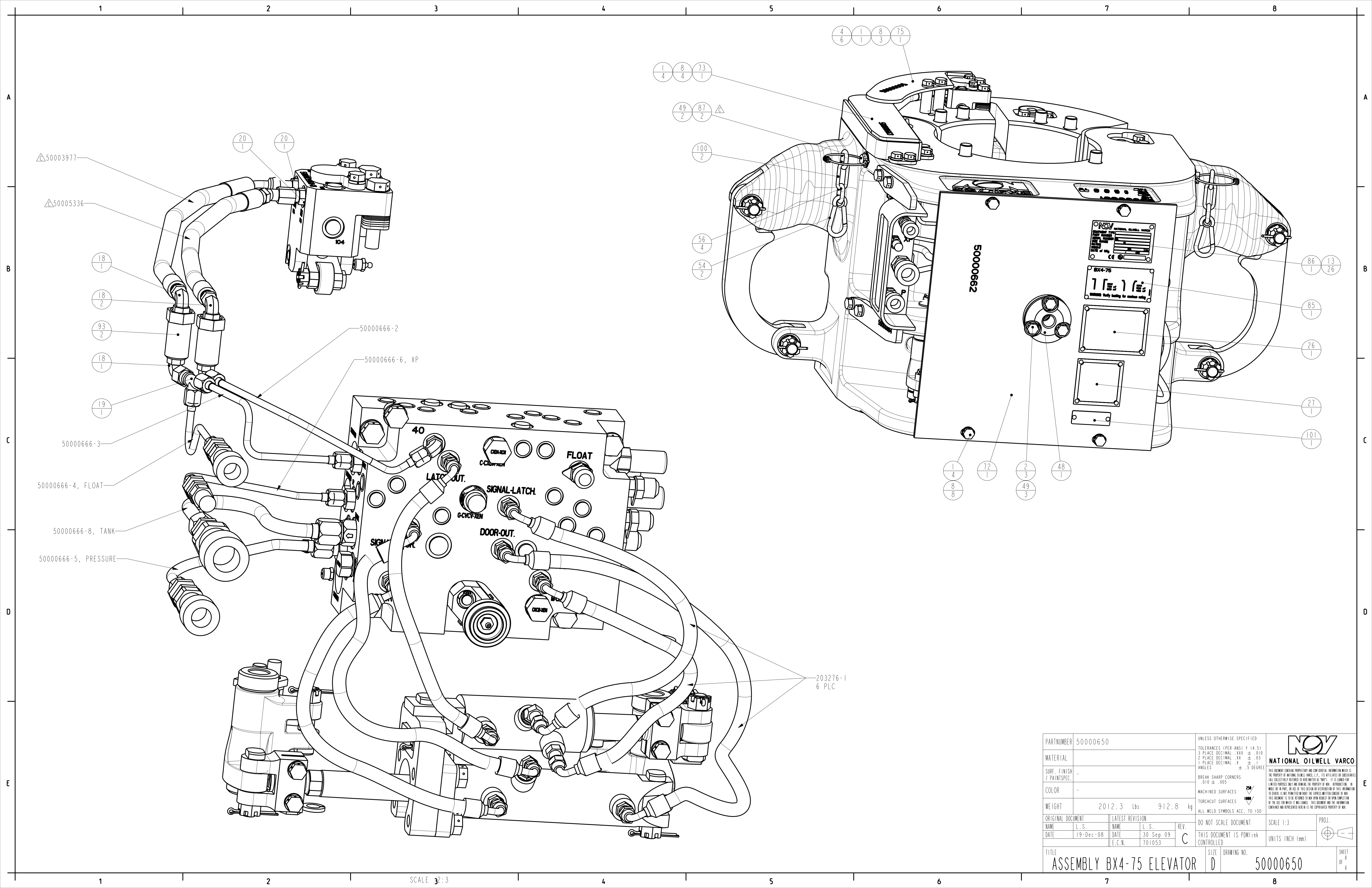
TEST ACCORDING TSEL-140

PARTNUMBER	50000650	UNLESS OTHERWISE SPECIFIED		<b>NOV</b> NATIONAL OILWELL VARCO	
MATERIAL		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE			
SURF. FINISH	-	BREAK SHARP CORNERS .010 ± .005		THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P.. ITS AFFILIATES OR SUBSIDIARIES AND IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISSEMINATION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.	
COLOR	-	MACHINED SURFACES TORNCUT SURFACES			
WEIGHT	2012.3 lbs 912.8 kg	ALL WELD SYMBOLS ACC. TO ISO		DO NOT SCALE DOCUMENT	
ORIGINAL DOCUMENT		LATEST REVISION		REV.	
NAME	L.S.	NAME	L.S.	DATE	30 Sep 09
DATE	19-Dec-08	E.C.N.	701053	CONTROLLED	C
TITLE	ASSEMBLY BX4-75 ELEVATOR		SIZE	D	DRAWING NO.
					50000650
					SHEET 1 OF 4





PARTNUMBER 50000650		UNLESS OTHERWISE SPECIFIED		 <b>NATIONAL OILWELL VARCO</b>
MATERIAL		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		
SURF. FINISH / PAINTSPEC.		BREAK SHARP CORNERS .010 ± .005		THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P. ITS AFFILIATES OR SUBSIDIARIES AND COLLECTIVELY REFERRED TO HEREIN AS "NOV". IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISSEMINATION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.
COLOR		MACHINED SURFACES 		
WEIGHT 2012.3 lbs 912.8 kg		TORCHCUT SURFACES 		DO NOT SCALE DOCUMENT SCALE 1:3 PROJ. 
ORIGINAL DOCUMENT		ALL WELD SYMBOLS ACC. TO ISO		
NAME L.S.		LATEST REVISION		THIS DOCUMENT IS PDWink CONTROLLED
DATE 19-Dec-08		NAME L.S. DATE 30-Sep-09 E.C.N. 701053		
TITLE		SIZE		DRAWING NO. 50000650
ASSEMBLY BX4-75 ELEVATOR		D		
				SHEET 3 OF 4



50003977

50005336

18  
1

18  
2

93  
2

18  
1

19  
1

50000666-3

50000666-4, FLOAT

50000666-8, TANK

50000666-5, PRESSURE

50000666-2

50000666-6, XP

40

DOOR-IN  
CC-CYC-15N

FLOAT

LATCH-OUT.

SIGNAL-LATCH

6-CYC-15N

DOOR-OUT.

203276-1  
6 PLC

4  
6  
1  
1  
8  
3  
75  
1

1  
4  
8  
4  
73  
1

49  
2  
87  
2

100  
2

56  
4

54  
2

86  
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72  
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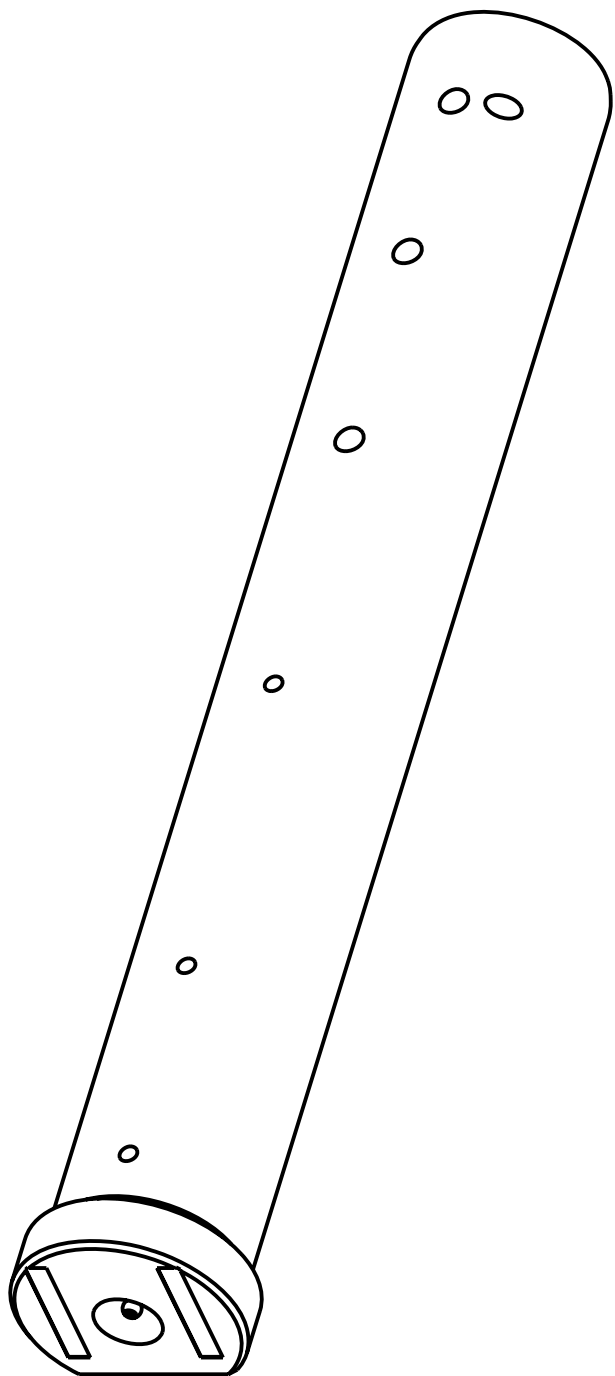
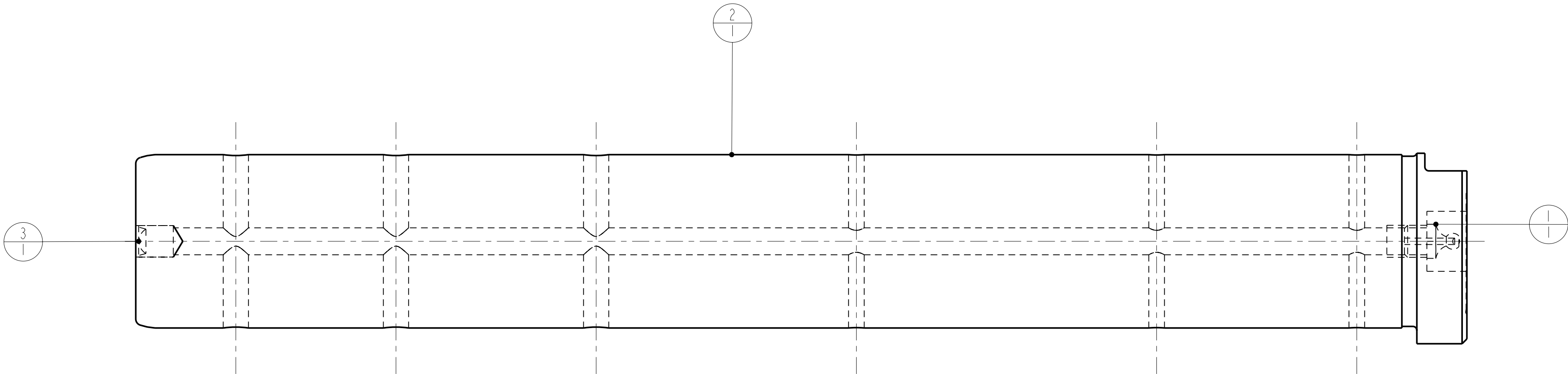
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3  
49  
3

48  
1

PARTNUMBER	50000650		UNLESS OTHERWISE SPECIFIED		<div> <b>NATIONAL OILWELL VARCO</b></div> <div>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES AND IS LOANED TO YOU FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISSEMINATION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE SOLE PROPERTY OF NOV.</div>
MATERIAL			TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		
SURF. FINISH / PAINTSPEC.	-		BREAK SHARP CORNERS .010 ± .005		
COLOR	-		MACHINED SURFACES TORNCUT SURFACES		
WEIGHT	2012.3	lbs	912.8	kg	
ORIGINAL DOCUMENT	LATEST REVISION		DO NOT SCALE DOCUMENT		SCALE 1:3
NAME	L.S.	NAME	L.S.	REV.	PROJ.
DATE	19-Dec-08	DATE	30 Sep 09	C	
		E.C.N.	701053		
TITLE	SIZE		DRAWING NO.		SHEET
ASSEMBLY BX4-75 ELEVATOR			D	50000650	4 OF 4




SCALE 3/2:3

4			5
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	53201	GREASE FITTING, STRAIGHT
2	1	203206	HINGE PIN DOOR BX ELEVATOR FRAME 4
3	1	979455-10	EXPANDER

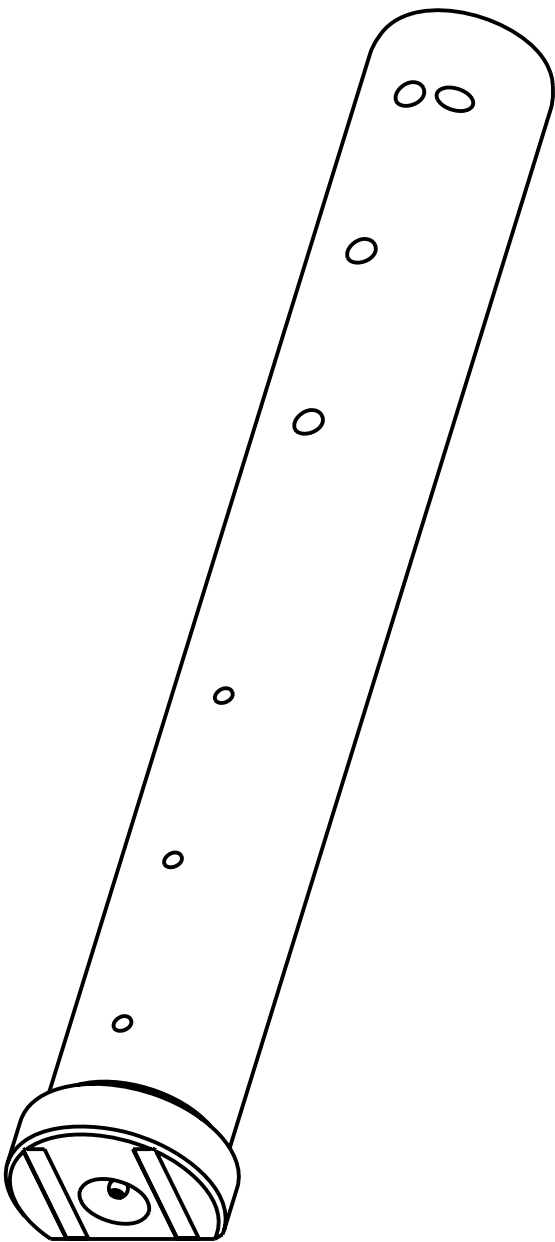
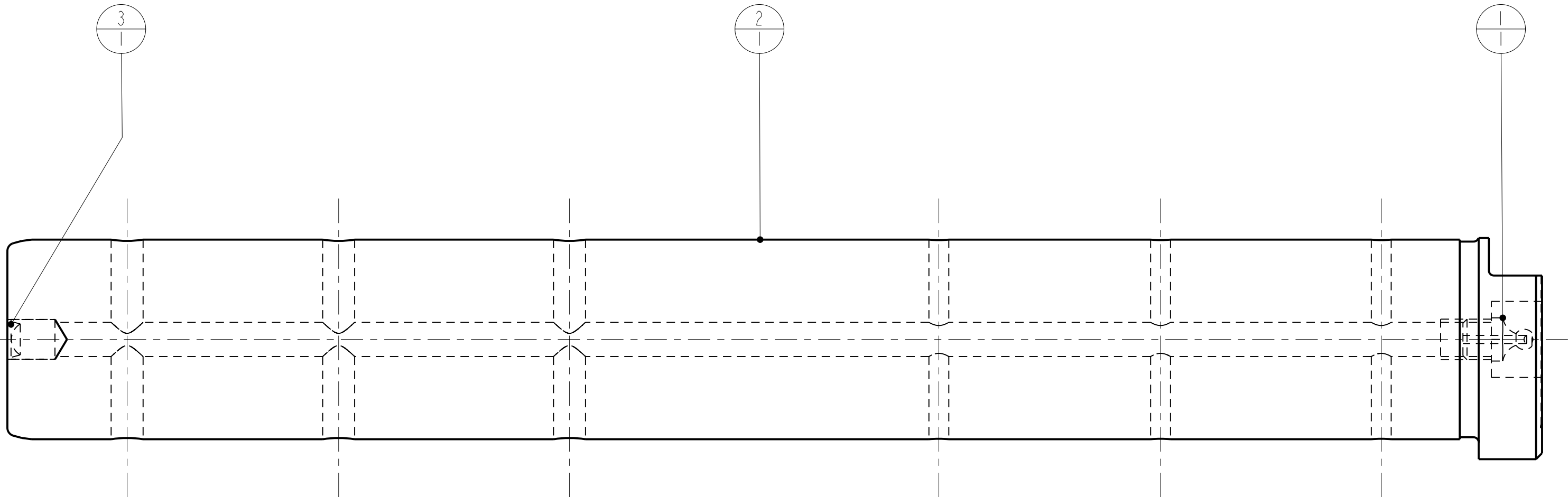


3D VIEW  
SCALE 1:2

This pin is for BX3




PARTNUMBER		203206-1		UNLESS OTHERWISE SPECIFIED		<div> <b>NATIONAL OILWELL VARCO</b></div> <div><small>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.</small></div>					
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE							
SURF. FINISH / PAINTSPEC.		-		BREAK SHARP CORNERS .010 ± .005							
COLOR		-		MACHINED SURFACES 							
WEIGHT		16.7 Lbs [ .1 ] kg		TORCHCUT SURFACES ALL WELD SYMBOLS ACC. TO ISO							
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT		SCALE 1:1		PROJ.			
NAME		SBe		NAME		L.S.		REV.			
DATE		18 DEC '97		DATE		24 Jul 09		D			
		E.C.N.		701053		THIS DOCUMENT IS PDMLink CONTROLLED		UNITS INCH (mm)			
TITLE						SIZE		DRAWING NO.		SHEET	
HINGE PIN ASSEMBLY DOOR BX 384 						C		203206-1		1 OF 1	

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	53201	GREASE FITTING, STRAIGHT
2	1	203207	HINGE PIN LATCH BX ELEVATOR FRAME 4
3	1	979455-10	EXPANDER

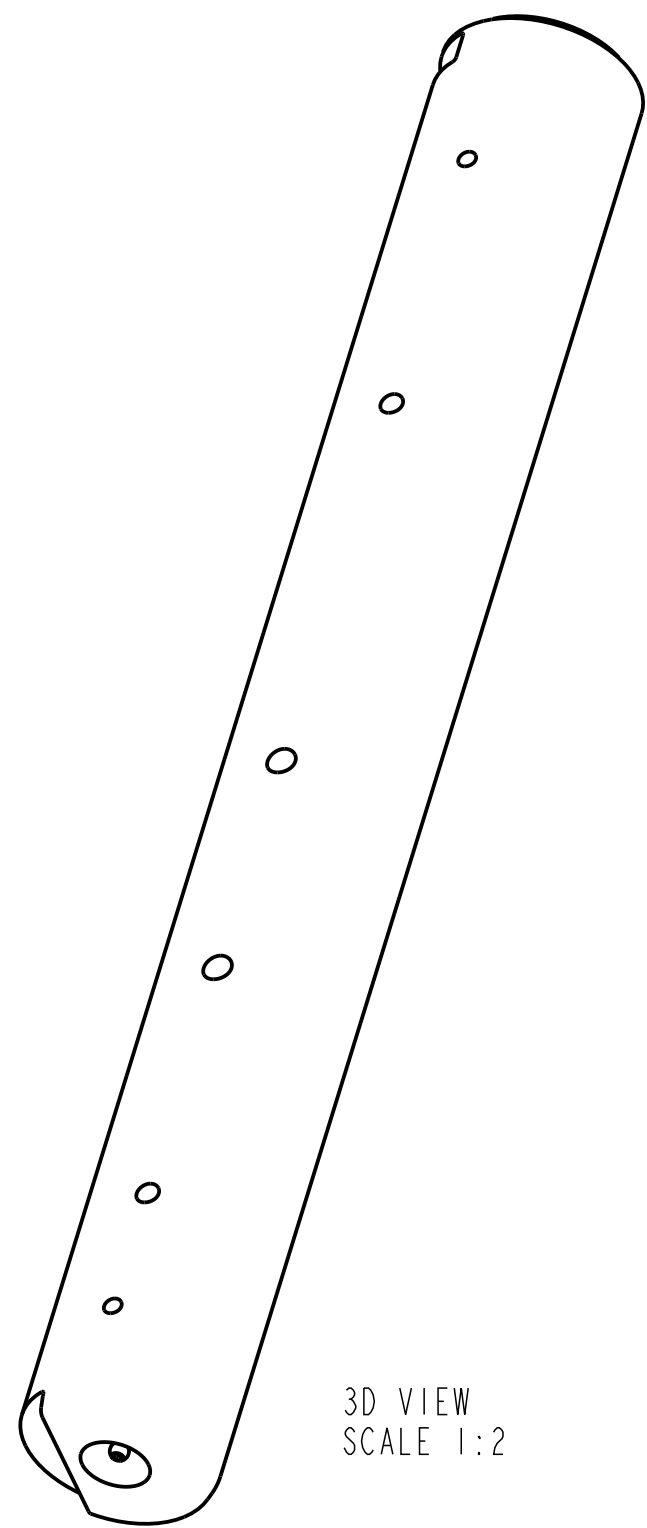
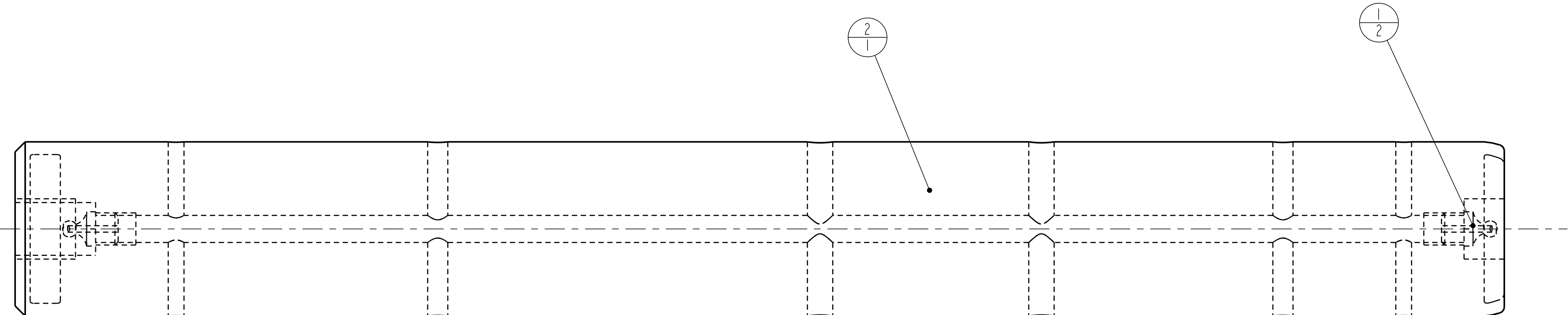



3D VIEW  
SCALE 1:2

This pin is for BX3

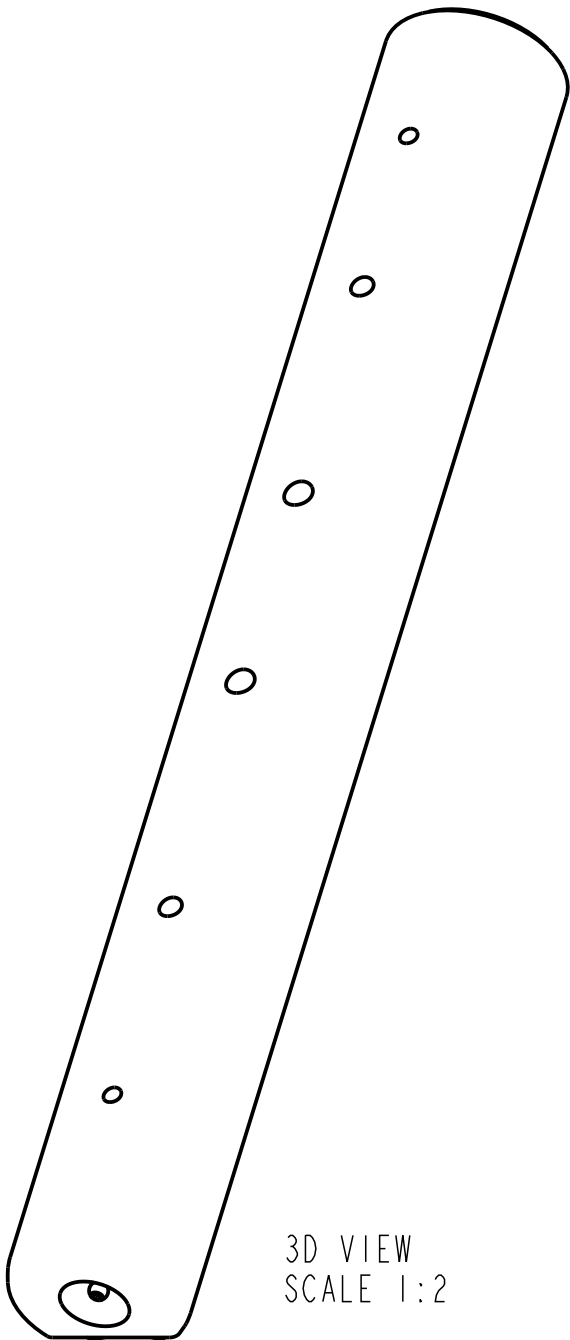
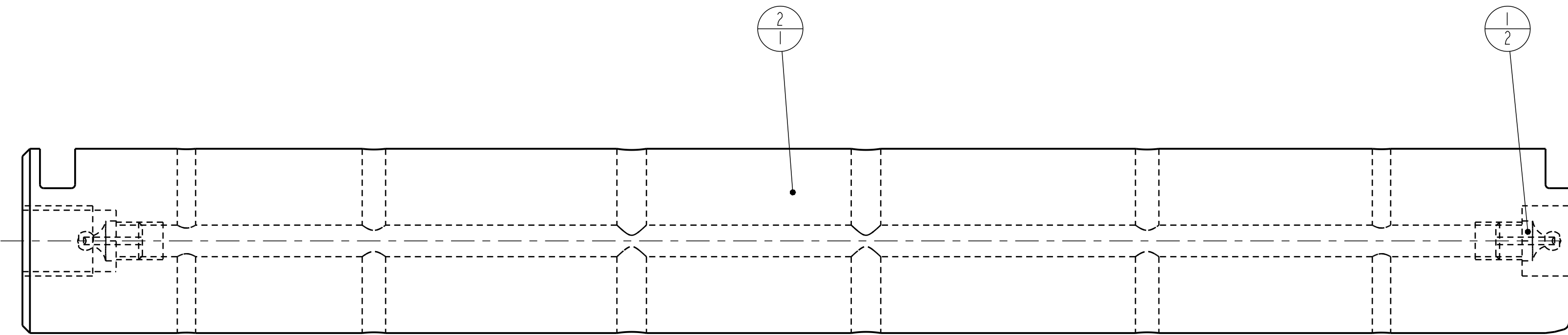
PARTNUMBER 203207-1		UNLESS OTHERWISE SPECIFIED		<div> NATIONAL OILWELL VARCO</div> <p>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.</p>	
MATERIAL		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE			
SURF. FINISH / PAINTSPEC. -		BREAK SHARP CORNERS .010 ± .005			
COLOR -		MACHINED SURFACES  TORCHCUT SURFACES			
WEIGHT 12.2 Lbs [ .1 ] kg		ALL WELD SYMBOLS ACC. TO ISO			
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	
NAME SBe		NAME L.S.		SCALE 1:1	
DATE 18 DEC '97		DATE 24 Jul 09		THIS DOCUMENT IS PDMLink CONTROLLED	
		E.C.N. 701053		UNITS INCH (mm)	
TITLE HINGE PIN ASSEMBLY LATCH BX3&4 				SHEET 1 OF 1	
SIZE C				DRAWING NO. 203207-1	


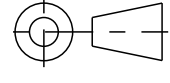
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	53201	GREASE FITTING, STRAIGHT
2	1	50000670	HINGE PIN DOOR BX ELEVATOR FRAME 4



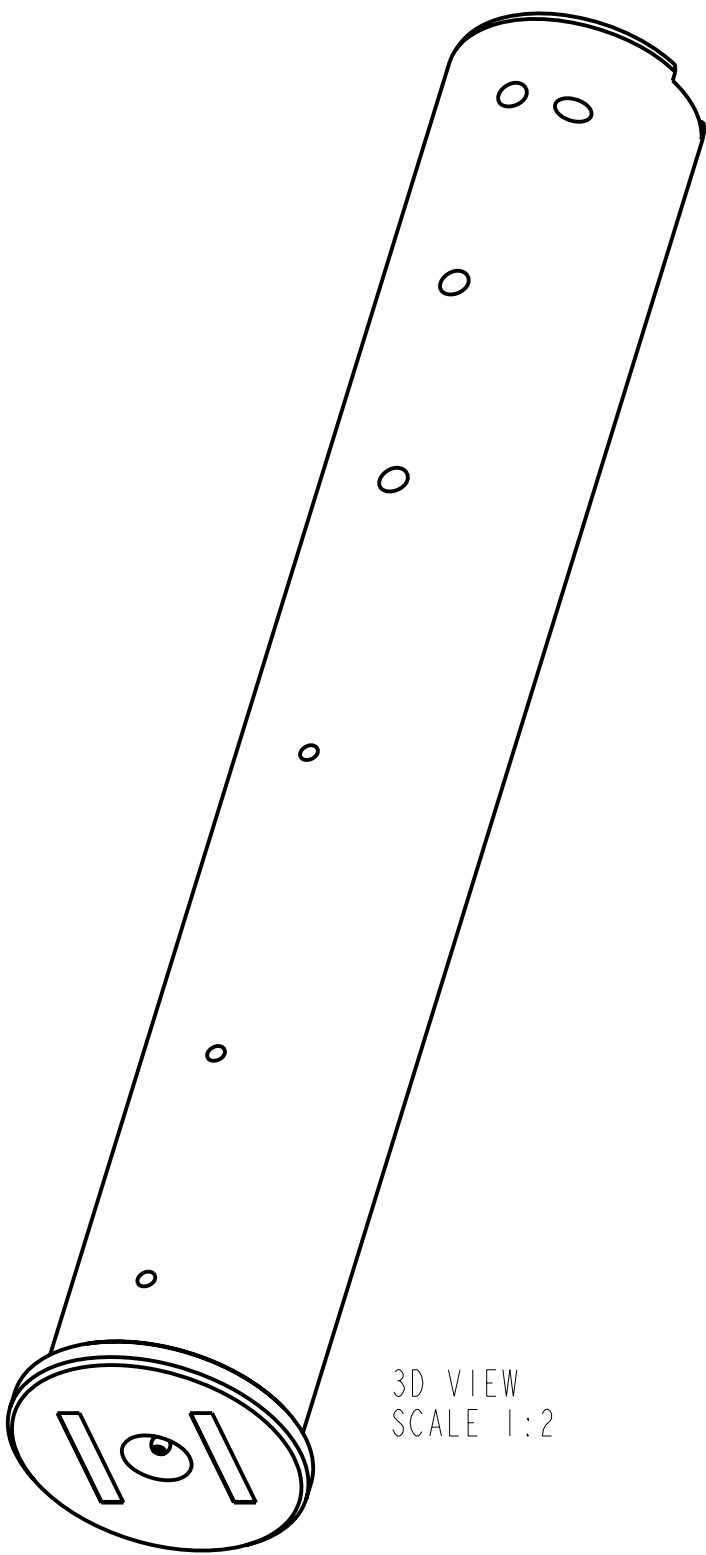
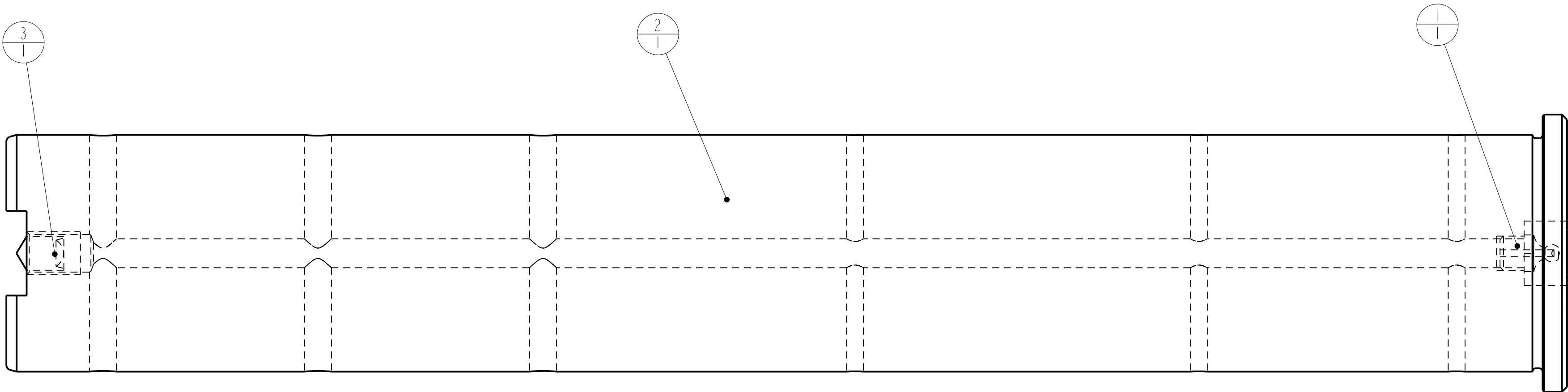
PARTNUMBER		50000670-1		UNLESS OTHERWISE SPECIFIED		<div> <b>NATIONAL OILWELL VARCO</b></div> <div><small>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.</small></div>	
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .xxx ± .010 2 PLACE DECIMAL .xx ± .03 1 PLACE DECIMAL .x ± .1 ANGLES ± .5 DEGREE			
SURF. FINISH / PAINTSPEC.		-		BREAK SHARP CORNERS .010 ± .005			
COLOR		-		MACHINED SURFACES <div>250 ✓ 1000</div>			
WEIGHT		18.3 Lbs [ .1 ] kg		TORCHCUT SURFACES			
				ALL WELD SYMBOLS ACC. TO ISO			
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT		SCALE 1:1	
NAME		L.S.		NAME		L.S.	
DATE		4 SEP 08		DATE		06 May 09	
				E.C.N.		701053	
				REV.		A	
				THIS DOCUMENT IS PDMinK CONTROLLED		UNITS INCH (mm)	
TITLE				SIZE	DRAWING NO.		SHEET
HINGE PIN ASSEMBLY DOOR BX ELEVATOR FRAME 4-75				C	50000670-1		1 of 1

4		5	
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	53201	GREASE FITTING, STRAIGHT
2	1	50000671	HINGE PIN LATCH BX ELEVATOR FRAME 4





PARTNUMBER		50000671-1		UNLESS OTHERWISE SPECIFIED		<div> NATIONAL OILWELL VARCO</div> <p>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.</p>			
MATERIAL				TOLERANCES (PER ANSI Y 14.5)					
SURF. FINISH / PAINTSPEC.		-		3 PLACE DECIMAL .xxx ± .010 2 PLACE DECIMAL .xx ± .03 1 PLACE DECIMAL .x ± .1 ANGLES ± .5 DEGREE					
COLOR		-		BREAK SHARP CORNERS .010 ± .005					
WEIGHT		13.1 Lbs [ .1 ] kg		MACHINED SURFACES 250/✓ TORCHCUT SURFACES 1000/✓					
ALL WELD SYMBOLS ACC. TO ISO									
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT		SCALE 1:1		PROJ.	
NAME		NAME		L.S.		REV.			
DATE		DATE		06 May 09		A			
E.C.N.		701053							
TITLE				SIZE		DRAWING NO.		SHEET	
HINGE PIN ASSEMBLY LATCH BX4-75				C		50000671-1		1 OF 1	

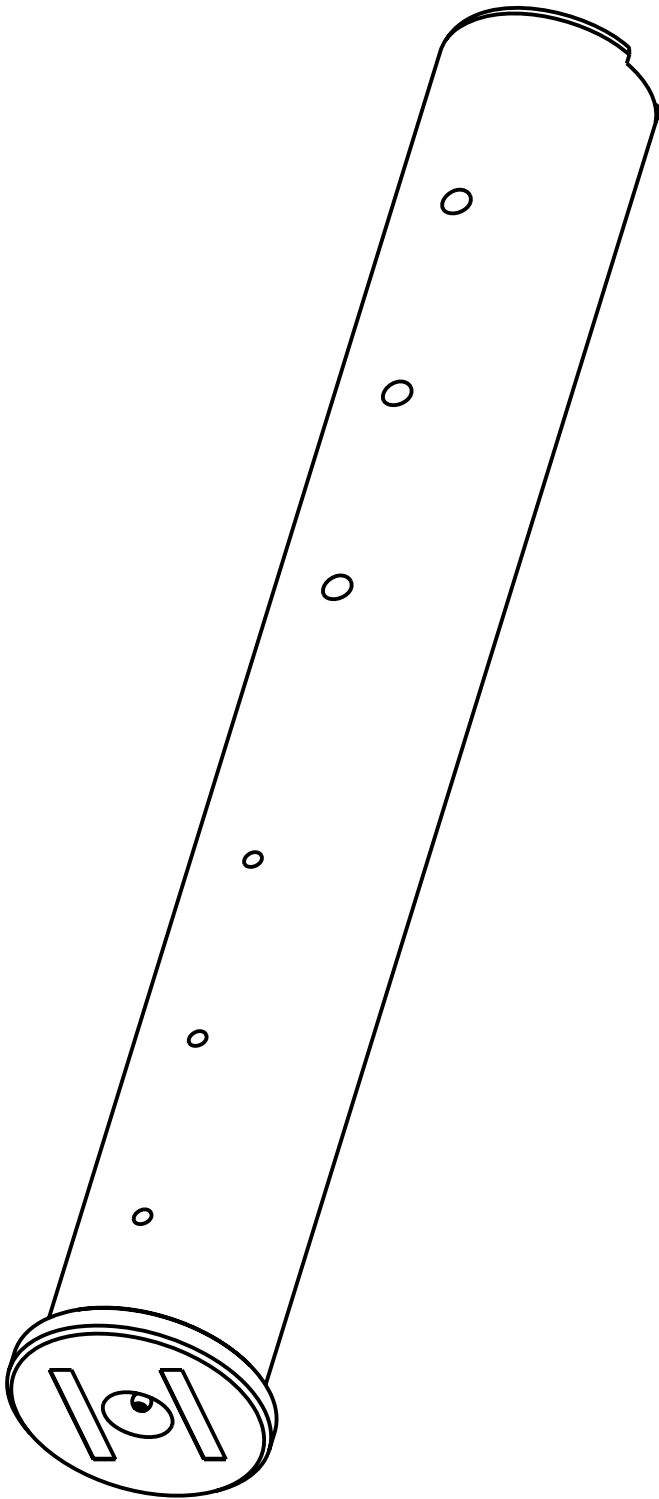
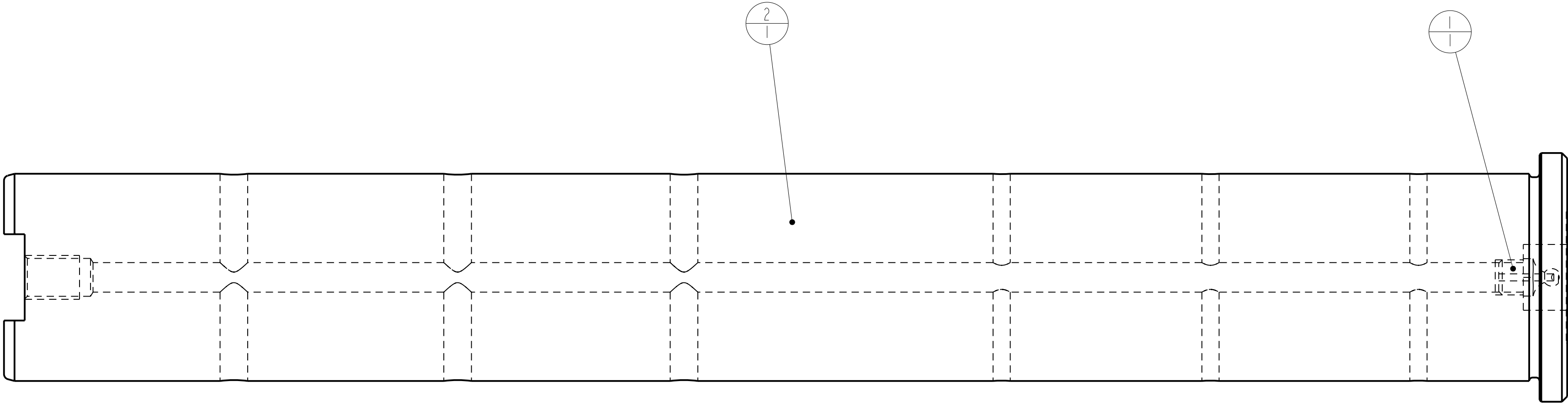
4			5
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	53201	GREASE FITTING, STRAIGHT
2	1	50004006	HINGE PIN, DOOR BX ELEVATOR FRAME 5
3	1	979455-10	EXPANDER



This drawing has number 50004006-1


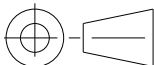
PARTNUMBER 50004006-1		UNLESS OTHERWISE SPECIFIED		<div> NATIONAL OILWELL VARCO</div> <p>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.</p>	
MATERIAL		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE			
SURF. FINISH / PAINTSPEC. -		BREAK SHARP CORNERS .010 ± .005			
COLOR -		MACHINED SURFACES  TORCHCUT SURFACES			
WEIGHT 30.2 Lbs [ .1 ] kg		ALL WELD SYMBOLS ACC. TO ISO			
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	
NAME SBe		NAME L.S.		SCALE 1:1	
DATE 07-Jan-00		DATE 24 Jul 09		THIS DOCUMENT IS PDMLink CONTROLLED	
		E.C.N. 701053		UNITS INCH (mm)	
TITLE				SHEET 1 OF 1	
HINGE PIN ASSEMBLY DOOR BX 5				DRAWING NO. 50004006-1	

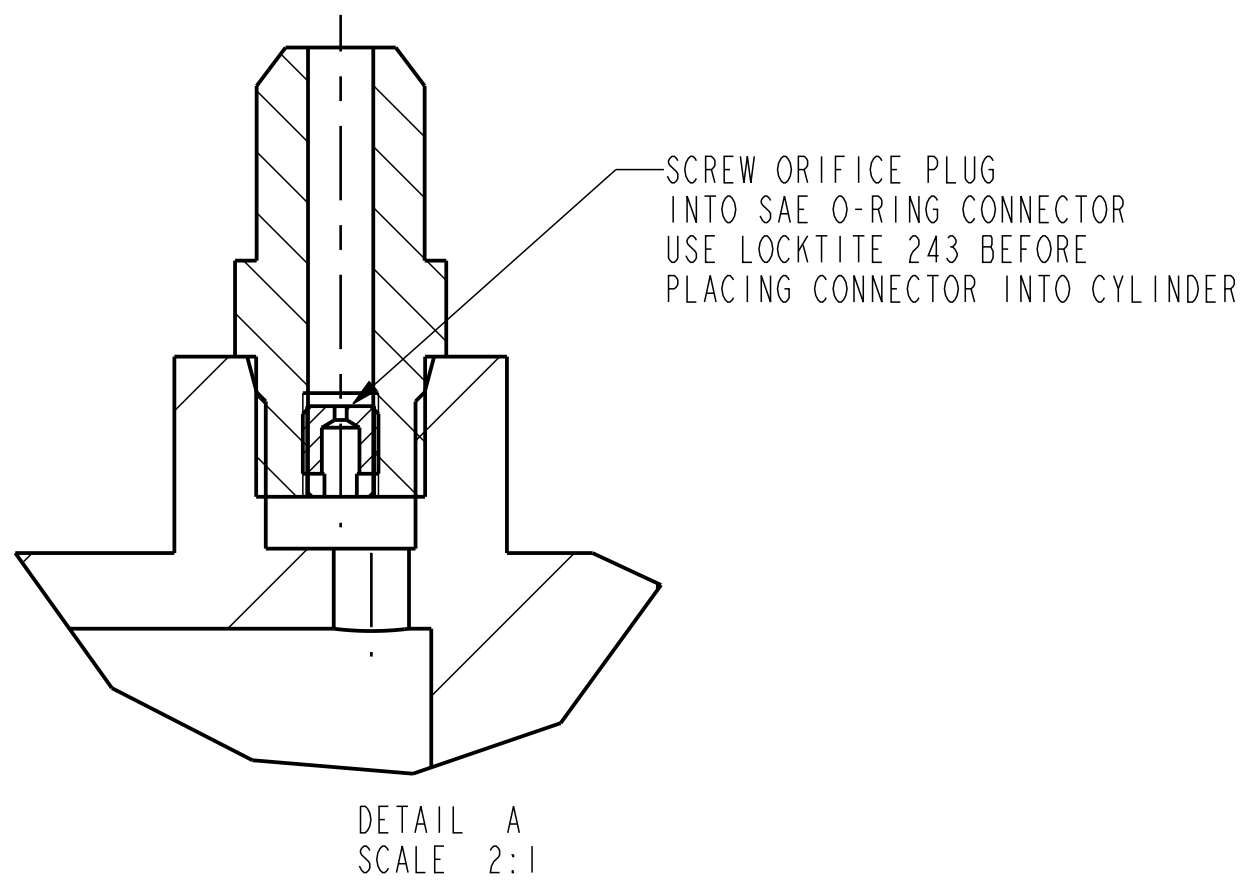
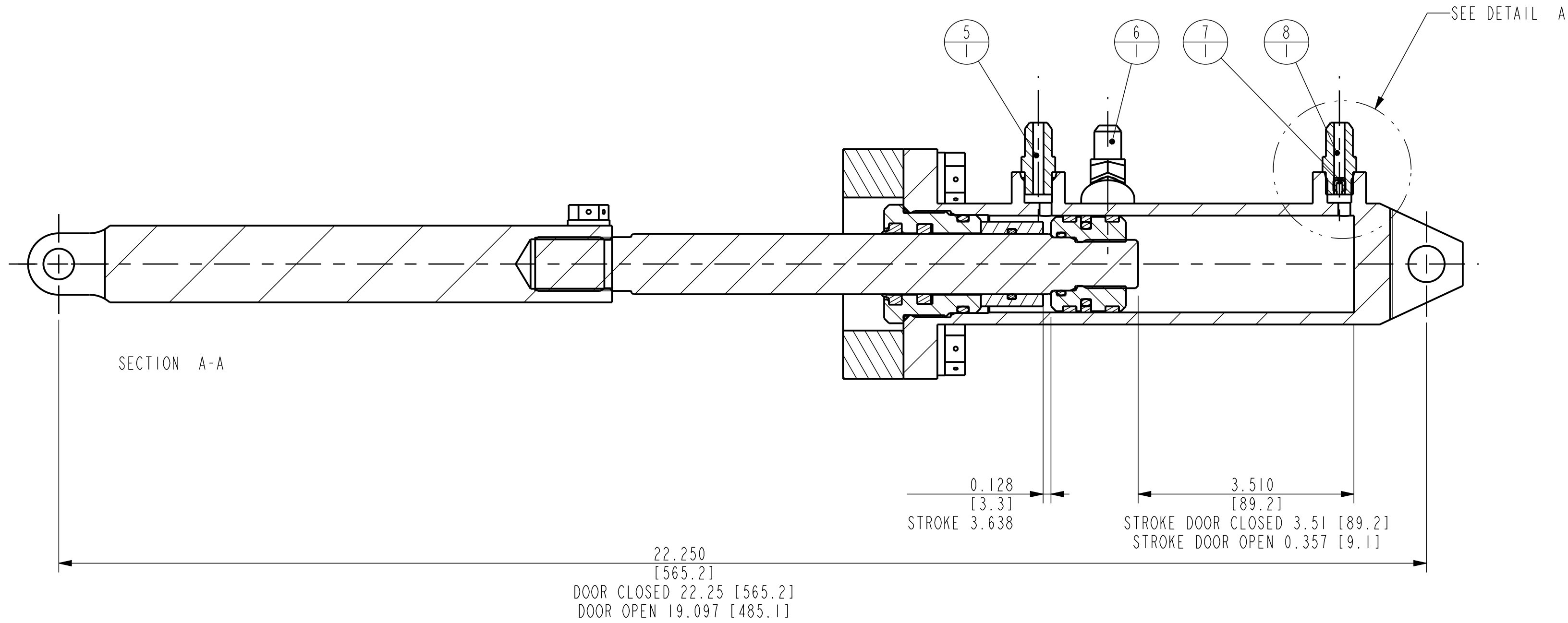
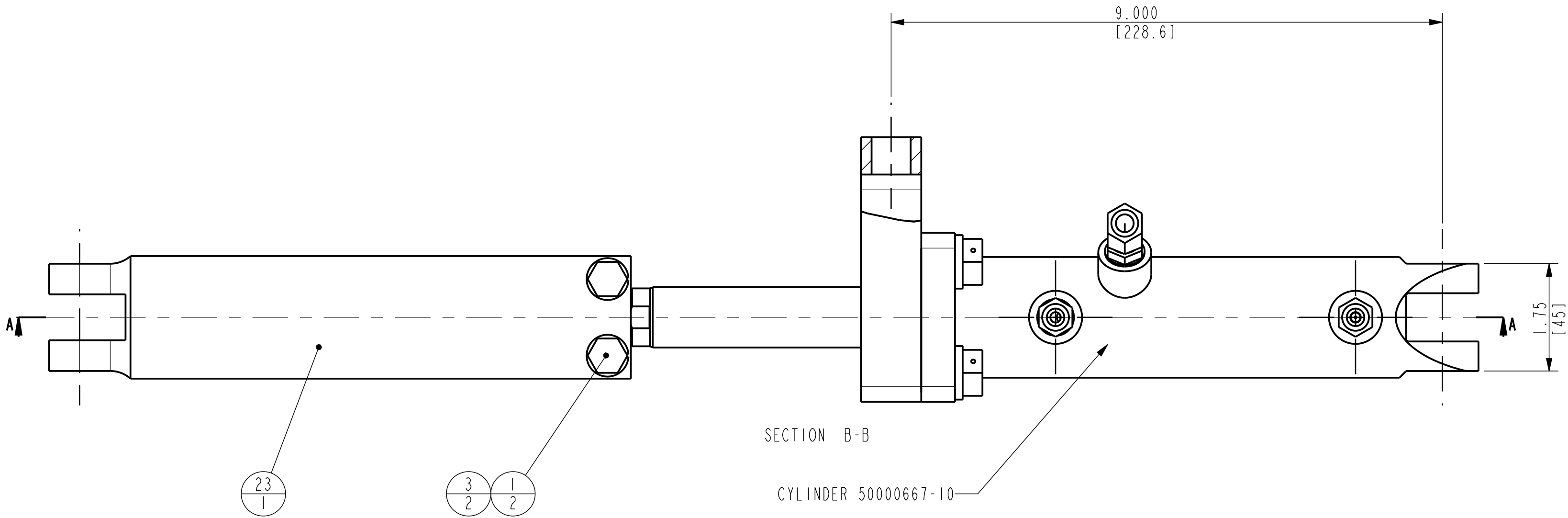
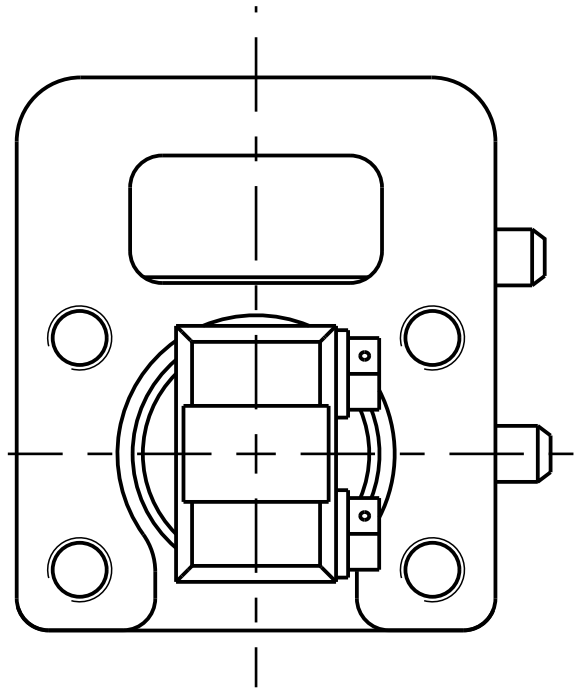
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	53201	GREASE FITTING, STRAIGHT
2	1	50004007	HINGE PIN LATCH BX ELEVATOR FRAME 5



3D VIEW  
SCALE 1:2

This drawing has number 50004007-1


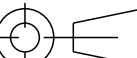
PARTNUMBER	50004007-1			UNLESS OTHERWISE SPECIFIED		<div> NATIONAL OILWELL VARCO</div> <div><small>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.</small></div>		
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE				
SURF. FINISH / PAINTSPEC.	-			BREAK SHARP CORNERS .010 ± .005				
COLOR	-			MACHINED SURFACES TORCHCUT SURFACES				
WEIGHT	17.8 Lbs [ .1 ] kg			ALL WELD SYMBOLS ACC. TO ISO				
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT		SCALE 1:1	PROJ.	
NAME	SBe		NAME	L.S.	REV. A	THIS DOCUMENT IS PDMLink CONTROLLED	UNITS INCH (mm)	
DATE	07-Jan-00		DATE	24 Jul 09				
		E.C.N.	701053					
TITLE					SIZE	DRAWING NO.		SHEET
HINGE PIN ASSEMBLY LATCH BX 5					C	50004007-1		1 OF 1

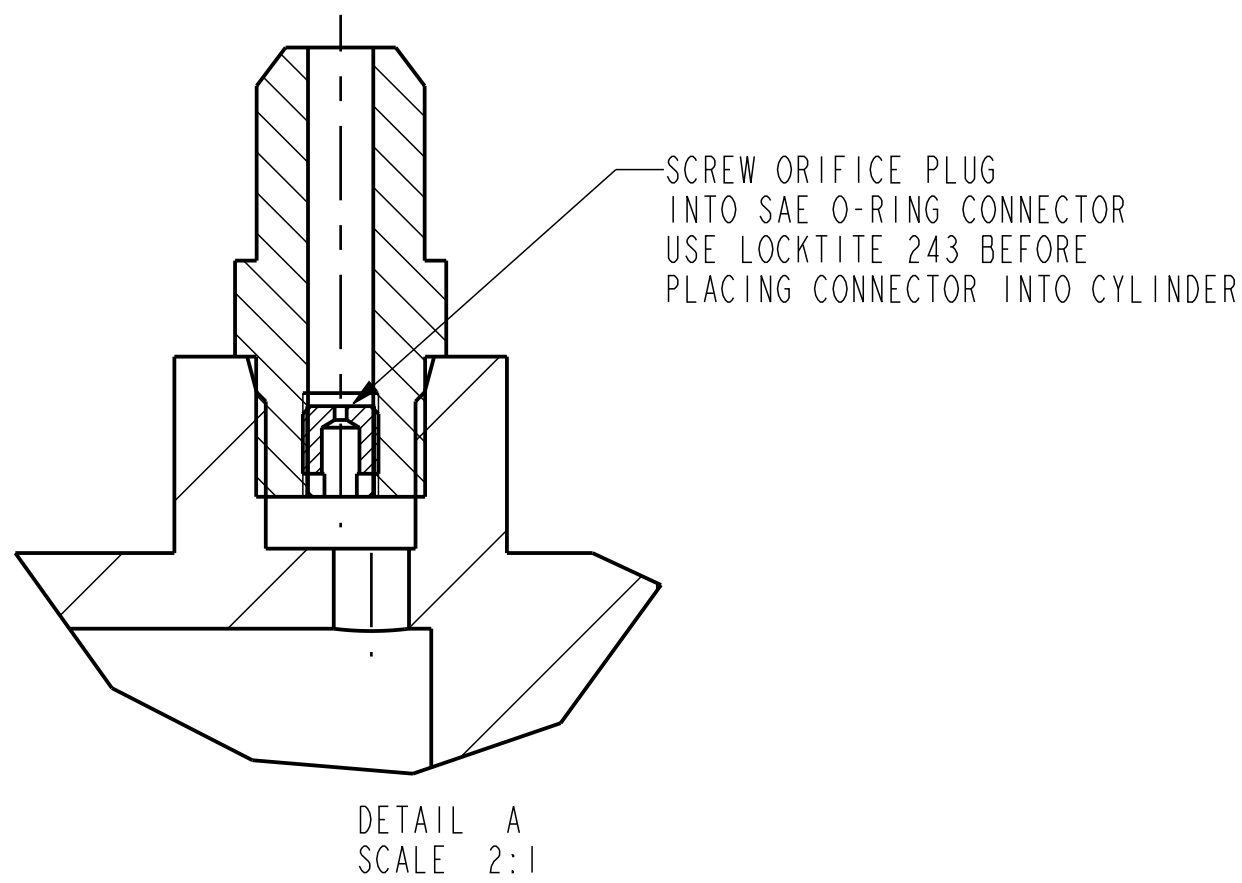
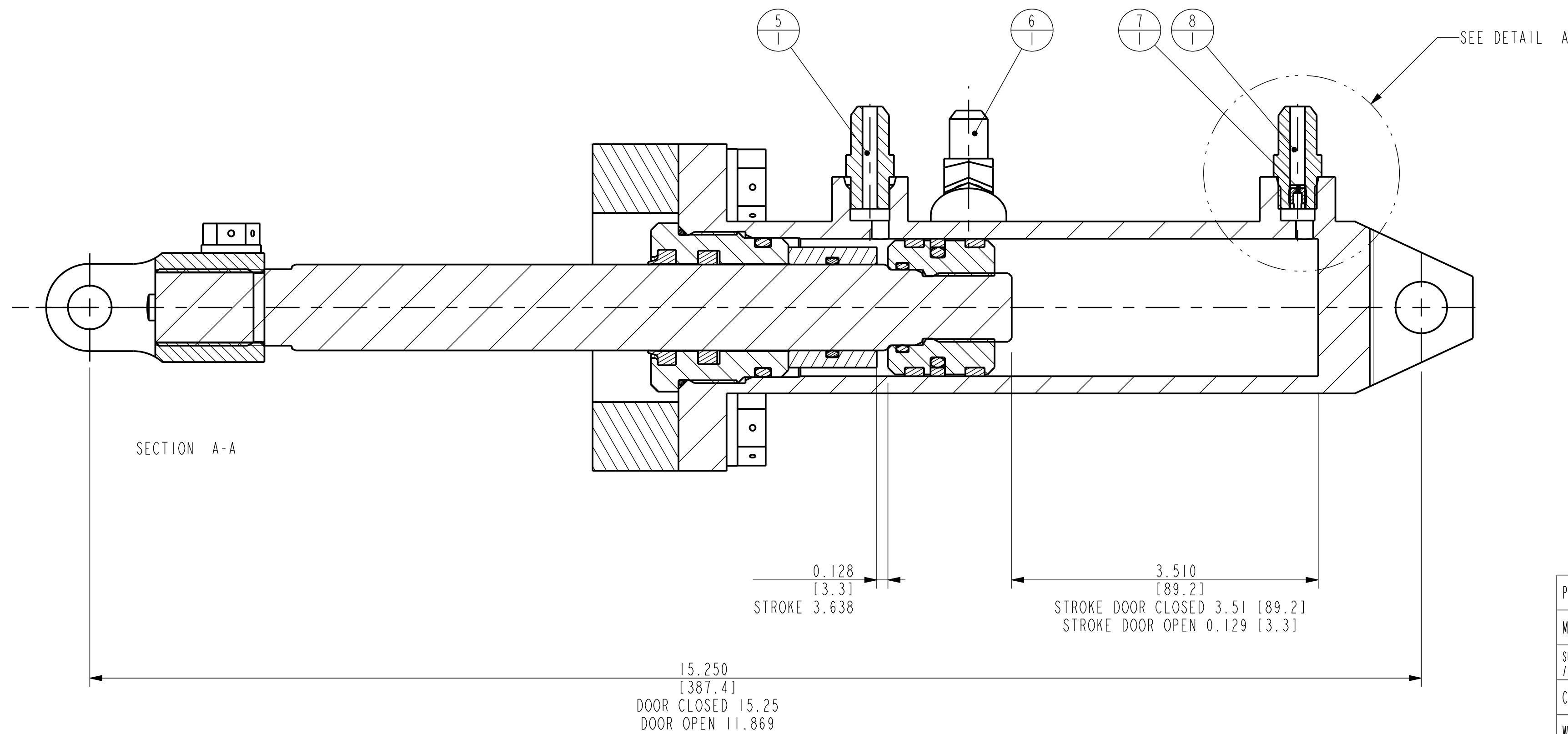
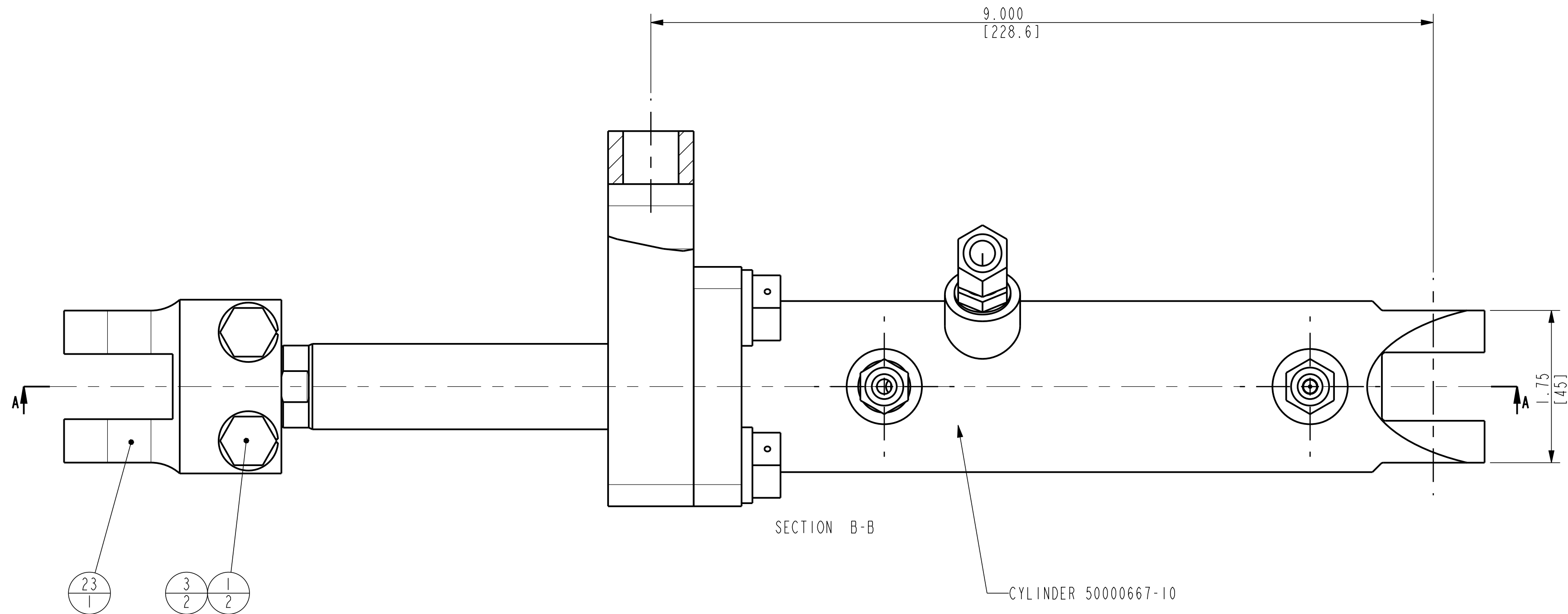
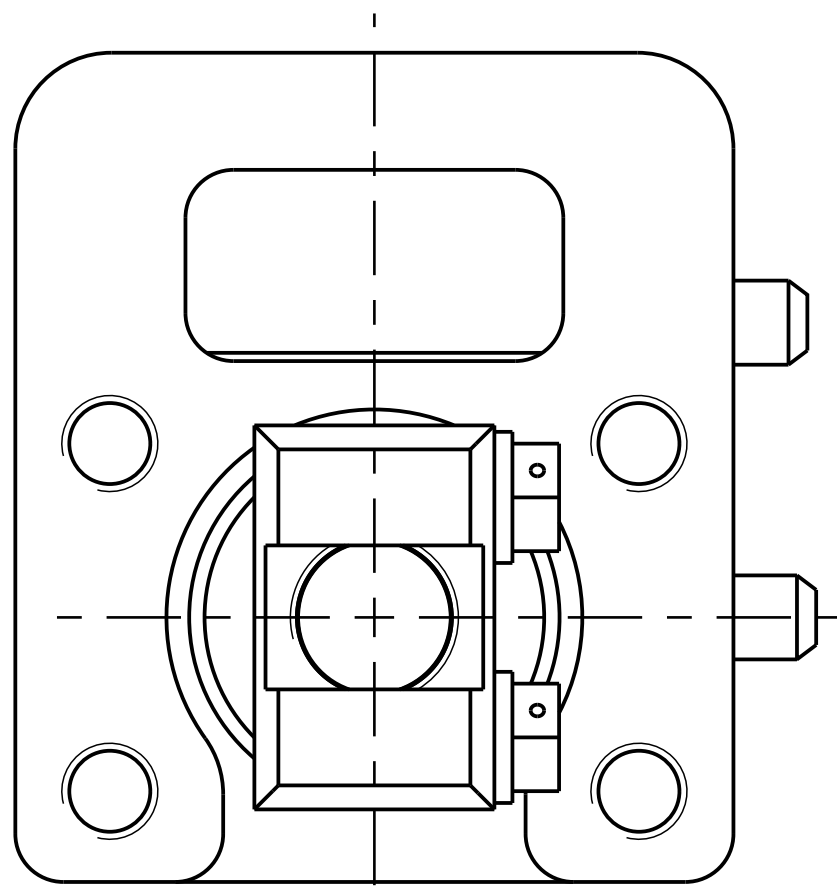


ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	50006-10-C8D	SCREW,CAP-HEX HD (UNC 3/8")
2	4	50008-12-C8D	SCREW,CAP-HEX HD (UNC 1/2")
3	2	50906-C	WASHER, LOCK-REGULAR 0.375
4	4	50908-C	WASHER, LOCK-REGULAR 0.500
5	1	56529-4-4-S	CONNECTOR SAE O-RING -4 TO 37 JIC -4
6	1	56557-4-4-S	ELBOW, 45DEGR. O-RING BOSS / 37 JIC MALE
7	1	109105-08	ORIFICE PLUG M5x0.8 -- 0.8 mm
8	1	109106-4S-S	STRAIGHT CONNECTOR SAE O-RING -4, ORIFICE PLUG
9	1	50000667-1	CYLINDER ROD
10	2	50000667-11	Wearring 40x35x5.6, 10EGTP1250560400A
11	1	50000667-12	Glyd ring, 10e/gr0400a-15/4470
12	1	50000667-13	O-RING 2.62x25.07-Sh70, 012622507
13	1	50000667-14	O-RING 2.62x22.23-Sh90, 032622223
14	1	50000667-15	O-RING 3.53x32.92-Sh90, 033533292
15	1	50000667-16	O-RING 2.00x41.00-Sh70, 012004100
16	1	50000667-17	Rod Seal, 10TS2533/L
17	1	50000667-18	DUST WIPER, 10WRM-P25
18	1	50000667-2	PISTON
19	1	50000667-3	Cylinder housing
20	1	50000667-4	Gland door cylinder D40/25, 85TE4025
21	1	50000667-5	RING
22	1	50000667-6	Flange
23	1	50000683	CLEVIS HEAD DOOR CYLINDER BX3

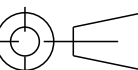
Notes:  
1) ITEM 2, 3 & 9 TO 22 ARE PART OF  
PURCHASE PART 50000667-10

△ CHANGED CYLINDER 50000667-10

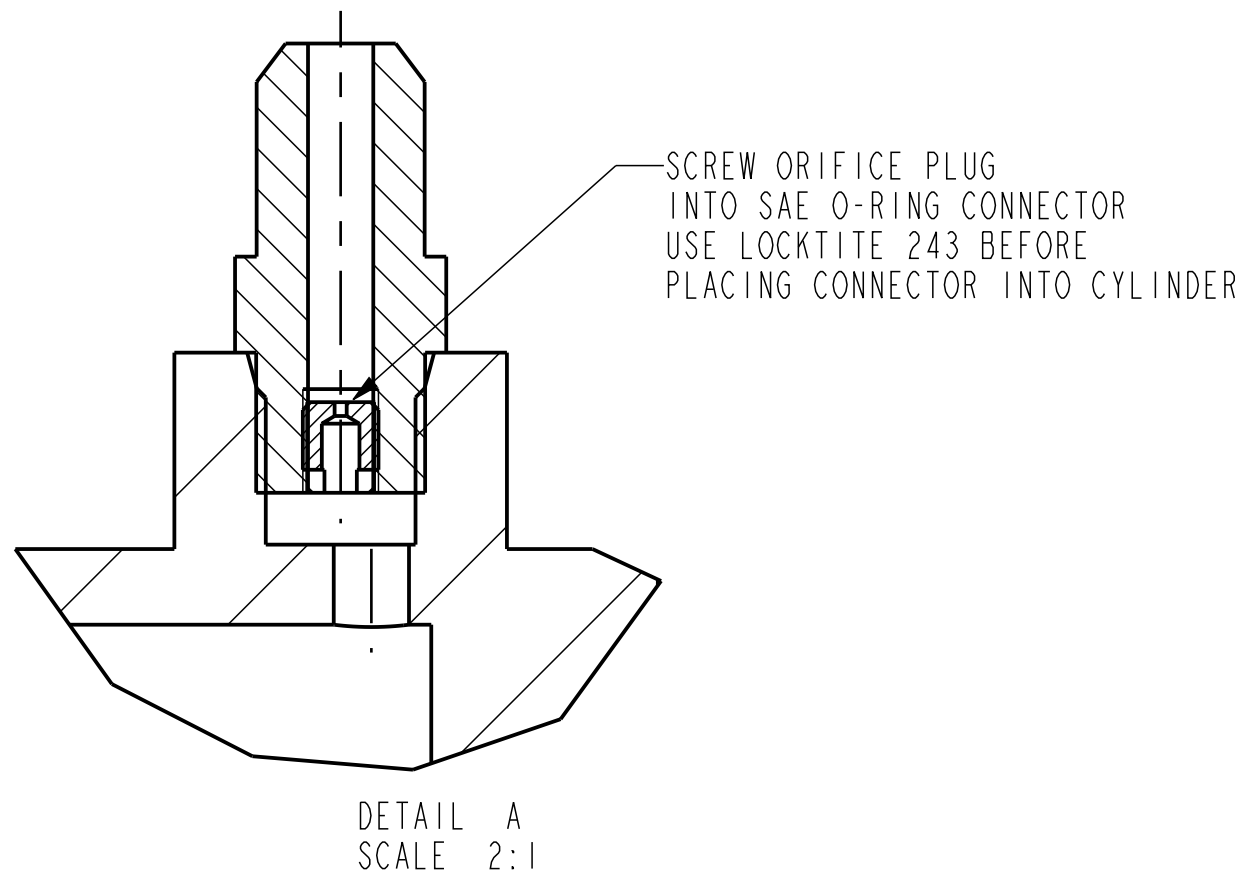
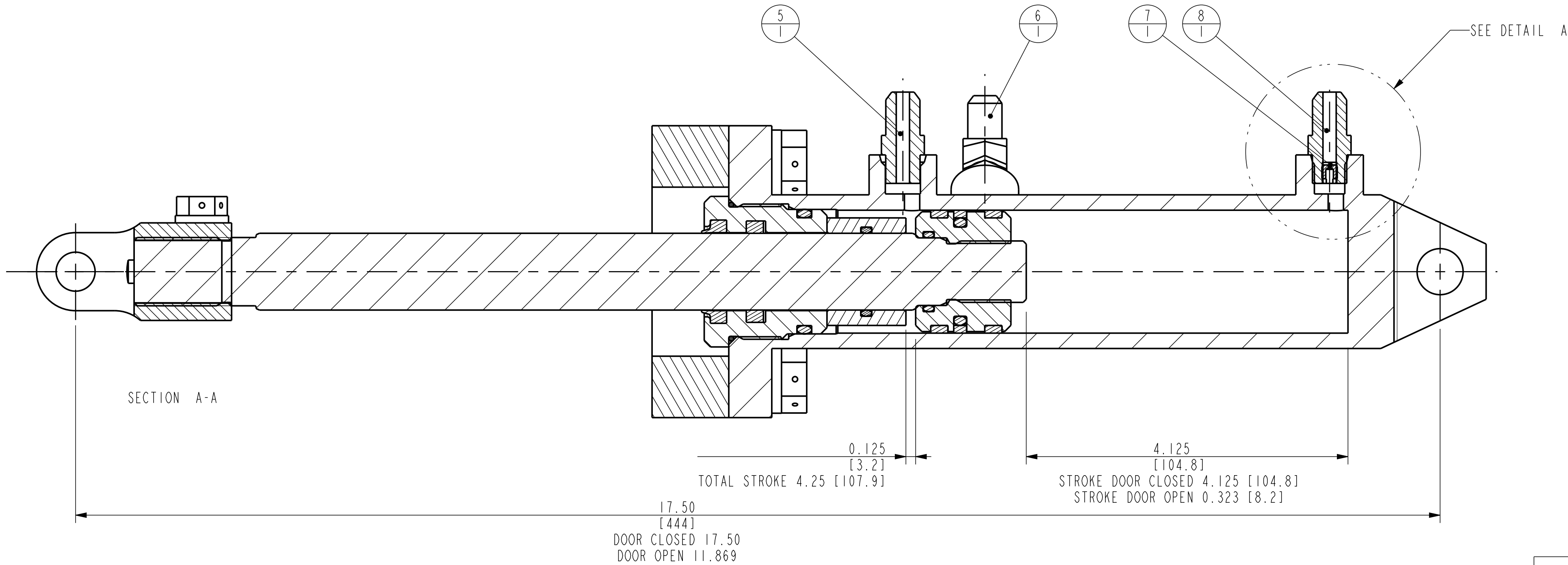
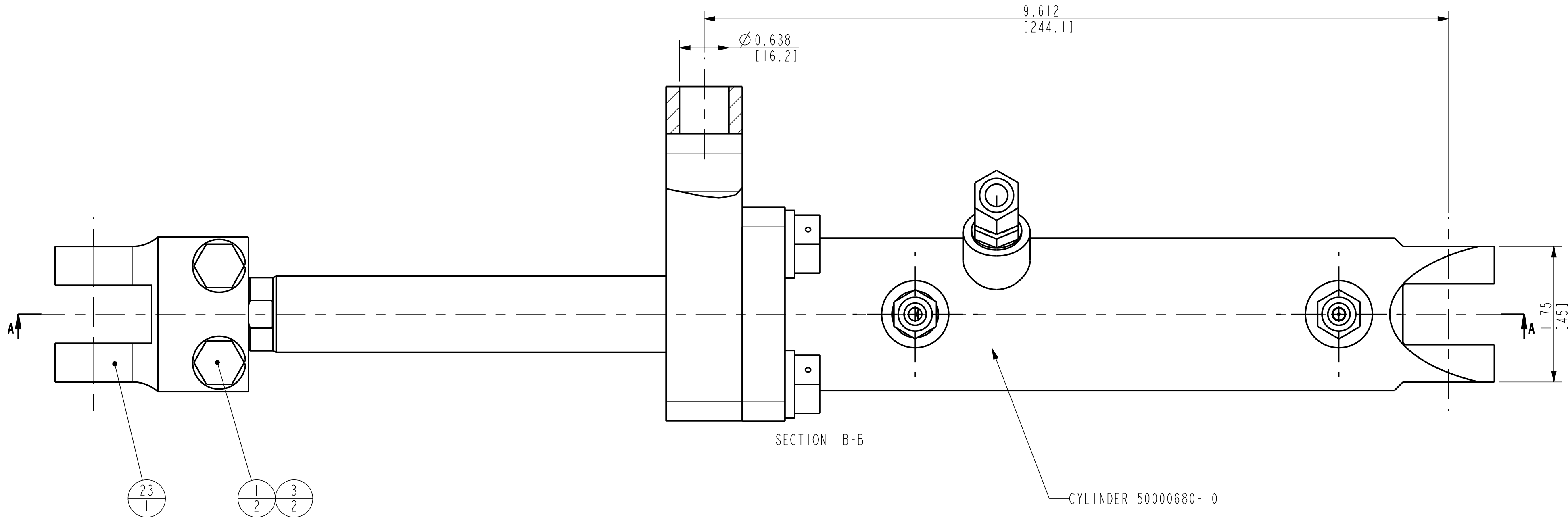
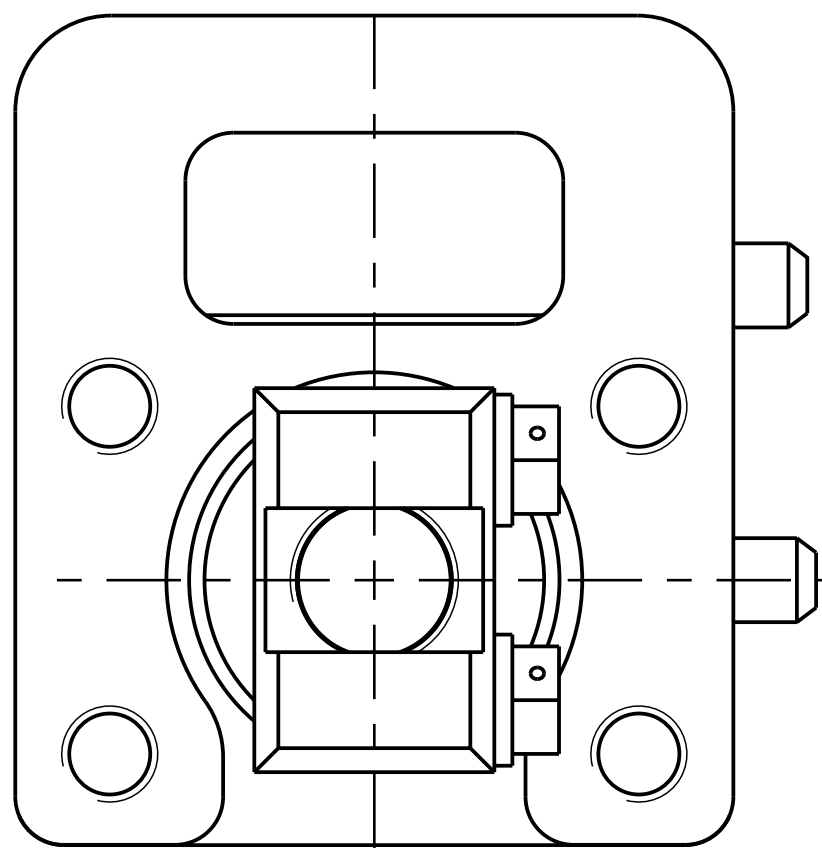
PARTNUMBER	50000682			UNLESS OTHERWISE SPECIFIED		<div> <b>NATIONAL OILWELL VARCO</b></div> <div>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES AND COLLECTIVELY REFERRED TO HEREIN AS "NOV". IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISSEMINATION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.</div>
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		
SURF. FINISH / PAINTSPEC.	-			BREAK SHARP CORNERS .010 ± .005		
COLOR	-			MACHINED SURFACES TORNCUT SURFACES		
WEIGHT	16.3 lbs 7.4 kg			ALL WELD SYMBOLS ACC. TO ISO		
ORIGINAL DOCUMENT				DO NOT SCALE DOCUMENT		SCALE 2:3
NAME L.S.		NAME L.S.		REV. <div>A</div>	THIS DOCUMENT IS PDWlink CONTROLLED	
DATE 13 Mar 09		DATE 02 Apr 09			UNITS INCH (mm)	
		E.C.N. 701042			PROJ. 	
TITLE				SIZE	DRAWING NO.	SHEET 1 OF 1
Door cylinder BX3				D	50000682	



CHANGED CYLINDER 50000667-10

PARTNUMBER 50000667		UNLESS OTHERWISE SPECIFIED		<div><div>NOV</div><div>NATIONAL OILWELL VARCO</div><div><small>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P. ITS AFFILIATES OR SUBSIDIARIES AND IS LOANED TO YOU FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISSEMINATION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.</small></div></div>	
MATERIAL		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE			
SURF. FINISH / PAINTSPEC.	-	BREAK SHARP CORNERS .010 ± .005		<div>250</div> <div>1000</div>	
COLOR	-	MACHINED SURFACES TORNCUT SURFACES			
WEIGHT	11.5 lbs	5.2 kg	ALL WELD SYMBOLS ACC. TO ISO		
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	SCALE 1:1
NAME	L.S.	NAME	L.S.	THIS DOCUMENT IS PDWINK CONTROLLED	PROJ. 
DATE	18-DEC-08	DATE	01 Apr 08		
		E.C.N.	701053	UNITS INCH (mm)	
TITLE		SIZE	DRAWING NO.	SHEET 1 OF 1	
Door cylinder BX4		D	50000667		


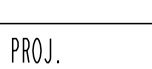
Notes:  
1) ITEM 2, 3 & 9 TO 22 ARE PART OF PURCHASE PART 50000667-10

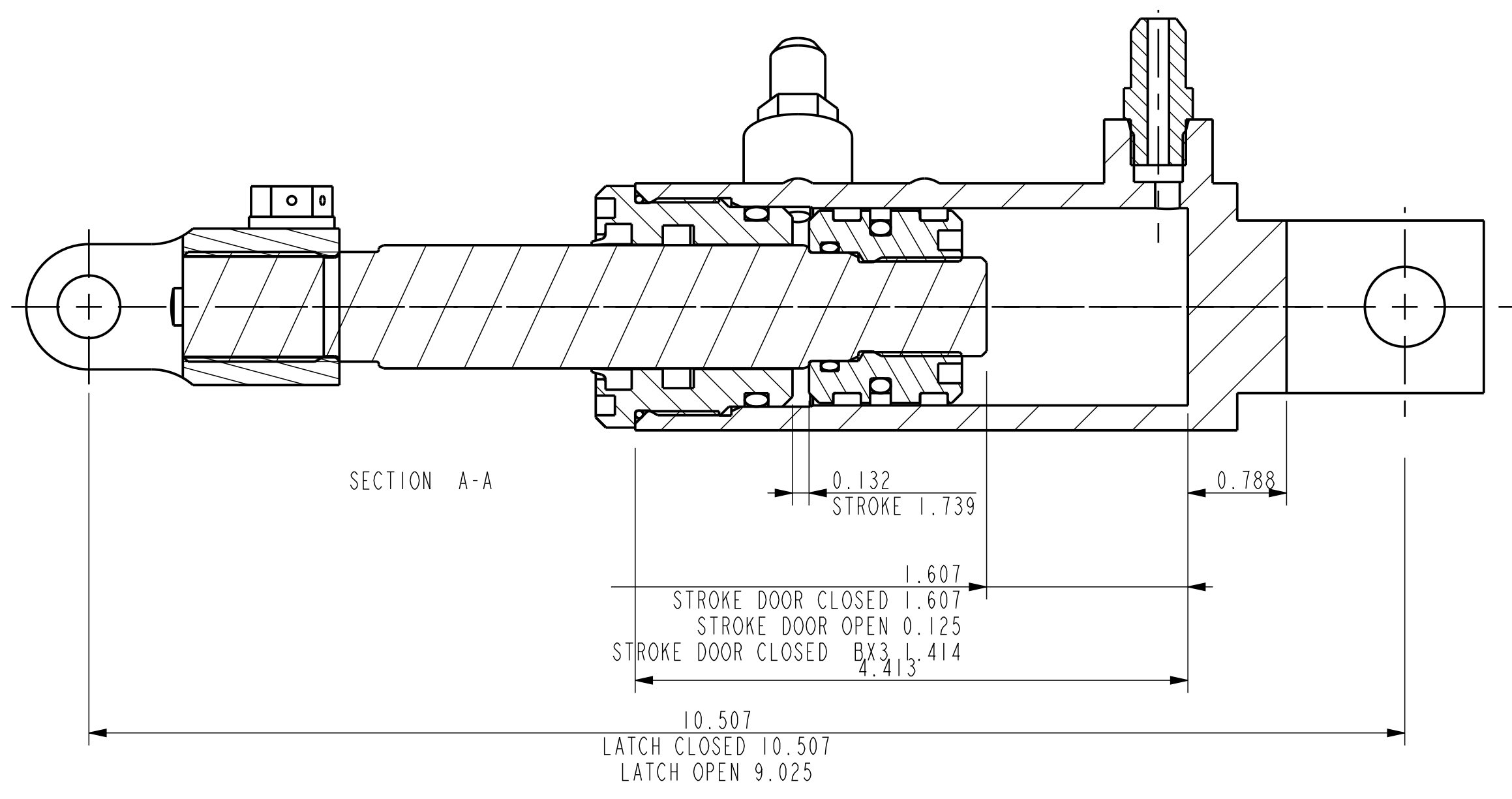
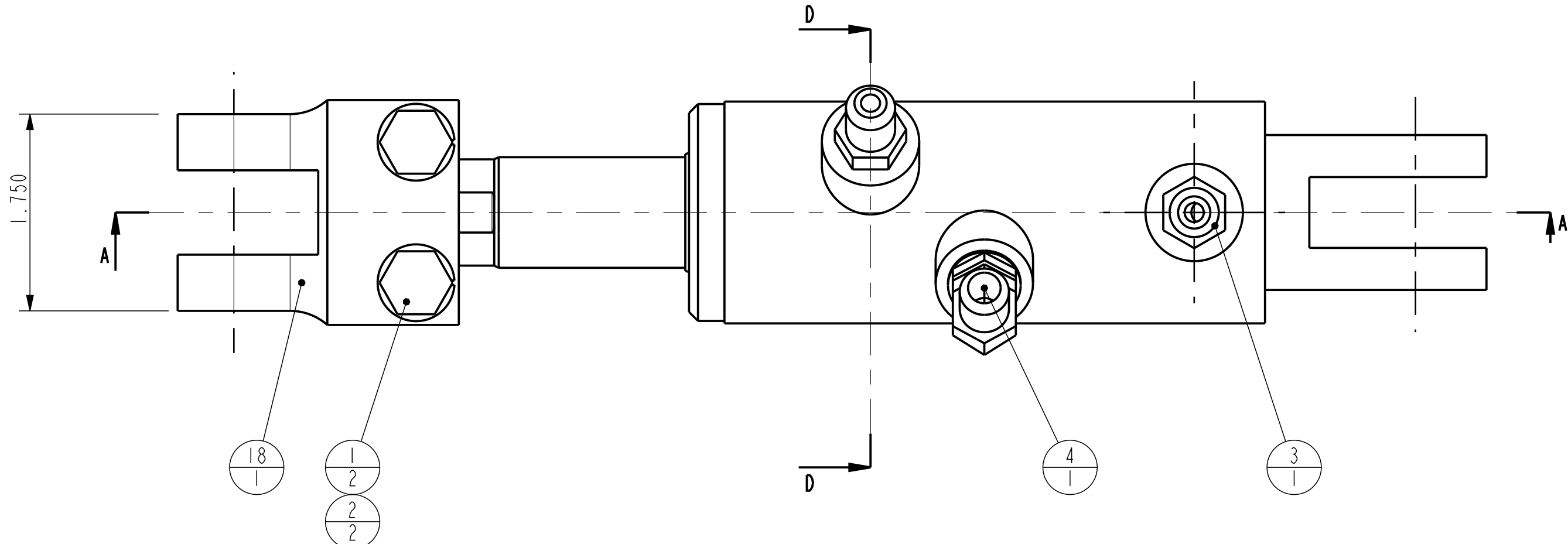
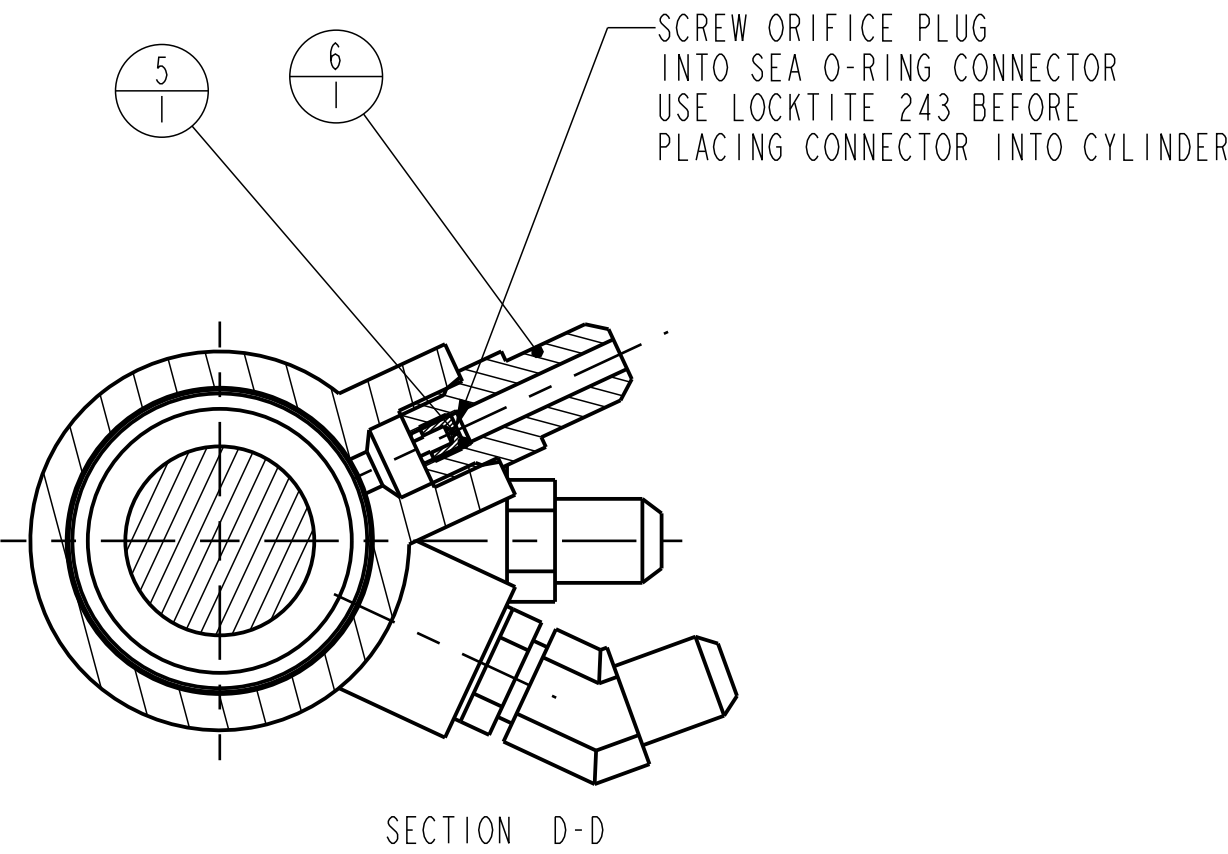
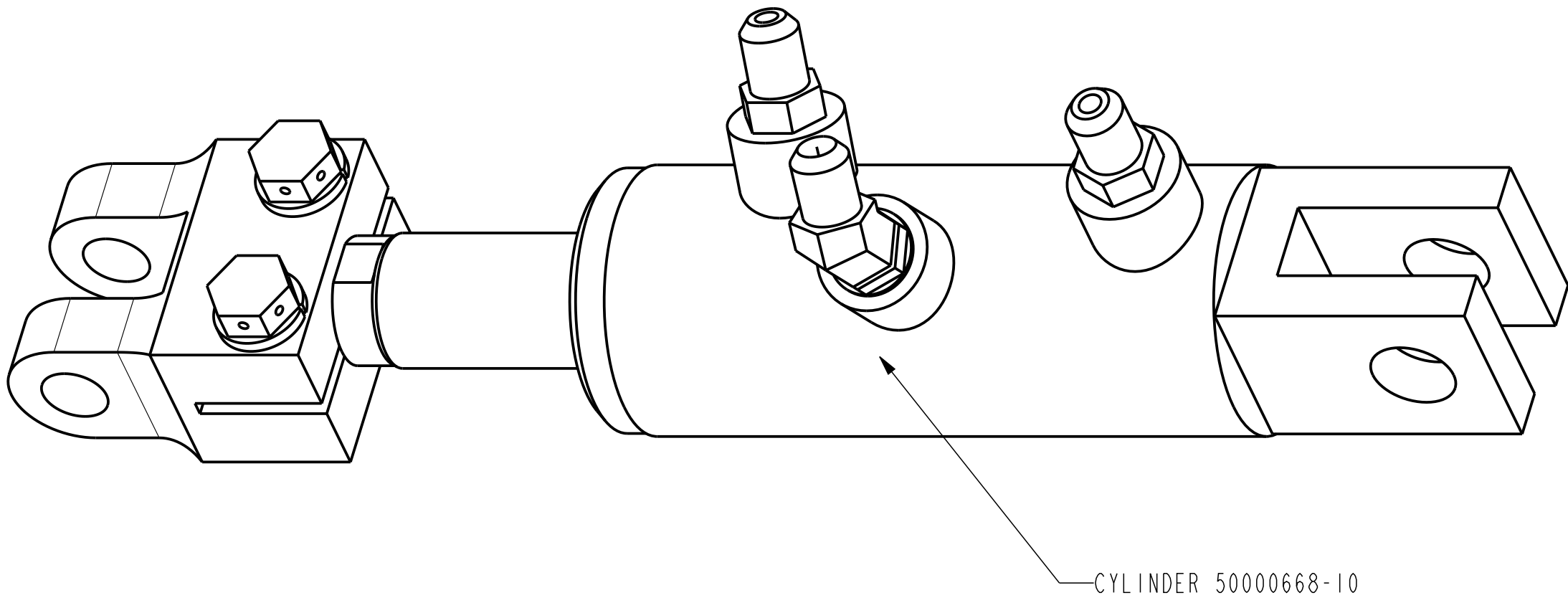


CHANGED CYLINDER 50000680-10

Notes:  
1) ITEM 2, 3 & 9 TO 22 ARE PART OF  
PURCHASE PART 50000680-10

ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	50006-10-C8D	SCREW,CAP-HEX HD (UNC 3/8")
2	4	50008-12-C8D	SCREW,CAP-HEX HD (UNC 1/2")
3	2	50906-C	WASHER, LOCK-REGULAR 0.375
4	4	50908-C	WASHER, LOCK-REGULAR 0.500
5	1	56529-4-4-S	CONNECTOR SAE O-RING -4 TO 37 JIC -4
6	1	56557-4-4-S	ELBOW, 45DEGR. O-RING BOSS / 37 JIC MALE
7	1	109105-08	ORIFICE PLUG M5x0.8 -- 0.8 mm
8	1	109106-4S-S	STRAIGHT CONNECTOR SAE O-RING -4, ORIFICE PLUG
9	1	50000680-1	CYLINDER ROD
10	2	50000680-11	Wearring 40x35x5.6, 10EGTP1250560400A
11	1	50000680-12	Glyd ring, 10e/gr0400a-15/4470
12	1	50000680-13	O-RING 2.62x25.07-Sh70, 012622507
13	1	50000680-14	O-RING 2.62x22.23-Sh90, 032622223
14	1	50000680-15	O-RING 3.53x32.92-Sh90, 033533292
15	1	50000680-16	O-RING 2.00x41.00-Sh70, 012004100
16	1	50000680-17	Rod Seal, 10TS2533/L
17	1	50000680-18	DUST WIPER, 10WRM-P25
18	1	50000680-2	PISTON
19	1	50000680-3	Cylinder housing
20	1	50000680-4	Gland door cylinder D40/25, 85TE4025
21	1	50000680-5	RING
22	1	50000680-6	Flange
23	1	50004023	ROD CLEVIS, CYLINDER

PARTNUMBER	50000680			UNLESS OTHERWISE SPECIFIED		 NATIONAL OILWELL VARCO	
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE			
SURF. FINISH / PAINTSPEC.	-			BREAK SHARP CORNERS .010 ± .005		<p>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES AND IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.</p> 	
COLOR	-			MACHINED SURFACES TORNCUT SURFACES			
WEIGHT	12.1 lbs 5.5 kg			ALL WELD SYMBOLS ACC. TO ISO			
ORIGINAL DOCUMENT	LATEST REVISION			DO NOT SCALE DOCUMENT			
NAME	L.S.		NAME	L.S.		REV.	SCALE 1:1
DATE	12 Mar 09		DATE	02 Apr 09		A	UNITS INCH (mm)
			E.C.N.	701042			
TITLE				SIZE	DRAWING NO.		SHEET OF 1
Door cylinder BX5				D	50000680		



ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	50006-10-C8D	SCREW,CAP-HEX HD (UNC 3/8")
2	2	50906-C	WASHER, LOCK-REGULAR 0.375
3	1	56529-4-4-S	CONNECTOR SAE O-RING -4 TO 37 JIC -4
4	1	56557-4-4-S	ELBOW, 45DEGR. O-RING BOSS / 37 JIC MALE
5	1	109105-08	ORIFICE PLUG M5x0.8 -- 0.8 mm
6	1	109106-4S-S	STRAIGHT CONNECTOR SAE O-RING -4, ORIFICE PLUG
7	2	50000667-11	Wearring 40x35x5.6, 10EGTP1250560400A
8	1	50000667-12	Glyd ring, 10e/gr0400a-15/4470
9	1	50000667-14	O-RING 2.62x22.23-Sh90, 032622223
10	1	50000667-15	O-RING 3.53x32.92-Sh90, 033533292
11	1	50000667-16	O-RING 2.00x41.00-Sh70, 012004100
12	1	50000667-17	Rod Seal, 10TS2533/L
13	1	50000667-18	DUST WIPER, 10WRM-P25
14	1	50000668-1	CYLINDER ROD
15	1	50000668-2	PISTON
16	1	50000668-3	Cylinder housing
17	1	50000668-4	Gland door cylinder D40/25, 85TE4025
18	1	50004023	ROD CLEVIS, CYLINDER

NOTES:  
1) ITEM 7 TO 17 ARE PART OF PURCHASE PART 50000668-10.

This item is also for BX3

PARTNUMBER

50000668

MATERIAL

SURF. FINISH / PAINTSPEC.

-

COLOR

-

WEIGHT

5.9 lbs2.7 kg

ORIGINAL DOCUMENT

NAME L.S.

DATE 18-DEC-08

LATEST REVISION

NAME L.S.

DATE 18 DEC 08

REV. -

E.C.N. 700784

TITLE

Latch cylinder BX4-50/75

UNLESS OTHERWISE SPECIFIED

TOOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE

BREAK SHARP CORNERS .010 ± .005

MACHINED SURFACES 250 ✓

TORNCUT SURFACES 1000 ✓

ALL WELD SYMBOLS ACC. TO ISO

DO NOT SCALE DOCUMENT

THIS DOCUMENT IS PDWInk CONTROLLED

SIZE D

DRAWING NO. 50000668

SCALE 1:1

UNITS INCH (mm)

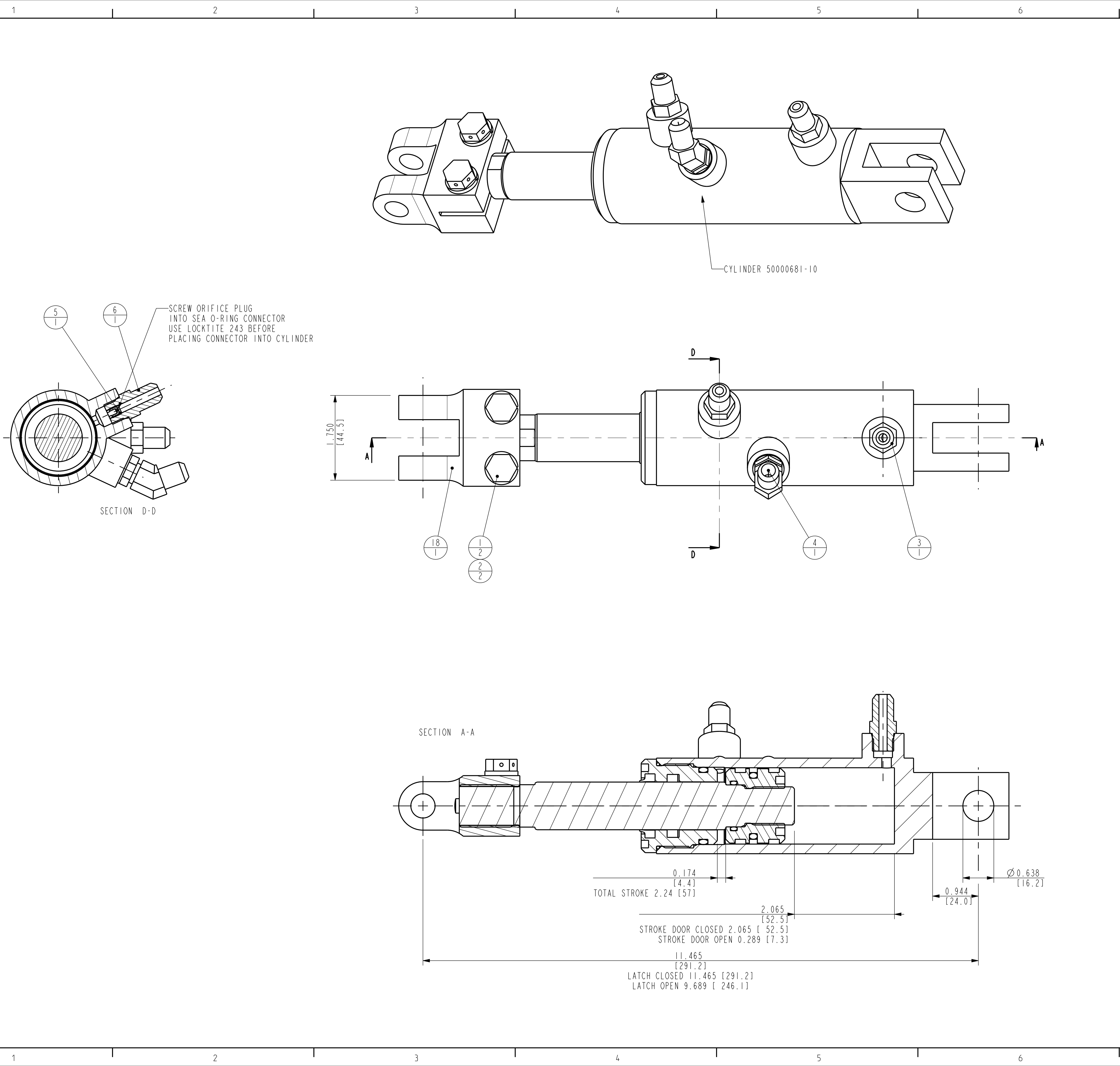
PROJ.

SHEET 1 OF 1

**NOV**


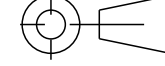
NATIONAL OILWELL VARCO

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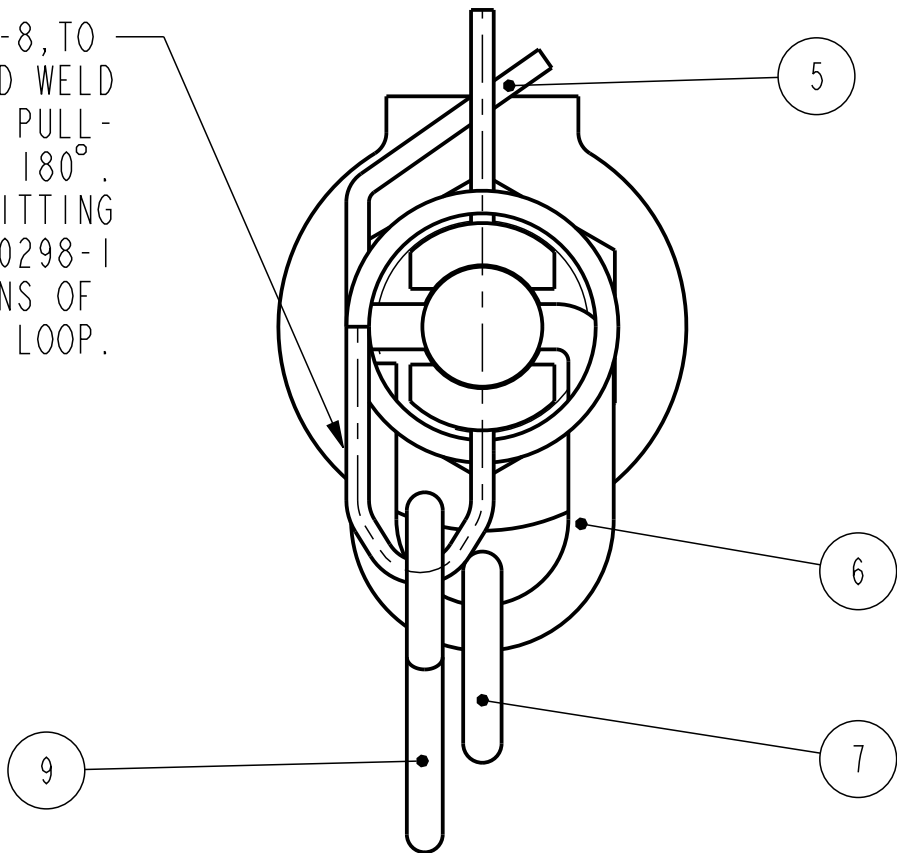
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	50006-10-C8D	SCREW,CAP-HEX HD (UNC 3/8")
2	2	50906-C	WASHER, LOCK-REGULAR 0.375
3	1	56529-4-4-S	CONNECTOR SAE O-RING -4 TO 37 JIC -4
4	1	56557-4-4-S	ELBOW, 45DEGR. O-RING BOSS / 37 JIC MALE
5	1	109105-08	ORIFICE PLUG M5x0.8 -- 0.8 mm
6	1	109106-4S-S	STRAIGHT CONNECTOR SAE O-RING -4, ORIFICE PLUG
7	1	50000681-1	CYLINDER ROD
8	2	50000681-11	Wearing 40x35x5.6, 10EGTP1250560400A
9	1	50000681-12	Glyd ring, 10e/gr0400a-15/4470
10	1	50000681-14	O-RING 2.62x22.23-Sh90, 032622223
11	1	50000681-15	O-RING 3.53x32.92-Sh90, 033533292
12	1	50000681-16	O-RING 2.00x41.00-Sh70, 012004100
13	1	50000681-17	Rod Seal, 10TS2533/L
14	1	50000681-18	DUST WIPER, 10WRM-P25
15	1	50000681-2	PISTON
16	1	50000681-3	Cylinder housing
17	1	50000681-4	Gland door cylinder D40/25, 85TE4025
18	1	50004023	ROD CLEVIS, CYLINDER

NOTES:  
1) ITEM 7 TO 17 ARE PART OF PURCHASE PART 50000681-10.

PARTNUMBER	50000681			UNLESS OTHERWISE SPECIFIED		<div> NATIONAL OILWELL VARCO</div>	
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE			
SURF. FINISH / PAINTSPEC.	-			BREAK SHARP CORNERS .010 ± .005		<div>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES. ALL COLLECTIVELY REFERRED TO HEREIN AS "NOV". IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.</div>	
COLOR	-			MACHINED SURFACES TORNCUT SURFACES			
WEIGHT	6.1 Lbs 2.8 kg			ALL WELD SYMBOLS ACC. TO ISO			
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT		SCALE 1:1	
NAME L.S.		NAME L.S.		REV.		PROJ.	
DATE 12 Mar 09		DATE 12 Mar 09		-		<div></div>	
		E.C.N. 701042		THIS DOCUMENT IS PDWInk CONTROLLED			
TITLE				SIZE	DRAWING NO.		SHEET 1 OF 1
Latch cylinder BX5				D	50000681		

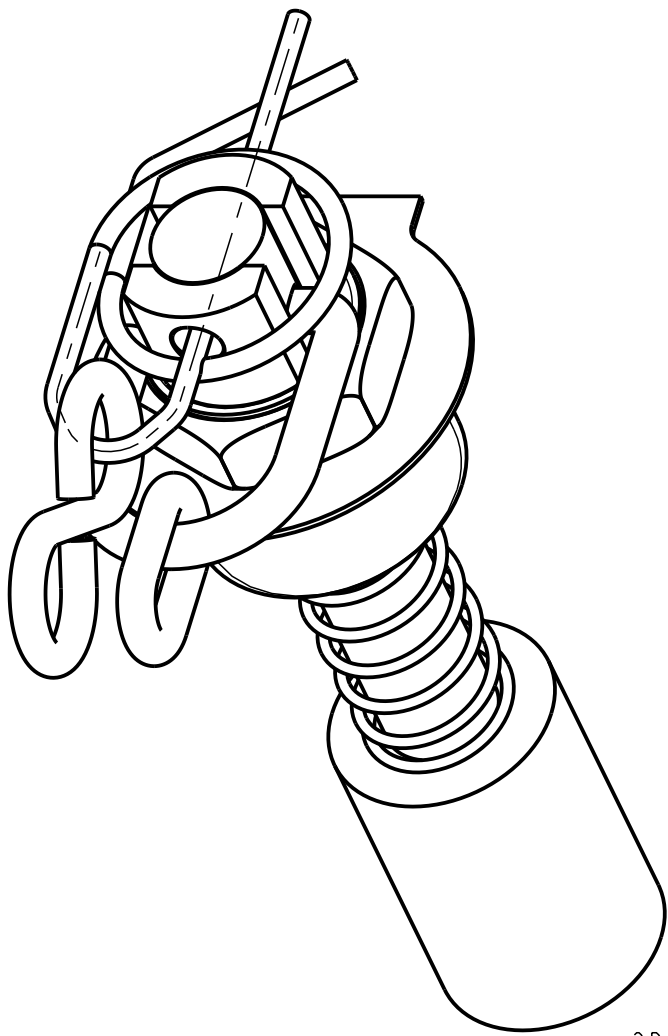
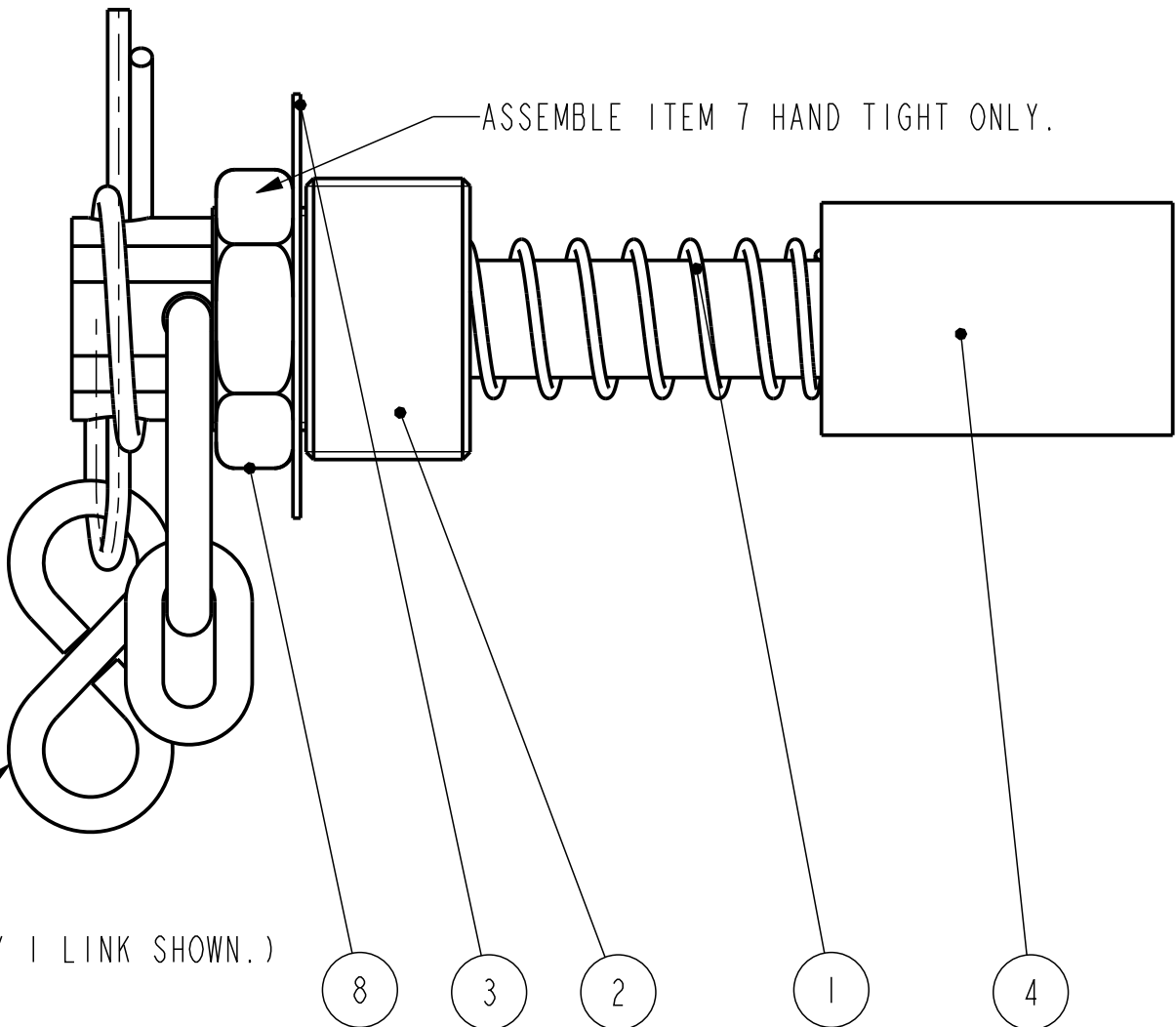
ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	1		980250	COMPRESSION SPRING D-210
2	1		203237	END CAP BUSHING LOCK
3	1		203240	LOCK RING
4	1		203236	LOCK SHAFT BUSHING LOCK
5	1		59000298-1	LOCKING RING, D=30mm, d= 3mm
6	1		203239	LOOP / LINK
7	1		948042-85	MACH. CHAIN STR. #3 LINK 5 LINKS LONG
8	1		980249-7	NUT 1 3/16 - 12 UNF
9	1		948051-2	S-HOOK

ATTACH CHAIN 948042-8, TO PULL-LOOP, CLOSE AND WELD AFTERWARDS. MAKE SURE PULL-LOOP CAN SWIVEL 180°. AND CHECK PROPER FITTING OF LOCKING RING 59000298-1 FOR BOTH POSITIONS OF PULL LOOP.



ATTACH S-HOOK TO END OF CHAIN 948042-85. CLOSE OTHER END ROUND LOCK RING 59000298-1 AFTER FINAL ASSEMBLY IN ELEVATOR.

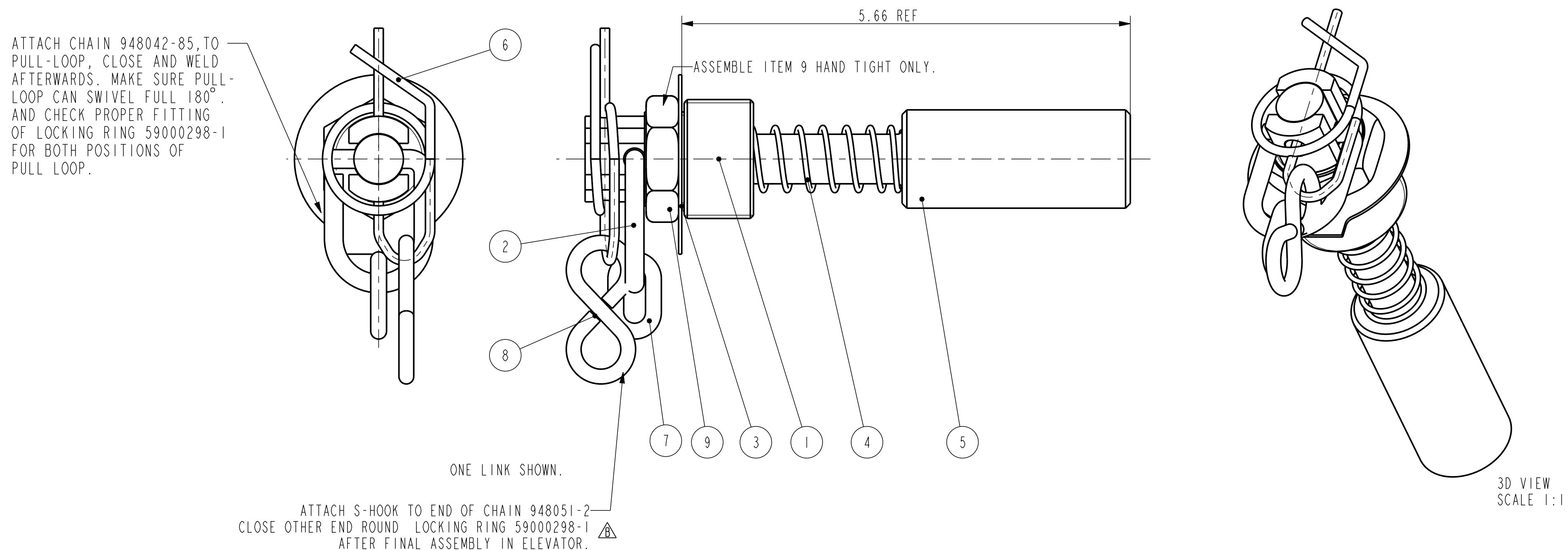
(ONLY 1 LINK SHOWN.)

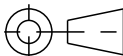


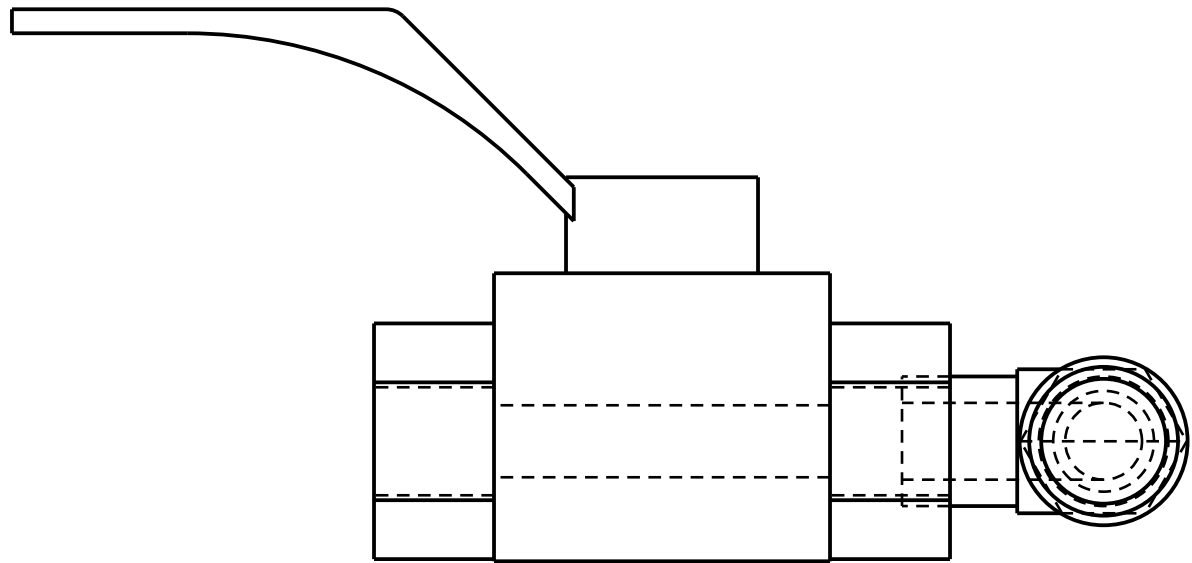
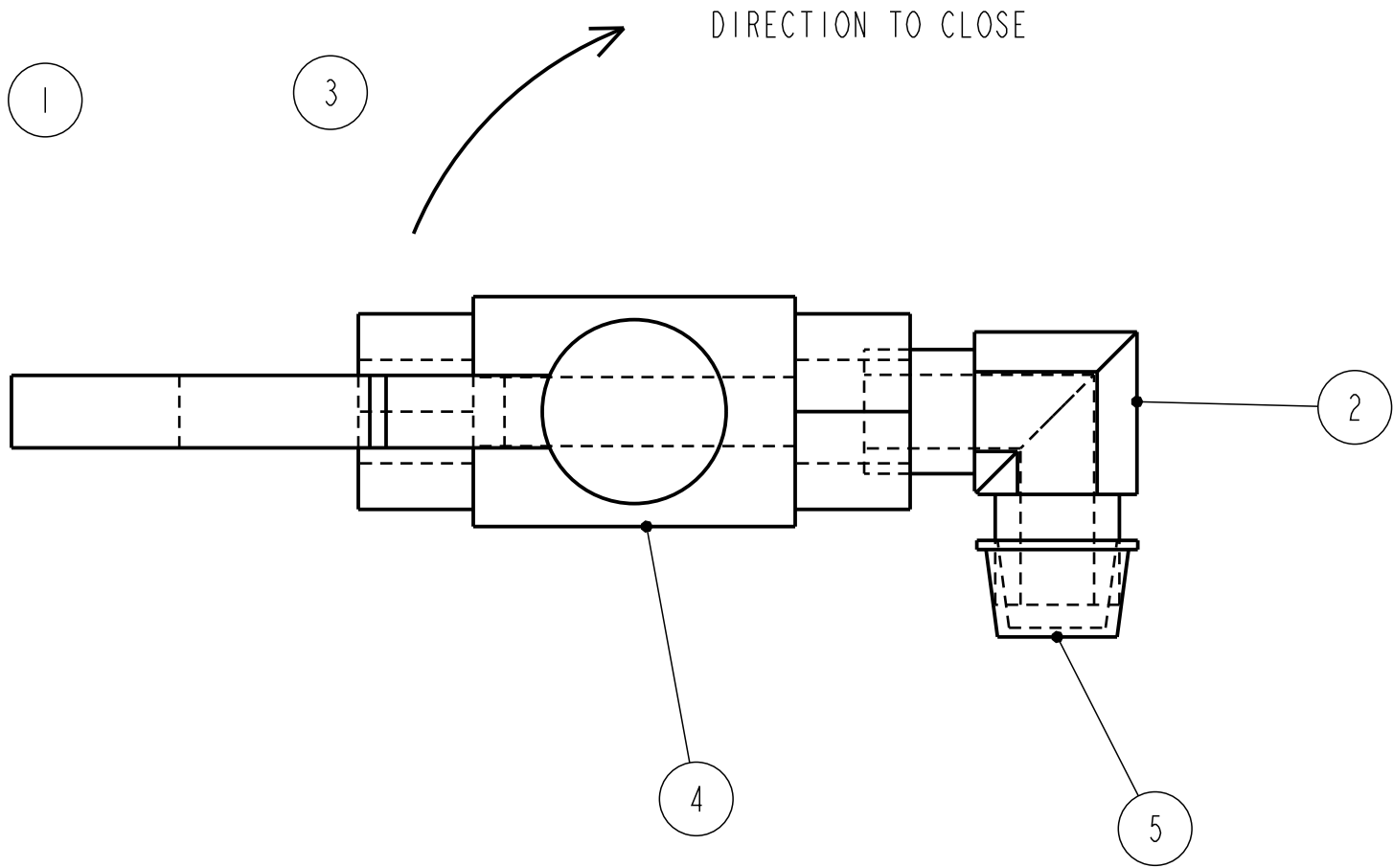
3D VIEW  
SCALE 1:1

203236-1		1	203236-1				K					
PART NO.		QTY.	NEXT ASSY.		FINAL ASSY.		J					
<div><div>Varco</div><div>OIL TOOLS</div><div>ETTEN-LEUR, THE NETHERLANDS</div></div> <p>THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER</p>							I					
							H					
TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250							G					
							F					
MATERIAL							E					
							D	700143	L.S.	29-JUN-05	P.D.	
APPROVED J. Tiebout 15-Jan-98 CHECKED AJ 15-Jan-98 PREPARED SBe 15-Jan-98							C	545003	P.D.	27-Oct-99	A.K.	
							B	545002	PD	15-Apr-98	AJ	
TITLE BUSHING LOCK ASSEMBLY SIZE C DRAWING NO. 203236-1							A	545001	SBe	15-Jan-98	AJ	
							REV.	E.C.N	NAME	DATE	CHECKED	
REDRAWN / REPLACED BY:							PRO/E FILE NO.: 203236-1					
REPLACES:												

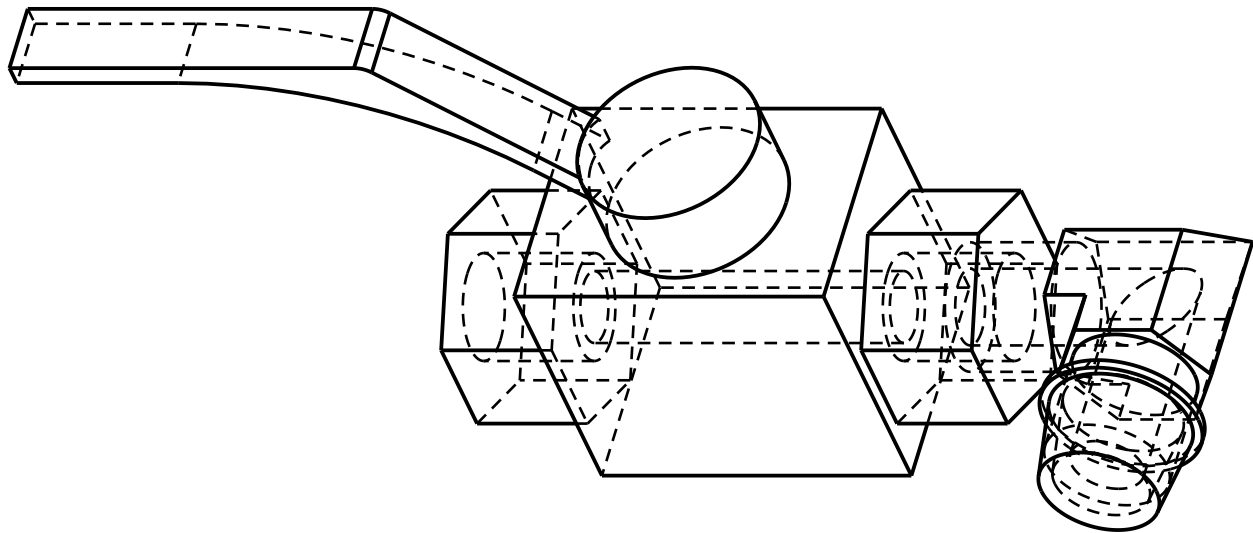
ITEM	QTY	DWG SIZE	PART NUMBER	DESCRIPTION
1	1		203237	END CAP BUSHING LOCK
2	1		203239	LOOP / LINK
3	1		203240	LOCK RING
4	1		980250	COMPRESSION SPRING D-210
5	1		50004036	LOCK SHAFT BUSHING LOCK
6	1		59000298-1	LOCKING RING, D=30mm, d= 3mm
7	1		948042-85	MACH. CHAIN STR. #3 LINK 5 LINKS LONG
8	1		948051-2	S-HOOK
9	1		980249-7	NUT 1 3/16 - 12 UNF

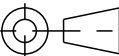


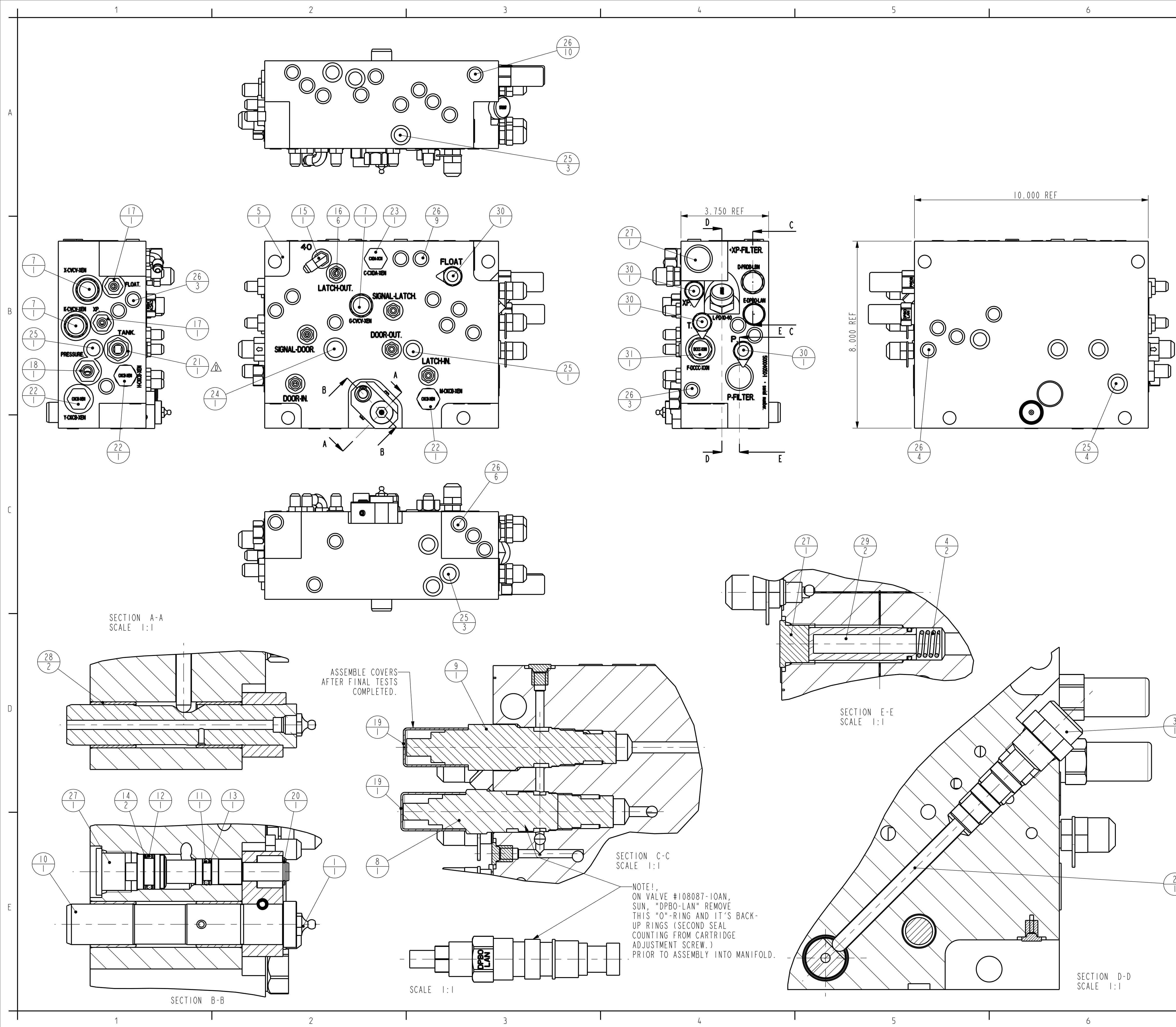
50004036-1				K											
PART NO.		QTY.	NEXT ASSY.		FINAL ASSY.		J								
<div>Varco. BJ™ OIL TOOLS</div> <div>ETTEN-LEUR, THE NETHERLANDS</div>				UNLESS OTHERWISE SPECIFIED  TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE  BREAK SHARP CORNERS .010 ± .005  MACHINED SURFACES <div>250/✓</div>				I							
								H							
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER				G											
				F											
				E											
				D											
				C											
NAME		DATE		<div>PROJ.</div> <div></div>		B		700143		L.S.		29 JUN 05		P.D.	
APPROVED		A. K.				A		583601		P.D.		25-Jan-00		A. K.	
CHECKED		A. K.		SCALE 1:1		REV.		E.C.N		NAME		DATE		CHECKED	
PREPARED		P. D.		UNITS (INCH (MM))		WEIGHT		LBS/		KG		PRO/E FILE NO.: 50004036-1			
TITLE						SIZE		DRAWING NO.						SHEET	
BUSHING LOCK ASSY' BX 5.						C		50004036-1						OF 1	
REDRAWN / REPLACED BY:						REPLACES:									



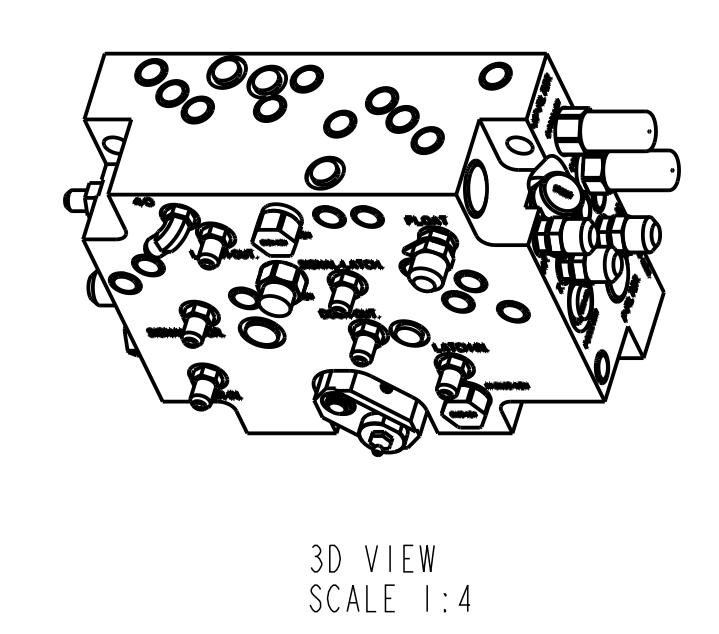
ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	1		55909-6-6	MALE QUICK DISCONNECT FD45 #6
2	1		56702-6-6-S	KNEE 3/8" NPT
3	1		56703-6-6-S	CONNECTOR 3/8" NPT
4	1		979552-1	BALL VALVE 3/8" NPT
5	1		-	PLASTIC CAP



203200-1				-	-	-	K				
PART NO.		QTY.		NEXT ASSY.		FINAL ASSY.		J			
<div>Varco<sup>®</sup> BJ<sup>™</sup></div> <div>OIL TOOLS</div> <div>ETTEN-LEUR, THE NETHERLANDS</div>				UNLESS OTHERWISE SPECIFIED  TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE  BREAK SHARP CORNERS .010 ± .005  MACHINED SURFACES 250✓				I			
								H			
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER								G			
								F			
								E			
								D			
								C			
	NAME	DATE	PROJ.		MATERIAL		B	545002	A. J.	10-Nov-98	P. D.
APPROVED	J. Tiebout	28-Oct-98					A	545001	A. J.	28-Oct-98	P. D.
CHECKED	P. D.	28-Oct-98	SCALE 1:1				REV.	E. C. N	NAME	DATE	CHECKED
PREPARED	A. J.	28-Oct-98	UNITS INCH (MM)				WEIGHT 0.000 LBS/ KG		PRO/E FILE NO.: 203200-1		
TITLE					SIZE		DRAWING NO.		SHEET		
PRESSURE SHUT VALVE					C		203200-1		OF 1		
REDRAWN / REPLACED BY:					REPLACES:						


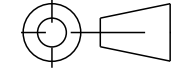


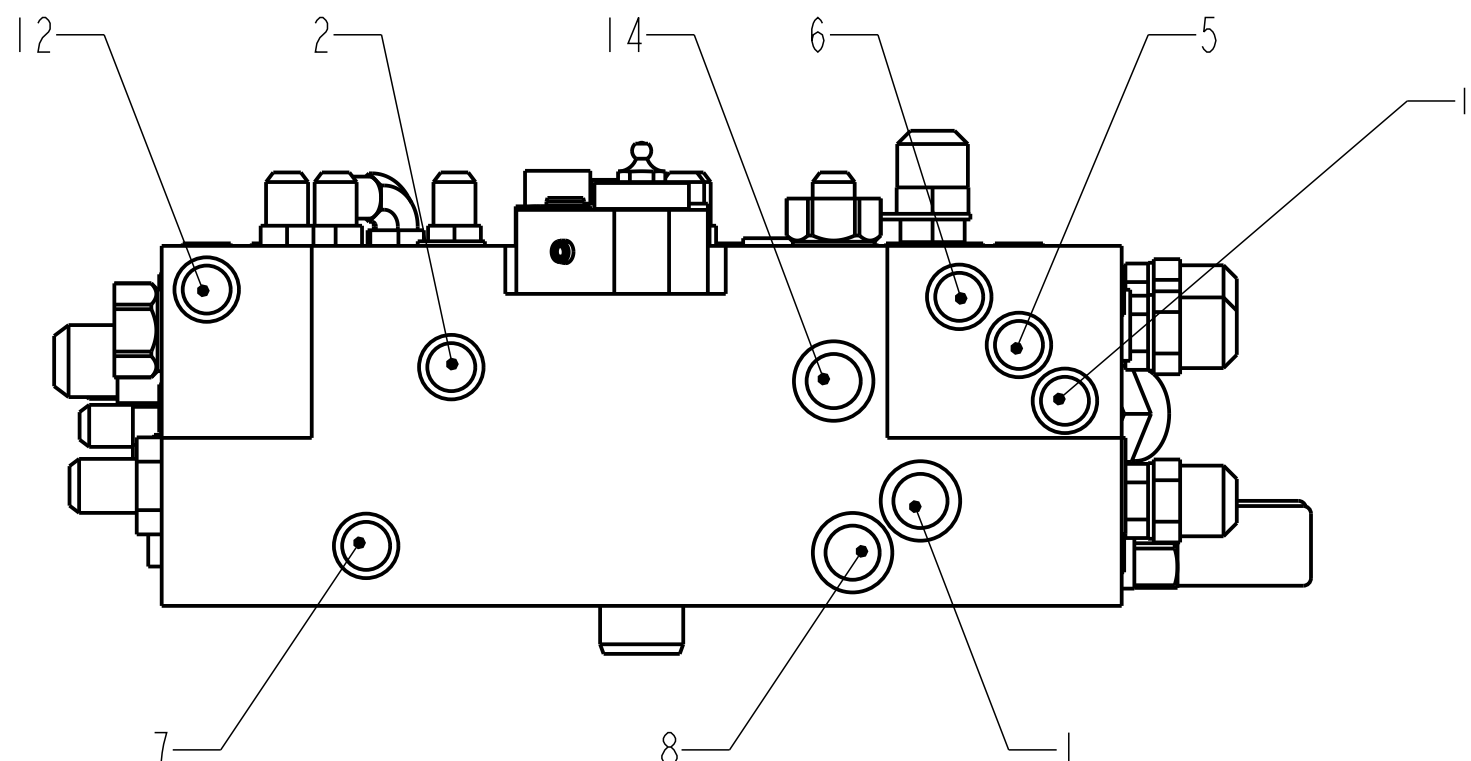
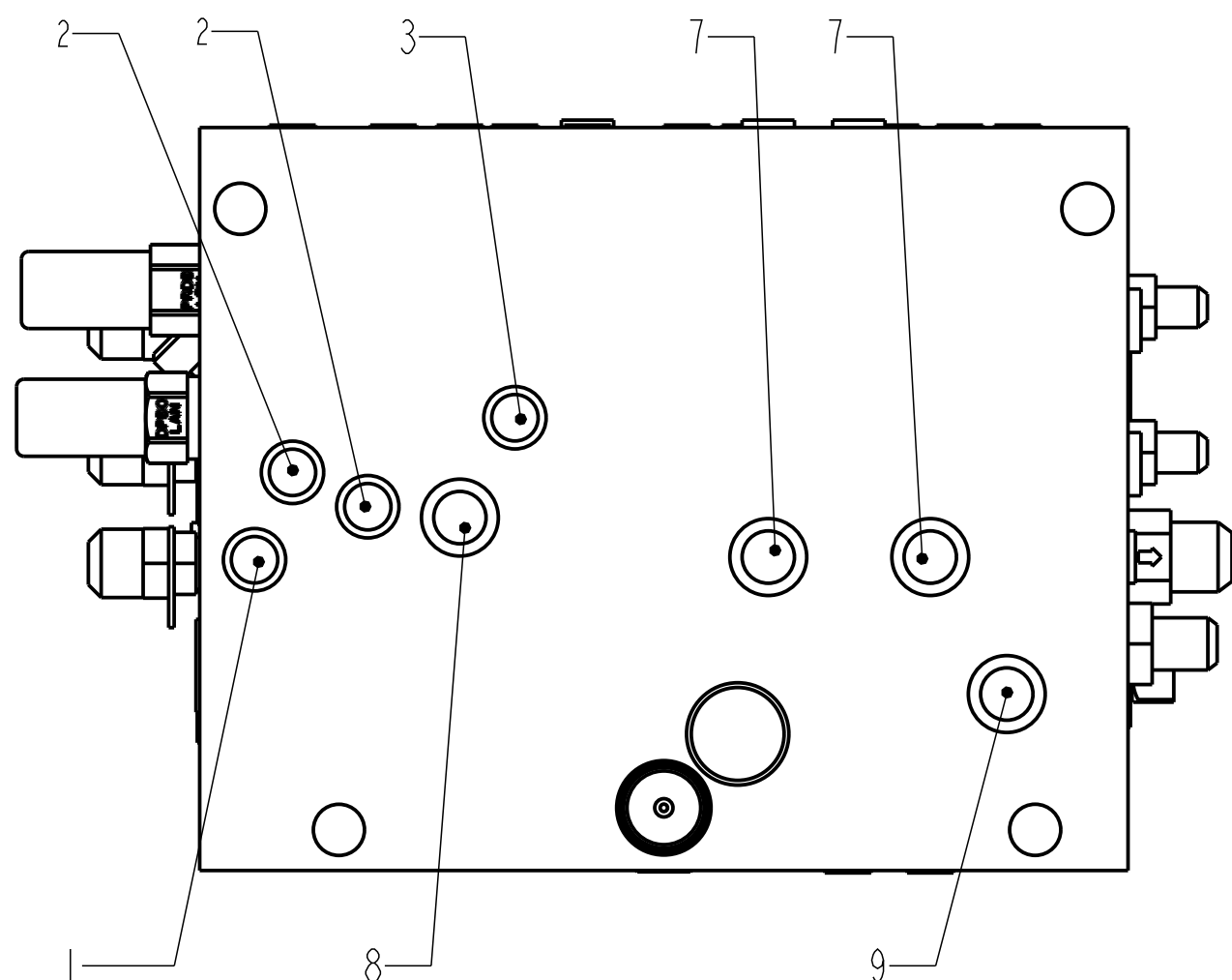
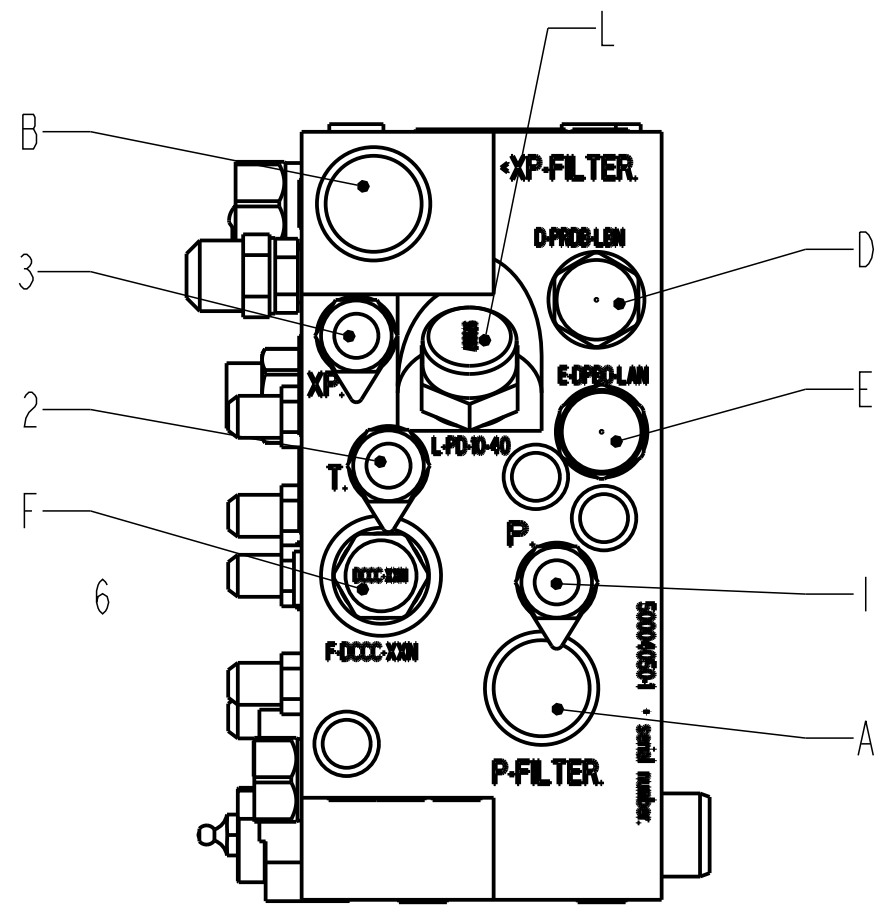
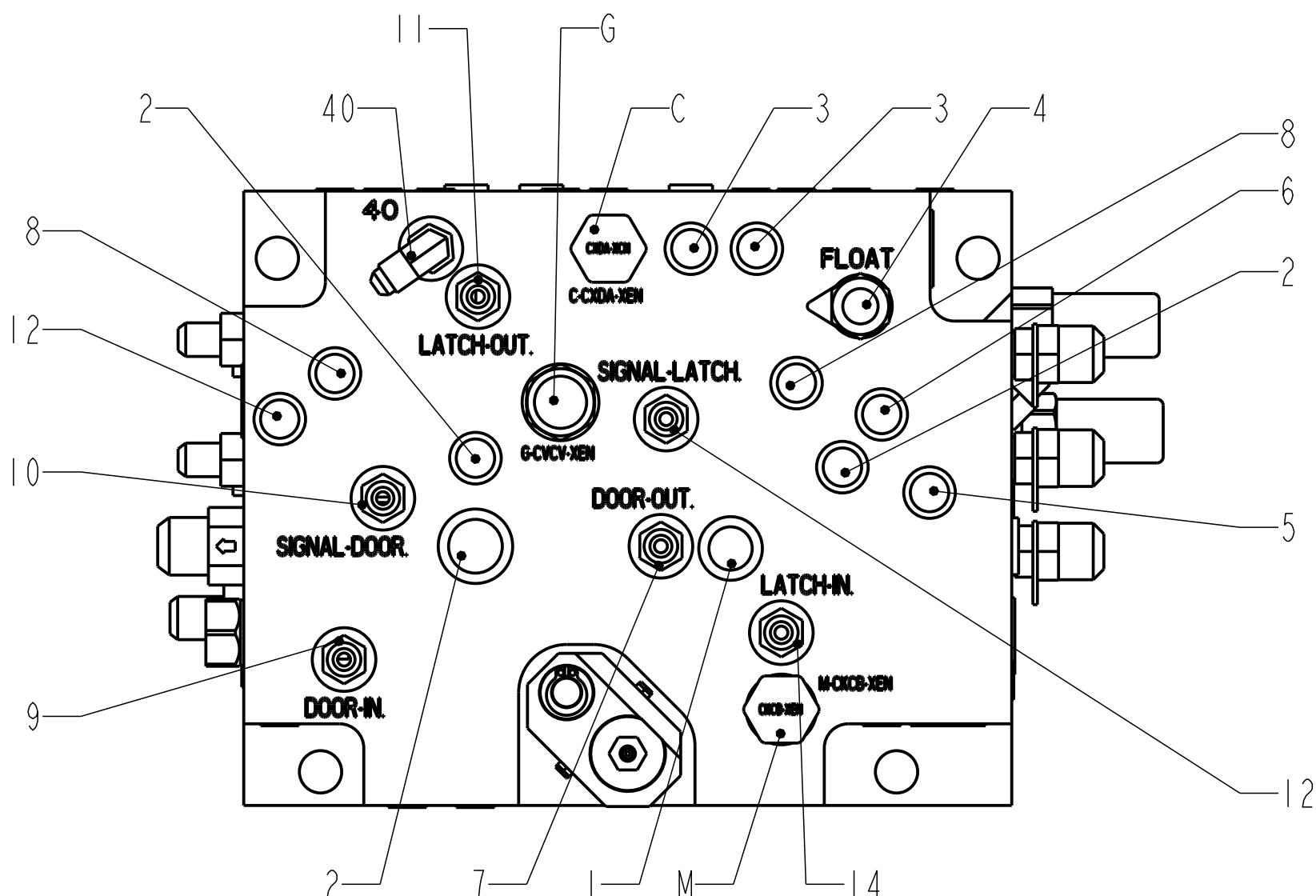
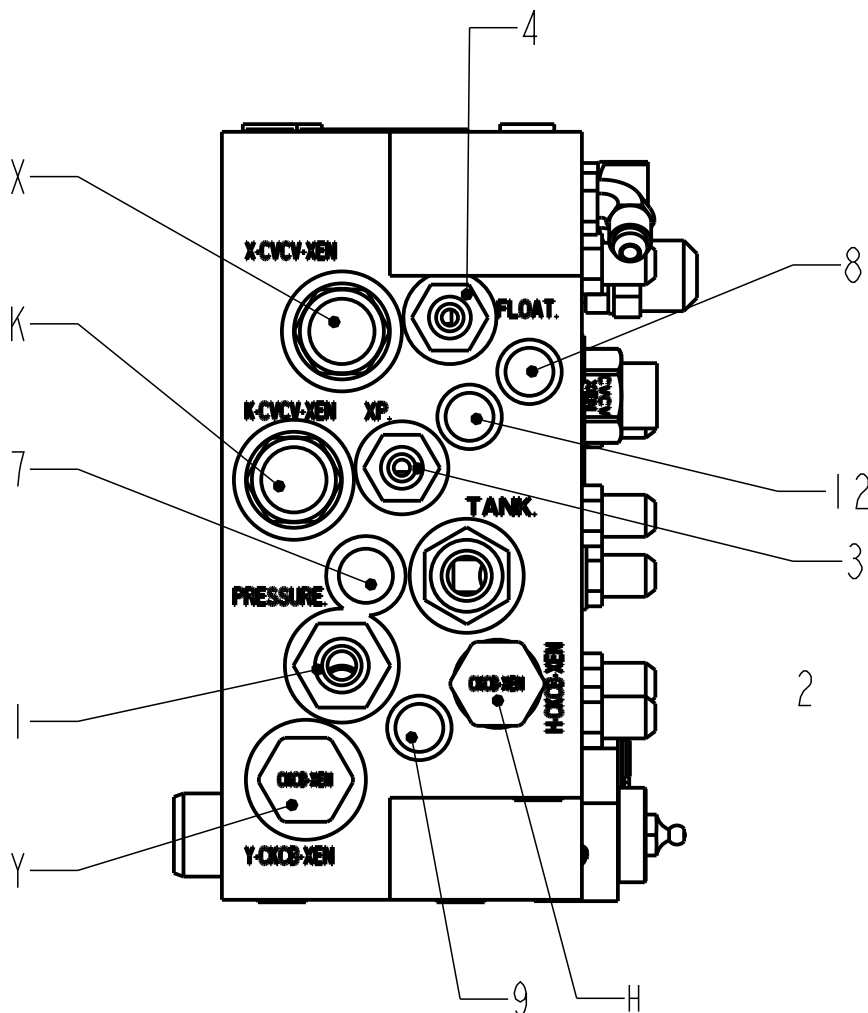
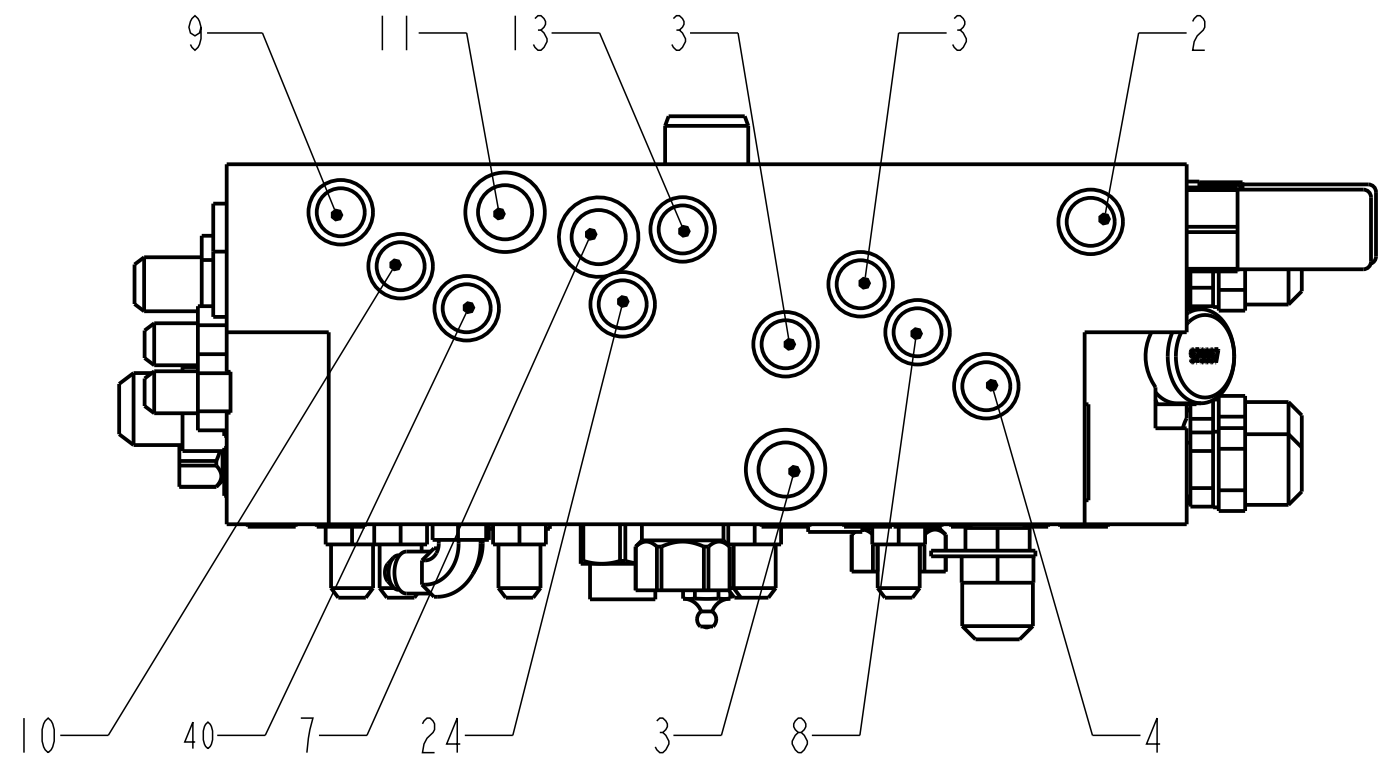
7			8
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	53201	GREASE FITTING, STRAIGHT
2	1	203272	INITIATOR PIN
3	1	979997	HYDRAFORCE PD10-40-NS-110
4	2	980252	COMPRESSION SPRING D-253
5	1	50004050	MANIFOLD BX FRAME 3 4 5
6	1	50004054	RETRACT PLUNGER
7	3	107029-175N	PILOT TO OPEN CHECK VALVE . EXT DRAINED.
8	1	108087-10AN	3-WAY SEQUENCE VALVE
9	1	109858-1BN	DIRECT ACTING PRESSURE REDUCING VALVE
10	1	50004051-1	TRIGGER SHAFT ASSY
11	1	51300-110-B	O-RING O 2-110 PARKER
12	1	51300-113-B	O RING O 2-113 PARKER
13	1	51301-110	BACKUP RING T 8-110 PARKER
14	2	51301-113	BACKUP RING T 8-113 PARKER
15	1	56519-4-4-S	ELBOW 90 deg O.RING EXT.7/16UNF TO EXT.7/16 JIC
16	6	56529-4-4-S	CONNECTOR SAE O-RING -4 TO 37 JIC -4
17	2	56529-6-4-S	CONNECTOR SAE O-RING -6 TO 37 JIC -4
18	1	56529-8-6-S	CONNECTOR SAE O-RING -8 TO 37 JIC -6
19	2	59000184-1	SUN TAMPER RESISTANT COVER SERIES I
20	1	59000213-10-C	RING, RETAINING 10mm, STAINLESS.
21	1	59000243-3-8	INLINE CHECKVALVE, DT-MOMF-500
22	3	93547-1B75N	PILOT TO OPEN CHECK VALVE INT. DRAIN CKCB-XEN
23	1	94536-130N	FREE-FLOW NOSE TO SIDE CHECK VALVE, CXDA-XCN
24	1	979512-2	PLUG 9/16" - UNF + O-RING
25	12	979512-3	PLUG 7/16" - UNF + 'O' RING
26	35	979512-9	PLUG 5/16-24" - UNF + 'O'-RING
27	3	979512-10	PLUG 7/8" - UNF + 'O' RING
28	2	979771-2225	GLACIER BEARING MB2225DU
29	2	979796-25-S	FILTER CARTRIDGE 25 MICRON
30	4	979798-1	PRESSURE GAUGE CONNECTOR MEV20 - 7/16 UNF-4
31	1	979880-8	SUN 3/4 CARTRIDGE DCCC-XXN



NOTE:  
TORQUE VALUES FOR CARTRIDGES:  
-SUN SERIES I 45-50 Nm - 33-37 ft/lbs  
-HYDRAFORCE 10 SIZE 34 Nm - 25 ft/lbs

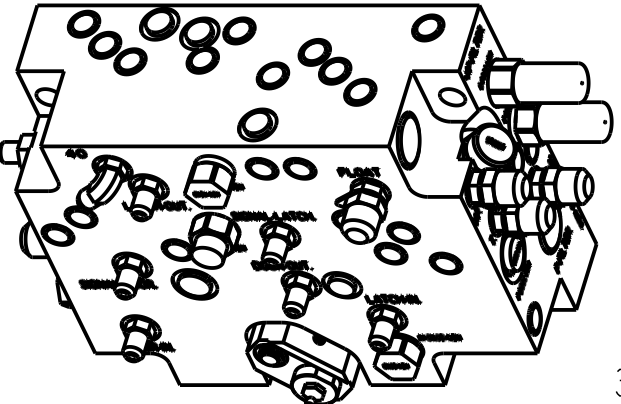
TEST ACC. TSEL 0040

PARTNUMBER		50004050-I		UNLESS OTHERWISE SPECIFIED		 <b>NATIONAL OILWELL VARCO</b>	
MATERIAL				TOLERANCES (PER ANSI Y 14.5): 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE			
SURF. FINISH / PAINTSPEC.		-		BREAK SHARP CORNERS .010 ± .005			
COLOR		-		MACHINED SURFACES		250°	
				TOUCHUP SURFACES		1000°	
WEIGHT		76.5 lbs		34.7 kg		ALL WELD SYMBOLS ACC. TO ISO	
ORIGINAL DOCUMENT		LATEST REVISION				DO NOT SCALE DOCUMENT	
NAME		P. Dekker		NAME		SCALE 1:2	
DATE		10-Sep-02		L. S.		PROJ.	
				DATE			
				E.C.N.		UNITS INCH (mm)	
				700784			
TITLE		SIZE		DRAWING NO.			
Ass'y Manifold BX frame 3, 4 & 5		D		50004050-I		SHEET 1 of 2	




- 1 = P  
2 = T  
3 = XP  
4 = FLOAT  
A = PRESSURE FILTERELEMENT, PART.NR. 979796-25  
B = X-PRESSURE FILTERELEMENT, PART.NR. 979796-25  
C = CXDA-XCN CARTRIDGE PART.NR. 94536-130N  
D = PRDB-LBN CARTRIDGE PART.NR. 109858-1BN  
E = DPBO-LAN CARTRIDGE PART.NR. 108087-10AN  
F = DCCC-XXN CARTRIDGE PART.NR. 979880-8  
G = CVCV-XEN CARTRIDGE PART.NR. 107029-175N  
H = CKCB-XEN CARTRIDGE PART.NR. 93547-1B75N  
K = CVCV-XEN CARTRIDGE PART.NR. 107029-175N  
L = PD10-40-NS-110 CARTRIDGE (HYDRAFORCE) PART.NR. 979997  
M = CKCB-XEN CARTRIDGE PART.NR. 93547-1B75N  
X = CVCV-XEN CARTRIDGE PART.NR. 107029-175N  
Y = CKCB-XEN CARTRIDGE PART.NR. 93547-1B75N
- PROVIDED WITH PRESSURE GAUGE-CONNECTOR  
PROVIDED WITH PRESSURE GAUGE-CONNECTOR  
PROVIDED WITH PRESSURE GAUGE-CONNECTOR  
PROVIDED WITH PRESSURE GAUGE-CONNECTOR

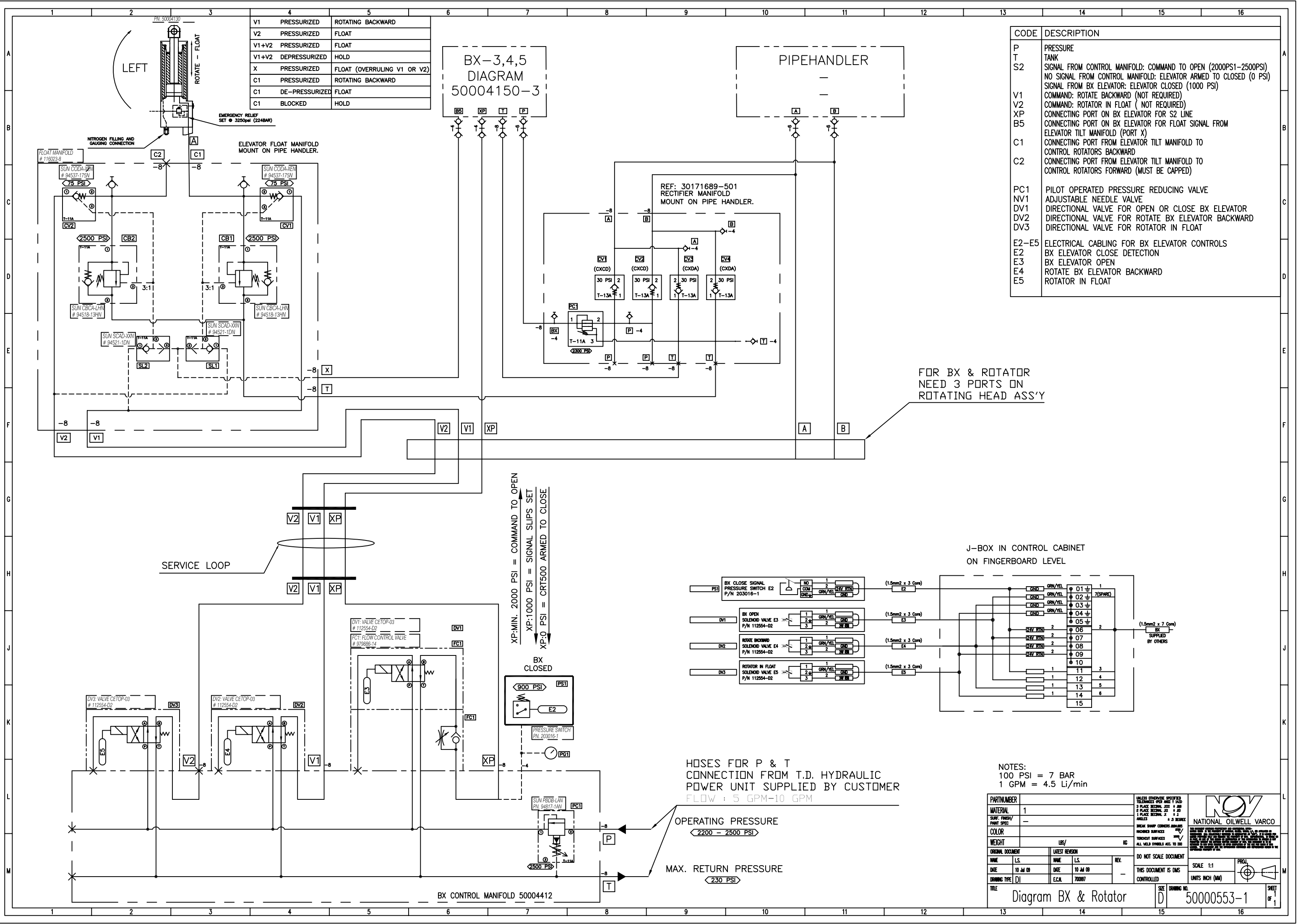
- 7 = DOOR CYLINDER OUT (DOORS CLOSE)  
10 = SIGNAL DOOR CYLINDER  
9 = DOOR CYLINDER IN (DOORS OPEN)  
11 = LATCH CYLINDER OUT (LATCH CLOSES)  
12 = SIGNAL LATCH CYLINDER  
14 = LATCH CYLINDER IN (LATCH OPENS)  
40 = PRESSURE LINE TO LATCH VALVE



3D VIEW  
SCALE 1:4

- NUMBERS REFLECT LINE-NUMBERS IN SCHEMATIC 50004050-3  
- "A" thru "Y" ARE COMPONENT ID IN SCHEMATIC 50004050-3

PARTNUMBER 50004050-1		UNLESS OTHERWISE SPECIFIED		 NATIONAL OILWELL VARCO	
MATERIAL		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE			
SURF. FINISH 7 PAINTSPEC.		BREAK SHARP CORNERS .010 ± .005		THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES AND IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.	
COLOR -		MACHINED SURFACES TORNCUT SURFACES			
WEIGHT 76.5 lbs [ .1 ] kg		ALL WELD SYMBOLS ACC. TO ISO		DO NOT SCALE DOCUMENT	
ORIGINAL DOCUMENT		LATEST REVISION		SCALE 1:2	
NAME P. Dekker		NAME L.S.		PROJ.	
DATE 10-Sep-02		DATE 13 Feb 09		UNITS INCH (mm)	
		E.C.N. 700784			
TITLE		SIZE		DRAWING NO.	
Ass'y Manifold BX frame 3, 4 & 5		D		50004050-1	
				SHEET 2 OF 2	



V1	PRESSURIZED	ROTATING BACKWARD
V2	PRESSURIZED	FLOAT
V1+V2	PRESSURIZED	FLOAT
V1+V2	DEPRESSURIZED	HOLD
X	PRESSURIZED	FLOAT (OVERRULING V1 OR V2)
C1	PRESSURIZED	ROTATING BACKWARD
C1	DE-PRESSURIZED	FLOAT
C1	BLOCKED	HOLD

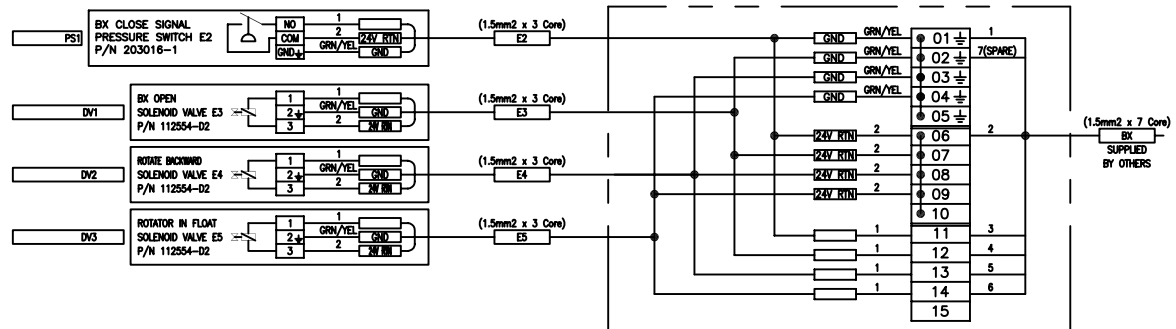
BX-3,4,5  
DIAGRAM  
50004150-3

PIPEHANDLER

CODE	DESCRIPTION
P	PRESSURE
T	TANK
S2	SIGNAL FROM CONTROL MANIFOLD: COMMAND TO OPEN (2000PSI-2500PSI) NO SIGNAL FROM CONTROL MANIFOLD: ELEVATOR ARMED TO CLOSED (0 PSI) SIGNAL FROM BX ELEVATOR: ELEVATOR CLOSED (1000 PSI)
V1	COMMAND: ROTATE BACKWARD (NOT REQUIRED)
V2	COMMAND: ROTATOR IN FLOAT (NOT REQUIRED)
XP	CONNECTING PORT ON BX ELEVATOR FOR S2 LINE
B5	CONNECTING PORT ON BX ELEVATOR FOR FLOAT SIGNAL FROM ELEVATOR TILT MANIFOLD (PORT X)
C1	CONNECTING PORT FROM ELEVATOR TILT MANIFOLD TO CONTROL ROTATORS BACKWARD
C2	CONNECTING PORT FROM ELEVATOR TILT MANIFOLD TO CONTROL ROTATORS FORWARD (MUST BE CAPPED)
PC1	PILOT OPERATED PRESSURE REDUCING VALVE
NV1	ADJUSTABLE NEEDLE VALVE
DV1	DIRECTIONAL VALVE FOR OPEN OR CLOSE BX ELEVATOR
DV2	DIRECTIONAL VALVE FOR ROTATE BX ELEVATOR BACKWARD
DV3	DIRECTIONAL VALVE FOR ROTATOR IN FLOAT
E2-E5	ELECTRICAL CABLING FOR BX ELEVATOR CONTROLS
E2	BX ELEVATOR CLOSE DETECTION
E3	BX ELEVATOR OPEN
E4	ROTATE BX ELEVATOR BACKWARD
E5	ROTATOR IN FLOAT

FOR BX & ROTATOR  
NEED 3 PORTS ON  
ROTATING HEAD ASS'Y

J-BOX IN CONTROL CABINET  
ON FINGERBOARD LEVEL



HOSES FOR P & T  
CONNECTION FROM T.D. HYDRAULIC  
POWER UNIT SUPPLIED BY CUSTOMER  
FLOW : 5 GPM-10 GPM

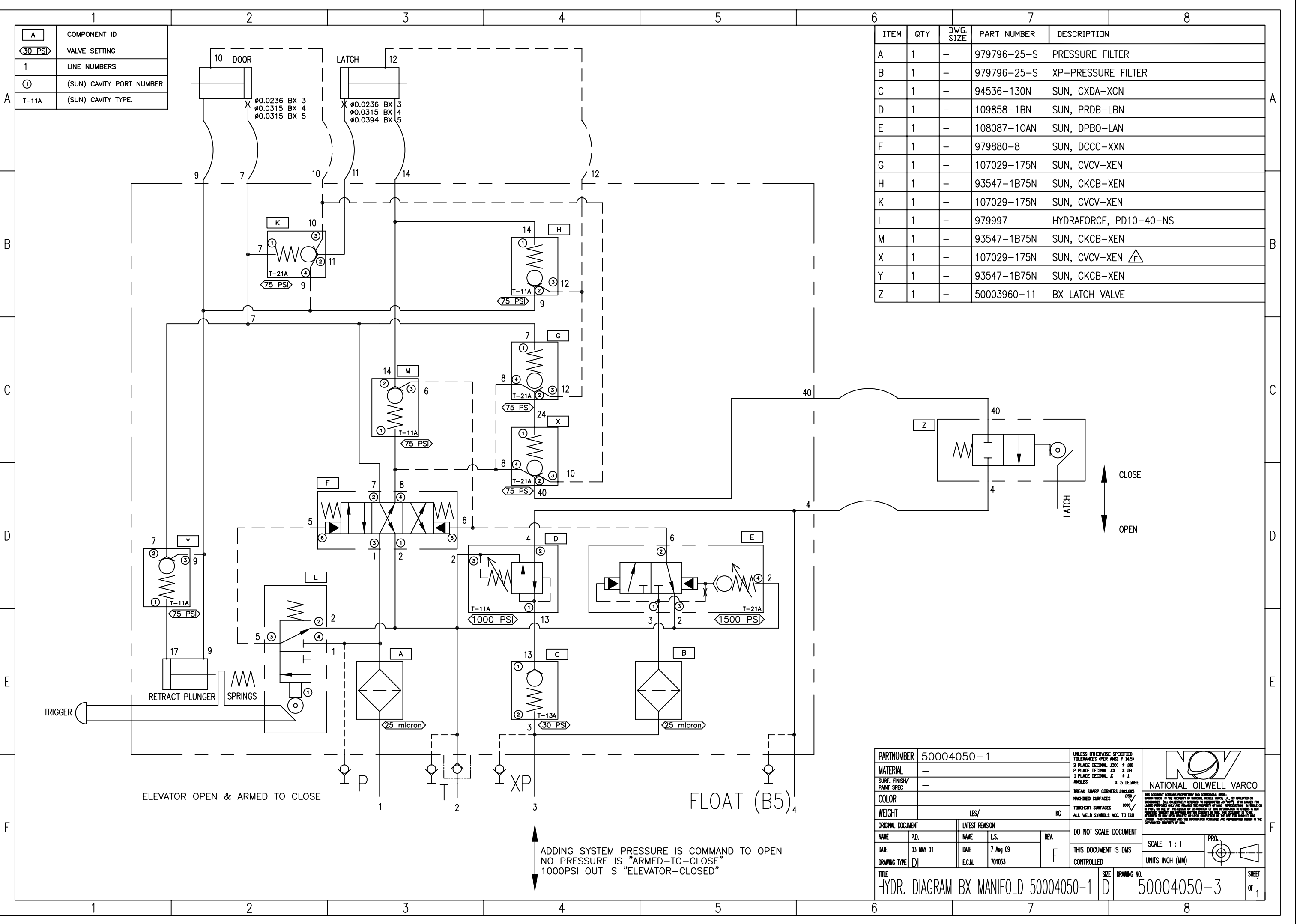
OPERATING PRESSURE  
2200 - 2500 PSI

MAX. RETURN PRESSURE  
230 PSI


NOTES:  
100 PSI = 7 BAR  
1 GPM = 4.5 Li/min

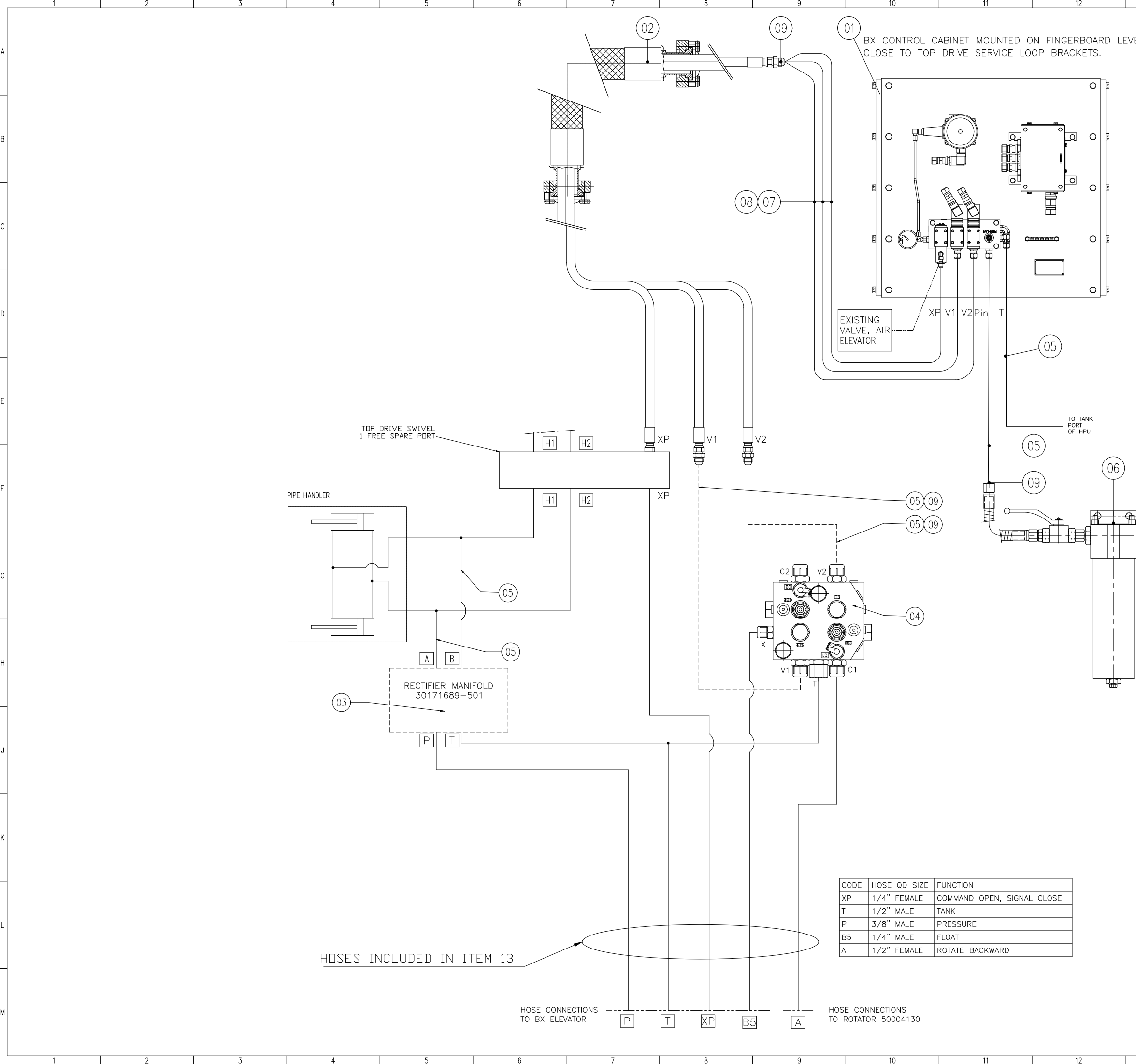
PARTNUMBER		VALS: OTHER/STP SPECIFIED		NATIONAL OILWELL VARCO
MATERIAL	1	2 PLACE: OTHER/STP SPECIFIED		
SURF. FINISH/PAINT SPEC		3 PLACE: OTHER/STP SPECIFIED		
COLOR		4 PLACE: OTHER/STP SPECIFIED		
WEIGHT		5 PLACE: OTHER/STP SPECIFIED		
ORIGINAL DOCUMENT		6 PLACE: OTHER/STP SPECIFIED		
NAME	LS	7 PLACE: OTHER/STP SPECIFIED		
DATE	10 Jul 09	8 PLACE: OTHER/STP SPECIFIED		
DRAWING TYPE	DI	9 PLACE: OTHER/STP SPECIFIED		
TITLE	Diagram BX & Rotator	10 PLACE: OTHER/STP SPECIFIED		
SIZE	D	11 PLACE: OTHER/STP SPECIFIED		
DRAWING NO.	50000553-1	12 PLACE: OTHER/STP SPECIFIED		
SHEET	1	13 PLACE: OTHER/STP SPECIFIED		
OF	1	14 PLACE: OTHER/STP SPECIFIED		





ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
A	1	-	979796-25-S	PRESSURE FILTER
B	1	-	979796-25-S	XP-PRESSURE FILTER
C	1	-	94536-130N	SUN, CXDA-XCN
D	1	-	109858-1BN	SUN, PRDB-LBN
E	1	-	108087-10AN	SUN, DPBO-LAN
F	1	-	979880-8	SUN, DCCC-XXN
G	1	-	107029-175N	SUN, CVCV-XEN
H	1	-	93547-1B75N	SUN, CKCB-XEN
K	1	-	107029-175N	SUN, CVCV-XEN
L	1	-	979997	HYDRAFORCE, PD10-40-NS
M	1	-	93547-1B75N	SUN, CKCB-XEN
X	1	-	107029-175N	SUN, CVCV-XEN $\Delta$
Y	1	-	93547-1B75N	SUN, CKCB-XEN
Z	1	-	50003960-11	BX LATCH VALVE

PARTNUMBER 50004050-1		UNLESS OTHERWISE SPECIFIED TOLERANCES PER ANSI Y 14.5		<div> NATIONAL OILWELL VARCO</div> <p>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION. IT IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P. ITS RELEASE OR DISSEMINATION IS PROHIBITED WITHOUT THE WRITTEN PERMISSION OF NATIONAL OILWELL VARCO, L.P. IT IS LOANED TO THE USER FOR USE ONLY ON THE PROJECT AND FOR THE PURPOSES OF THE PROJECT. IT IS NOT TO BE REPRODUCED, COPIED, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM. IT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THE USER AGREES TO HOLD NATIONAL OILWELL VARCO, L.P. HARMLESS FROM ALL CLAIMS, DAMAGES, LOSSES, AND EXPENSES, INCLUDING ATTORNEY'S FEES, ARISING OUT OF OR RESULTING FROM THE USE OF THIS DOCUMENT OR THE INFORMATION CONTAINED HEREIN.</p>	
MATERIAL -		3 PLACE DECIMAL .XXX ± .010			
SURF. FINISH/PAINT SPEC -		2 PLACE DECIMAL .XX ± .03			
COLOR -		1 PLACE DECIMAL .X ± .1			
WEIGHT		LBS/ KG		DO NOT SCALE DOCUMENT	
ORIGINAL DOCUMENT		LATEST REVISION		THIS DOCUMENT IS DMS CONTROLLED	
NAME	P.D.	NAME	L.S.	REV.	
DATE	03 MAY 01	DATE	7 Aug 09		F
DRAWING TYPE	DI	E.C.N.	701053		
TITLE				SIZE	DRAWING NO.
HYDR. DIAGRAM BX MANIFOLD 50004050-1				D	50004050-3
				SHEET	1
				OF	1

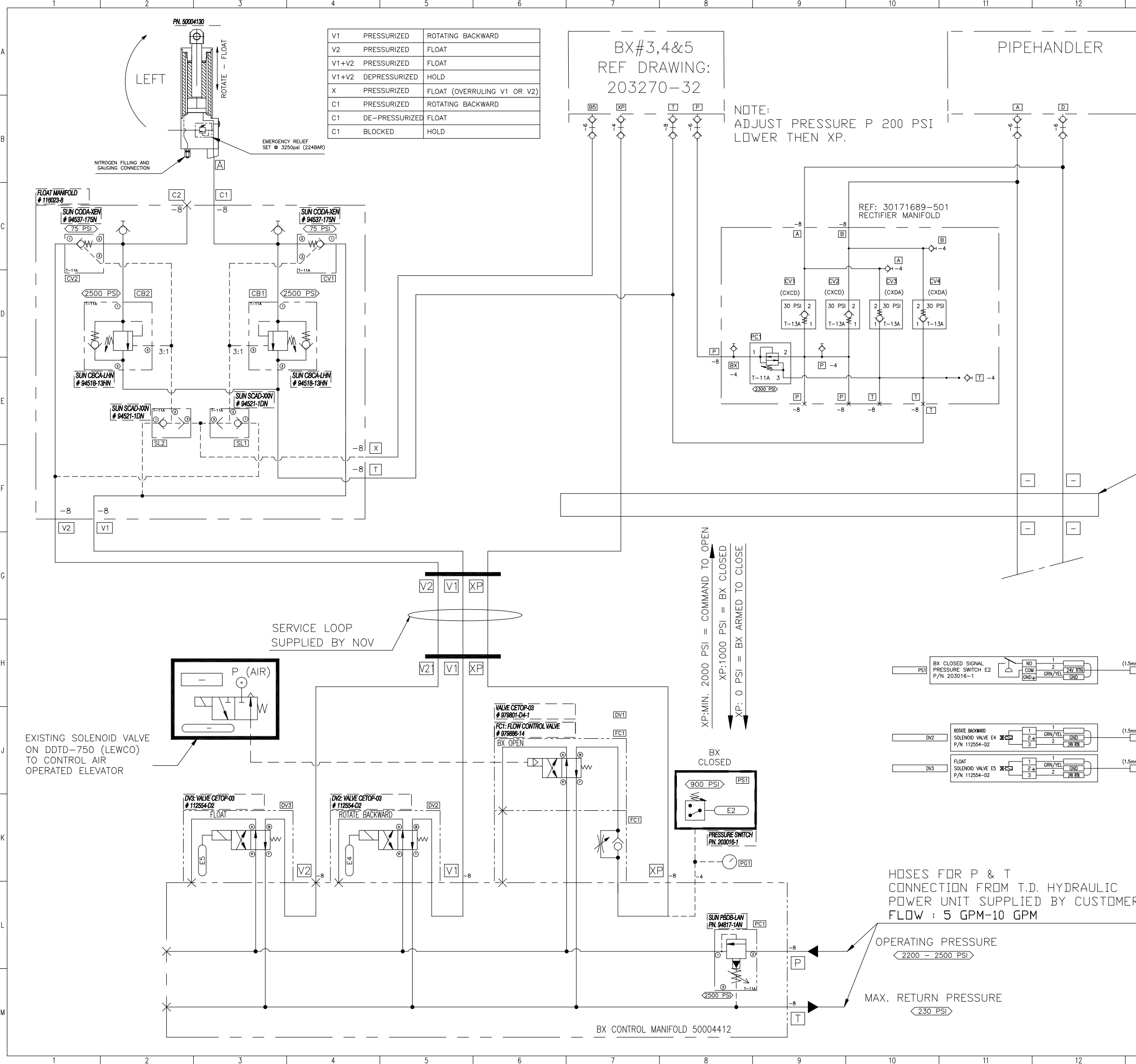


ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION	
01	1	D	50000520-1	MOUNTINGPLATE. ASS'Y BX , 24V/DC & AIR	
02	1	D	204681	ASS'Y SERVICE LOOP, 204680-86-12	A
03	1	—	30171689-501	RECTIFIER MANIFOLD	
04	1	—	116023-8	FLOAT MANIFOLD	
05	7	B	994011-100	HOSE ASSEMBLY, 1/2" - LENGHT 100"	
06	1	—	204702	INLINE PRESSURE FILTER ASS'Y	
07	3	—	994037-120	HOSE ASS'Y, 1/2", LENGTH 120"	B
08	4	—	56518-8-8-S	ELBOW 90°, SWIVEL INT. 37/37, 3/4-16UNF	
09	8	—	56520-8-8-S	UNION, EXT. 3/4-16UNF TO EXT. 3/4-16UNF	
10	2	—	56529-8-6-S	CONNECTOR O-RING BOSS/37, 3/4-16 TO 9/16-18 JIC	
11	2	—	56566-4-6-S	ADAPTER PIPE EXT. 1/4-18 NPT TO INT. 9/16-18 JIC	
12	1	—	55909-4-4	1/4" MALE VALVED COUPLER, QD INT. PIPE	
13	1	—	50004140	HOSE CONNECTION KIT BX	C

CODE	HOSE QD SIZE	FUNCTION
XP	1/4" FEMALE	COMMAND OPEN, SIGNAL CLOSE
T	1/2" MALE	TANK
P	3/8" MALE	PRESSURE
B5	1/4" MALE	FLOAT
A	1/2" FEMALE	ROTATE BACKWARD

SCHEMATIC DRAWING: 50000538-1

PARTNUMBER	50000538			UNLESS OTHERWISE SPECIFIED TOLERANCES (OVER ANG) Y 1430		<div><div>NATIONAL OILWELL VARCO</div><div>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION. IT IS THE PROPERTY OF NATIONAL OILWELL VARCO, INC. (NOV). IT IS LOANED TO THE USER BY NOV AND REMAINS THE PROPERTY OF NOV. IT IS NOT TO BE REPRODUCED, COPIED, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. NO WARRANTY IS MADE BY NOV FOR THE USE OF THIS DOCUMENT IN ANY MANNER OTHER THAN THAT FOR WHICH IT WAS ORIGINALLY DESIGNED. THE USER ASSUMES ALL LIABILITY FOR THE PROPER USE OF THIS DOCUMENT AND REPRESENTS AND WARRANTS THAT IT IS THE SOLE PROPERTY OF NOV.</div></div>
MATERIAL	1			3 PLACE DECIMAL .XXX + .000		
SURF. FINISH/ PAINT SPEC	—			2 PLACE DECIMAL .XX + .00		
COLOR	—			1 PLACE DECIMAL .X + .1		
WEIGHT	—			LB/	KG	BREAK SHARP CORNERS (R20-R25) MACHINED SURFACES TORUS/OUT SURFACES ALL WELD SYMBOLS ACC. TO ISO
ORIGINAL DOCUMENT				LATEST REVISION		DO NOT SCALE DOCUMENT
NAME	L.S.		NAME	L.S.		REV.
DATE	29 SEP 08		DATE	29 SEP 08		—
DRAWING TYPE	MG		E.C.N.	700692		
TITLE	HUK BX&ROT,			SIZE	D	
			DRAWING NO.		50000538	
			UNITS INCH (MM)		SHEET 1 OF 1	



V1	PRESSURIZED	ROTATING BACKWARD
V2	PRESSURIZED	FLOAT
V1+V2	PRESSURIZED	FLOAT
V1+V2	DEPRESSURIZED	HOLD
X	PRESSURIZED	FLOAT (OVERRULING V1 OR V2)
C1	PRESSURIZED	ROTATING BACKWARD
C1	DE-PRESSURIZED	FLOAT
C1	BLOCKED	HOLD

BX#3,4&5  
REF DRAWING:  
203270-32

NOTE:  
ADJUST PRESSURE P 200 PSI  
LOWER THEN XP.

PIPEHANDLER

CODE	DESCRIPTION
P	PRESSURE
T	TANK
XP	SIGNAL FROM CONTROL MANIFOLD: COMMAND TO OPEN (2000PSI-2500PSI) NO SIGNAL FROM CONTROL MANIFOLD: ELEVATOR ARMED TO CLOSED (0 PSI) SIGNAL FROM BX ELEVATOR: ELEVATOR CLOSED (1000 PSI)
V1	COMMAND: ROTATE BACKWARD
V2	COMMAND: ROTATOR IN FLOAT
B5	CONNECTING PORT ON BX ELEVATOR FOR FLOAT SIGNAL TO ELEVATOR TILT MANIFOLD (PORT X)
PC1	PILOT OPERATED PRESSURE REDUCING VALVE
NV1	ADJUSTABLE NEEDLE VALVE
DV1	DIRECTIONAL VALVE FOR OPEN OR CLOSE BX ELEVATOR
DV2	DIRECTIONAL VALVE FOR ROTATE BX ELEVATOR BACKWARD
DV3	DIRECTIONAL VALVE FOR ROTATOR IN FLOAT
E2-E5	ELECTRICAL CABLING FOR BX ELEVATOR CONTROLS
E2	BX ELEVATOR CLOSE DETECTION
E4	ROTATE BX ELEVATOR BACKWARD
E5	ROTATOR IN FLOAT

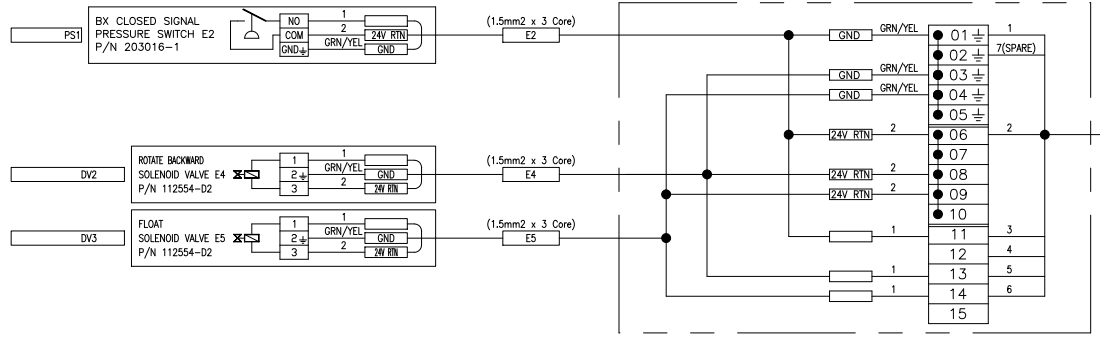
DDTD-750 LEWCO TOP DRIVE  
1 FREE SPARE PORT ON  
ROTATING HEAD ASS'Y

SERVICE LOOP  
SUPPLIED BY NOV

EXISTING SOLENOID VALVE  
ON DTD-750 (LEWCO)  
TO CONTROL AIR  
OPERATED ELEVATOR

XP-MIN. 2000 PSI = COMMAND TO OPEN  
XP:1000 PSI = BX CLOSED  
XP: 0 PSI = BX ARMED TO CLOSE

J-BOX IN CONTROL CABINET  
ON FINGERBOARD LEVEL





HOSES FOR P & T  
CONNECTION FROM T.D. HYDRAULIC  
POWER UNIT SUPPLIED BY CUSTOMER  
FLOW : 5 GPM-10 GPM

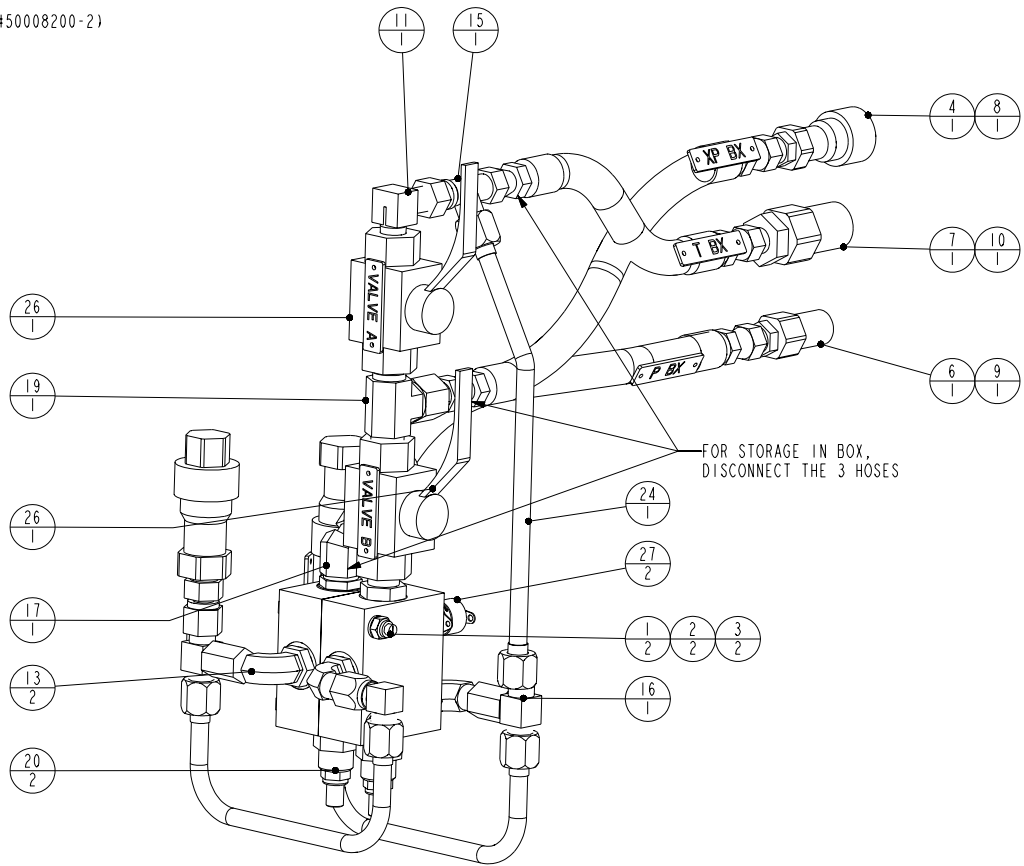
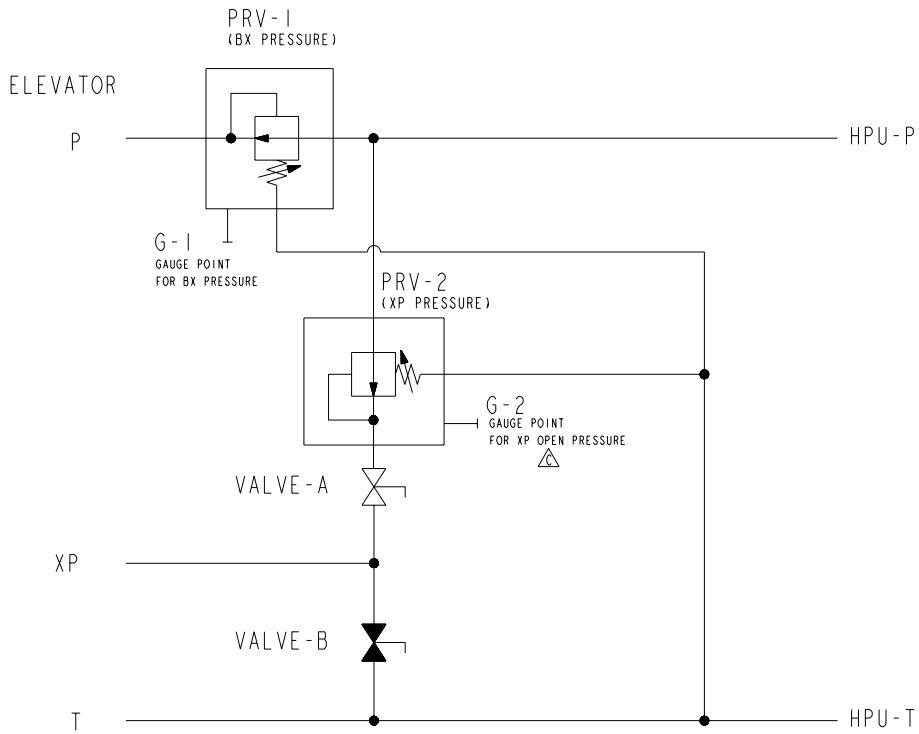
OPERATING PRESSURE  
2200 - 2500 PSI

MAX. RETURN PRESSURE  
230 PSI

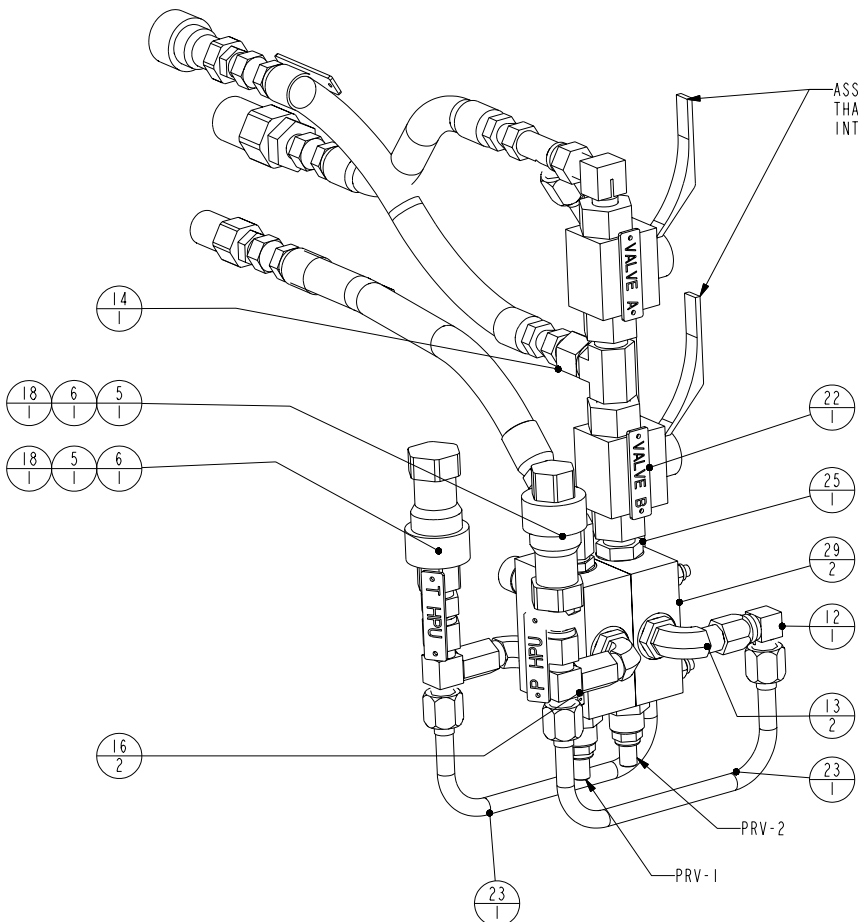
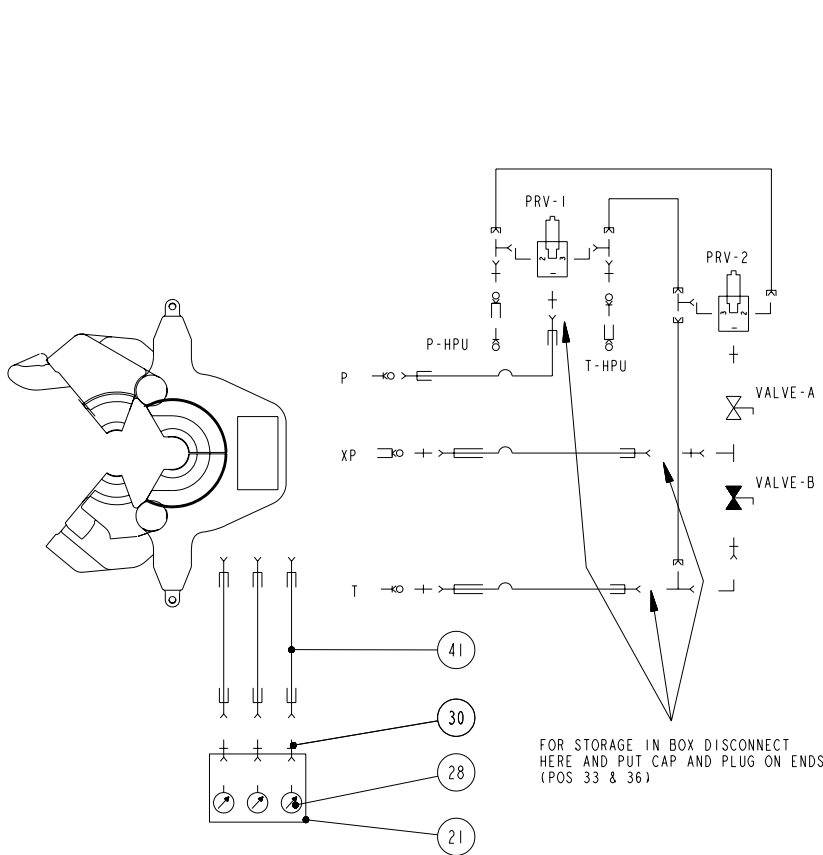
NOTES:  
100 PSI = 7 BAR  
1 GPM = 4.5 Li/min

PARTNUMBER	50000538			UNLESS OTHERWISE SPECIFIED TOLERANCES: (OVER ANGLES) 1/16"		 NATIONAL OILWELL VARCO
MATERIAL	1			3 PLACE DECIMAL XXX 1/100		
SURF. FINISH/ PAINT SPEC	—			2 PLACE DECIMAL XX 1/10		
COLOR	—			1 PLACE DECIMAL X 1/10		
WEIGHT	LBS/			KG		BREAK SHARP CORNERS $\overline{R100.00}$ MACHINED SURFACES TOLERANCE SURFACES ALL WELD SYMBOLS: AS TO ISO
ORIGINAL DOCUMENT	LATEST REVISION			DO NOT SCALE DOCUMENT		
NAME	L.S.	NAME	L.S.	REV.	—	
DATE	29 SEP 08			DATE	29 SEP 08	
DRAWING TYPE	DI			E.C.N.	700692	
TITLE				SIZE	D	DRAWING NO.
DIAGRAM HUK BX&ROT, OLINDA STAR				50000538-1		SHEET OF 1

KIT, INTENDED TO TEST AND HYDRAULICALLY ADJUST NOV BX ELEVATORS INDEPENDANT OF THEIR (TOP-DRIVE) CONTROLS SYSTEM.  
KIT IS SUITABLE FOR ALL BX ELEVATORS (BX-1 THR BX-5).  
KIT IS ALSO SUITABLE TO TEST OPERATE CRT-500 (CONFIGURATION WITH BX CONTROL INTERFACE (NOV#50008200-2)



ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	50004-24-C8D	SCREW,CAP-HEX HD (UNC 1/4")
2	2	50904-C	WASHER, LOCK-REGULAR 0.250
3	2	51804-C	NUT-HEX-SELF-LOCKING-1/4-20 UNC-2B
4	1	55908-4-4	FEMALE QUICK DISCONNECT FD45 -4
5	2	55908-6-6	FEMALE QUICK DISCONNECT FD45 -6
6	3	55909-6-6	MALE QUICK DISCONNECT FD45 -6
7	1	55909-8-8	MALE QUICK DISCONNECT FD45 -8
8	1	56501-4-6-S	STR.CON. EXT.1/4-18NPT TO EXT.9/16-18UNF
9	1	56501-6-6-S	STR.CON. EXT.3/8-18NPT TO EXT.9/16-18UNF
10	1	56501-8-6-S	STR.CON. EXT.1/2-14NPT TO EXT.9/16-18UNF
11	1	56506-6-6-S	ELBOW 90 degr EXT3/8-18NPT TO EXT9/16-18UNF
12	1	56518-6-6-S	ELBOW 90degr 9/16"-18JIC SWIVEL - 9/16"-18JIC MALE
13	4	56519-8-6-S	ELBOW 90 deg O-RING EXT.3/4UNF TO EXT.9/16 JIC SS
14	1	56521-6-6	ADAPTER PIPE INT3/8" / JIC 3/8"
15	1	56525-6-6-S	TEE-SWIVEL, 9/16"-18 JIC
16	3	56526-6-6-S	TEE, 37"/37"/SWIVEL INT 37"
17	1	56557-8-6-S	ELBOW, 45DEGR. O-RING BOSS / 37 JIC MALE
18	2	56566-6-6-S	ADAPTER, 3/8-18 NPTF MALE TO 9/16-18 JIC SWIVEL
19	1	56716-6	TEE, EXT. PIPE 3/8" NPT
20	2	94817-1AN	CARTRIDGE PRESSURE REDUCING VALVE, PBDB-LAN
21	1	202539-1	PLATE FOR 3 GAUGES
22	1	202539-2	LABELS TEST KIT
23	2	202539-3	TUBE, TEST KIT BX
24	1	202539-5	TUBE, TESTKIT BX
25	1	979504-5	3/4"-16 SAE O-RING / 3/8" EXT. NPT
26	2	979552-1	BALL VALVE 3/8" NPT
27	2	979798-2	GAUGE CONNECTOR, 1/4" NPT
28	3	979849-2	GAUGE, 0-3500 PSI, 1/4 BSP
29	2	979940-ELJ	LINE MOUNT BODY, 3 PORT
30	3	980481	PRESSURE GAUGE FITTING, M16
31	2	56525-4-4-S	TEE, JIC INT/EXT/EXT, 7/16 UNF
32	2	56525-6-6-S	TEE, JIC INT/EXT/EXT, 9/16 UNF
33	5	56544-6	CAP, FEMALE-37 SEAT 9/16 UNF
34	5	56553-6	PLUG, MALE-37 SEAT 9/16 UNF
35	4	979512-3	PLUG 7/16 UNF O-RING
36	4	979798-1	GAUGE CONNECTOR MEV20-7/16 UNF
37	2	979798-3	GAUGE CONNECTOR MEV20-9/16 UNF
38	2	980018-4	CONNECTOR 7/16 UNF FEM-GAUGE CONNECT
39	2	980018-6	CONNECTOR 9/16 UNF FEM-GAUGE CONNECT
40	2	980478	STORAGE BOX, 440x340x180 mm INSIDE
41	1	980479	HOSE PRESSURE GAUGE, 2 mtr
42	3	990065-11	HOSE 3/8" WITH JIC 9/16 UNF
43	1	T80600	LOCTITE 542-050 HYDR SEALANT



- BEFORE OPERATION, PRIOR TO TESTING:
1. SHUT DOWN HYDRAULIC POWER
  2. CONNECT HOSES BETWEEN "HPU-P" AND POWER UNIT PRESSURE SAME FOR "HPU-T: TO POWER UNIT TANK HOSES TO HPU ARE CUSTOMER SUPPLY USE QUICK CONNECT HALVES PROVIDED
  3. VERIFY SETTINGS OF PRV-1 AND PRV-2
  4. SHUT DOWN OR BLOCK HYDRAULIC PRESSURE "HPU-P"
  5. CONNECT HOSES TO BX ELEVATOR
  6. CONNECT PRESSURE GAUGES TO THE BX ELEVATOR ("P", "T" AND "XP")

- COMMAND TO OPEN IF ELEVATOR IS CLOSED:
1. CLOSE VALVE "B"
  2. OPEN VALVE "A"
  3. XP READS 2000 PSI AND ELEVATOR OPENS

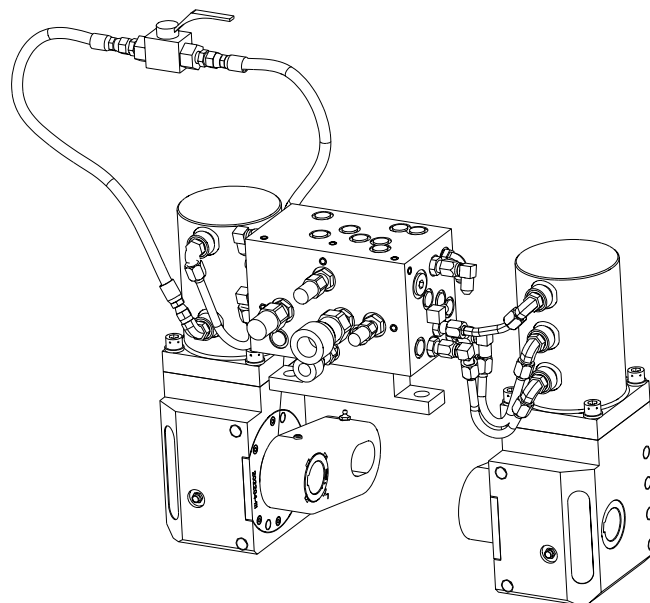
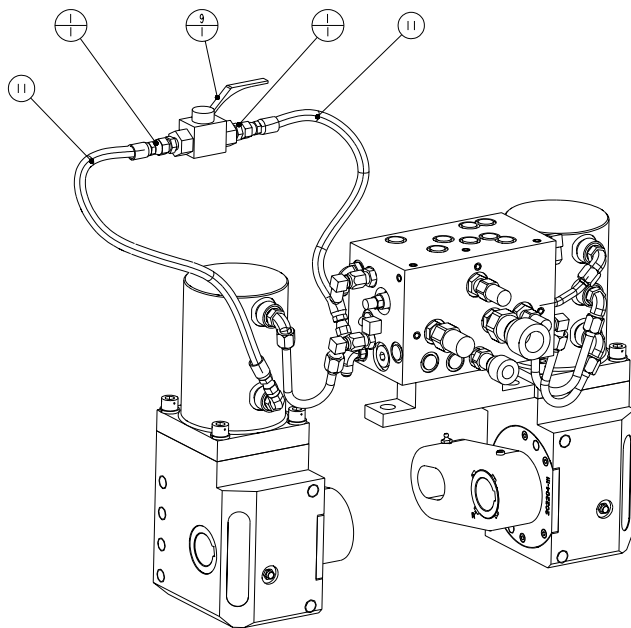
- COMMAND TO CLOSE IF ELEVATOR IS OPEN:
1. CLOSE VALVE "A"
  2. OPEN VALVE "B", XP READS 0 PSI
  3. CLOSE VALVE "B"
  4. ACTIVATE TRIGGER AND ELEVATOR CLOSSES
  5. XP ON THE ELEVATOR READS 1000 PSI WHEN ELEVATOR IS CLOSED

REFER TO APPLICABLE BX ELEVATOR TSEL FOR SET UP PROCEDURES OF THE ELEVATOR. REFER TO THE BX ELEVATOR MANUAL FOR TROUBLE SHOOTING INFO

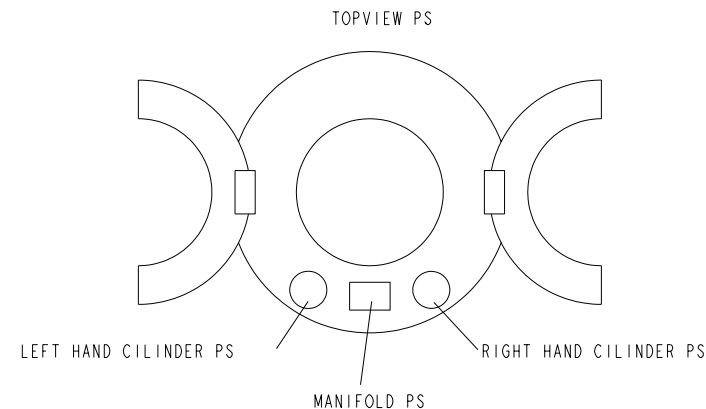
- AFTER FIRST ASSEMBLY OF TEST-KIT:
1. TURN BOTH PRV ADJUSTMENTS FULLY IN (HIGHEST SETTING)
  2. CONNECT "HPU-P" TO POWER UNIT PRESSURE CONNECT ALL OTHER PORTS TO "TANK"
  3. LEAVE BOTH VALVE A & B OPEN
  4. AIR PURGE COMPLETE TEST KIT WITH LOW HYDRAULIC PRESSURE
  5. FOR PRESSURE TESTING OF THE ASSEMBLY:
    - DISCONNECT ALL "TANK" CONNECTIONS MADE IN POINT 2
    - ONLY LEAVE "PRESSURE" CONNECTED
    - PRESSURE TEST AT 3000PSI FOR 5 MINUTES
    - NO LEAKAGE SHALL OCCUR
  6. ADJUST PRV-1 TO 1800 PSI (START WITH LOW SETTING OF PRV-1)
  7. ADJUST PRV-2 TO 2000 PSI (START WITH LOW SETTING OF PRV-2)
  8. FOR STORAGE DISCONNECT AT THE MARKED LOCATIONS AND CAP WITH CAPS PROVIDED

PARTNUMBER	202539	UNLESS OTHERWISE SPECIFIED	
MATERIAL	-	TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .05 ANGLES ± .5 DEGREE	
SURF. FINISH / PAINTSPEC.	-	BREAK SHARP CORNERS .010 ± .005	
COLOR	-	MACHINED SURFACES 254/ TORNCUT SURFACES 1009/	
WEIGHT	Lbs kg	ALL WELD SYMBOLS ACC. TO ISO	
ORIGINAL DOCUMENT		LATEST REVISION	
NAME	ADE	NAME	WB
DATE	24 JUN '99	DATE	07 OCT '09
		E.C.N.	701053
		REV.	C
		DO NOT SCALE DOCUMENT	
		THIS DOCUMENT IS PDW/ink CONTROLLED	
TITLE	TEST KIT BX ELEVATOR + PS	SIZE	D
		DRAWING NO.	202539
		UNITS (INCH (mm))	
		PROJ.	
		SHEET	1
		OF	2

PARTS INDICATED WITH \* ARE NOT VISIBLE ON DRAWING






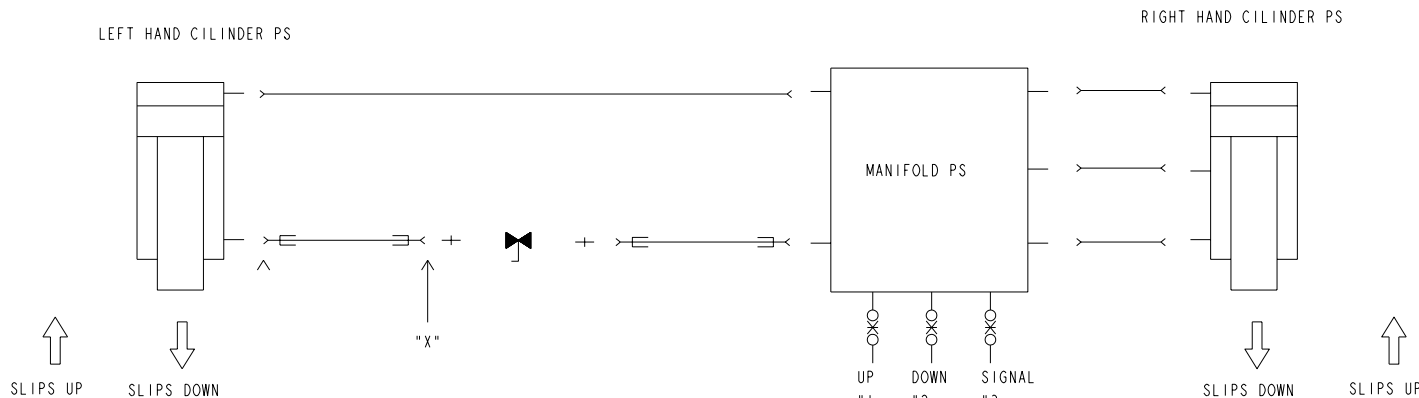
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	56501-6-6-S	STR.CON. EXT.3/8-18NPT TO EXT.9/16-18UNF
2	6	56519-6-6-S	ELBOW 90 deg O.RING EXT.9/16UNF TO EXT.9/16 JIC
3	1	202203-55	ACTUATOR LH PS INT. REL.
4	1	202204-55	ACTUATOR RH PS INT. REL.
5	1	202308-1	HYDRAULIC TUBE ASSY PS21
6	1	202308-2	TUBE ASSY PS21
7	1	202308-3	HYDRAULIC TUBE ASSY PS21
8	1	202308-6	HYDR. TUBE ASSY L.H. Slips down PS21
9	1	979552-1	BALL VALVE 3/8" NPT
10	1	50004746	MANIFOLD BLOCK PS21 ASSY
11	2	980482-20	SAE100R2AH1-4-J56-J56-20



- WHEN SLIPS ARE SAGGING / PROPER FUNCTIONING OF ANTI SAGGING SYSTEM HAS TO BE CHECKED:
1. REMOVE PS FROM WELL CENTER
  2. SET THE SLIPS AND DISCONNECT HOSES #1, #2 AND #3 FROM MANIFOLD BLOCK
  3. DISCONNECT BOTTOM TUBE FROM MANIFOLD TO LEFT HAND CILINDER
  4. CONNECT HOSES AND BALL VALVE TO CILINDER AND MANIFOLD AS OUTLINED IN SKETCH AT THE LEFT
  5. RE-CONNECT HOSES #1, #2 AND #3
  6. DE-AIR SYSTEM BY UNTIGHTENING NUT X UNTIL ALL AIR HAS ESCAPED
  7. RETIGHTEN NUT X, THEN RAISE SLIPS UP
  8. CLOSE BALL-VALVE WHILE STILL OPERATING POWER SLIPS TO "SLIPS-UP"
  9. OPERATE SLIPS SET, SLIPS SHOULD STAY UP
  10. IF SLIPS STILL SAGG, THE PISTON SEALS IN THE LEFT HAND CILINDER HAVE TO BE REPLACED.
  11. IF SLIPS DO NOT SAGG WITH BALL VALVE CLOSED, CHECK AND, IF NEEDED, REPLACE PILOT TO OPEN CHECKVALVE INSIDE MANIFOLD.
- (DISCONNECT HOSES #1, #2 AND #3 PRIOR TO REMOVAL OF P.O.C. VALVE AND/OR PISTON SEALS)  
MAKE SURE SLIPS ARE IN THE SET POSITION AND NO RESIDUAL (WEIGHT INDUCED) PRESSURE IS INSIDE THE POWER SLIPS HYDRAULICS

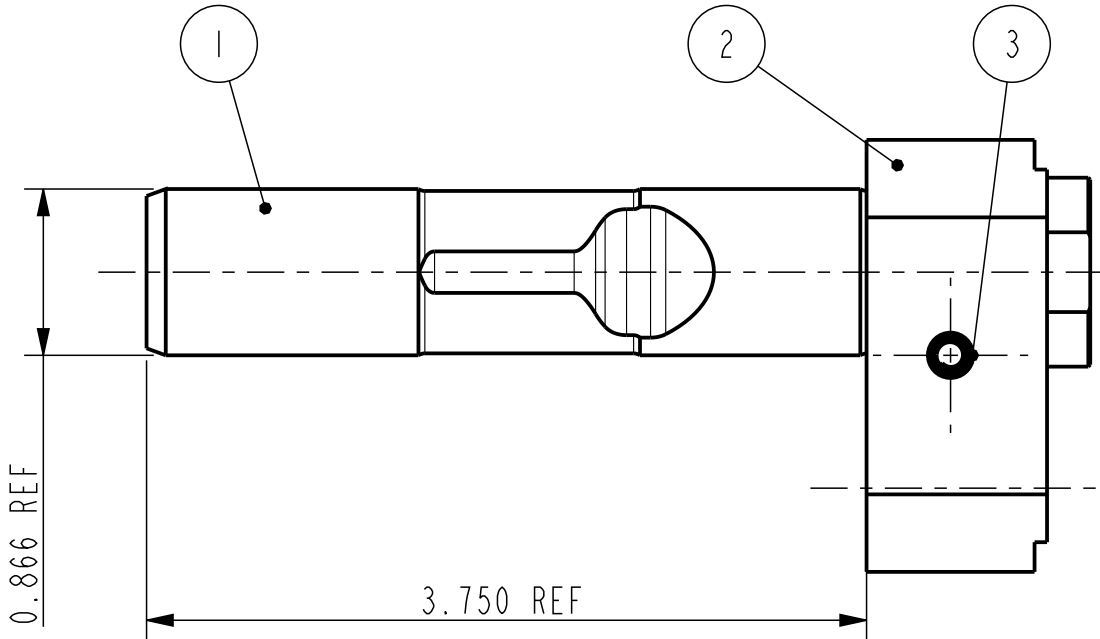
REFER TO APPLICABLE PS POWER SLIPS TSEL  
FOR SET UP PROCEDURES OF THE POWER SLIPS  
REFER TO THE PS POWER SLIPS USER MANUAL FOR TROUBLE SHOOTING INFO.

PARTNUMBER	202539	UNLESS OTHERWISE SPECIFIED		 NATIONAL OILWELL VARCO
MATERIAL	-	TOLERANCES (OVER ANGLES) ± 0.01		
SURF. FINISH / PAINTSPEC.	-	3 PLACES DECIMAL 1/16 ± 0.01		
COLOR	-	2 PLACES DECIMAL 1/8 ± 0.03		
WEIGHT	-	1 PLACES DECIMAL 1/2 ± 0.1		
ORIGINAL DOCUMENT	LATEST REVISION	BREAK SHARP CORNERS ± 0.015 ± 0.05		 DO NOT SCALE DOCUMENT SCALE 1:3 UNITS INCH (mm)
NAME	DATE	NAME	DATE	
ADDE	24 JUN '99	MDS	107 OCT '99	
DATE	107 OCT '99	REV.	107 OCT '99	
TITLE	TEST KIT FOR PS	CONTROLLED	107 OCT '99	 SHEET 2 OF 2

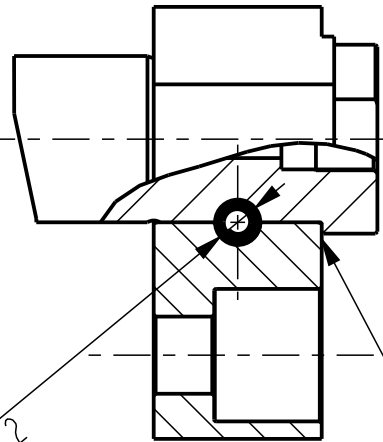


50004051-1
PART NUMBER

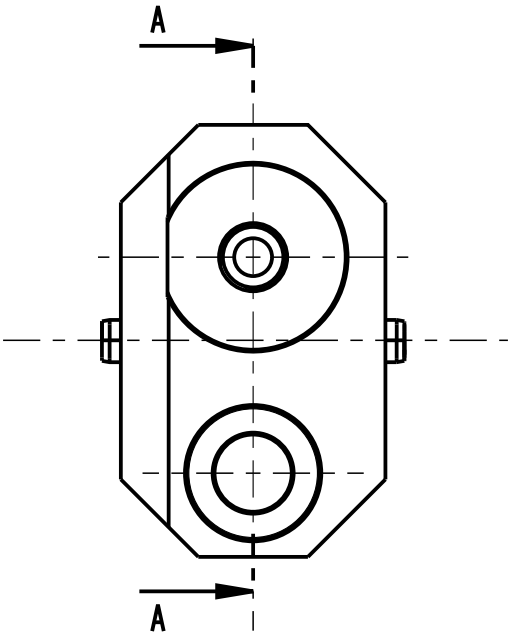
ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	1		50004051	TRIGGER SHAFT.
2	1		50004053	TRIGGER RETRACT CARRIER.
3	1		59000170-640	PIN, SPIRAL, SS 6 X 40MM



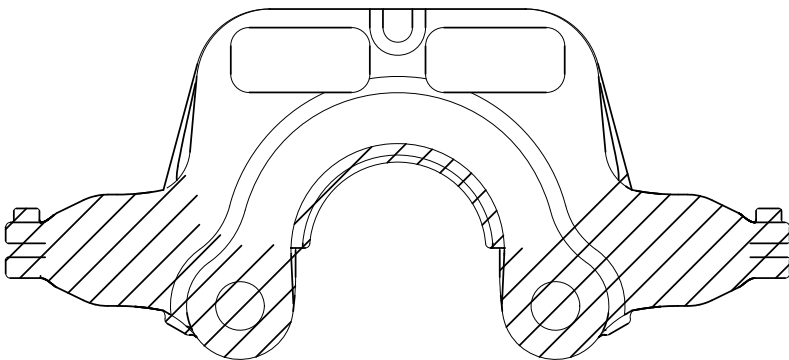
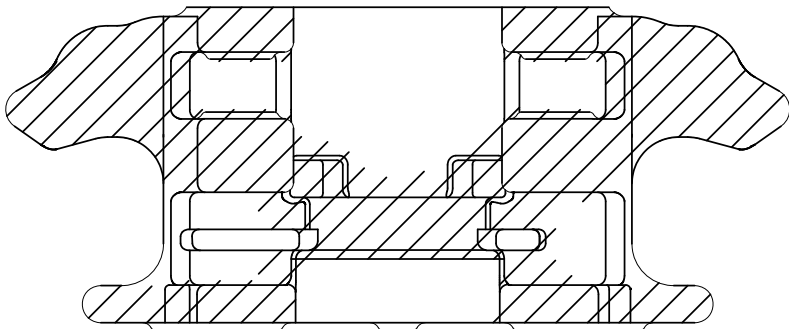
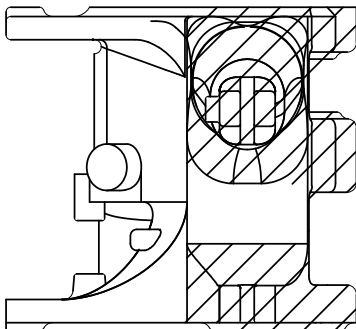
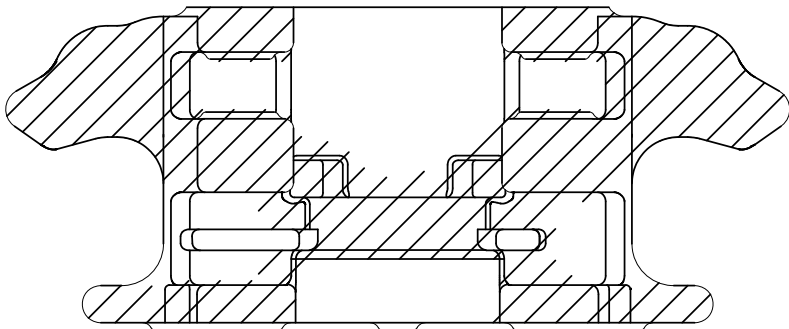
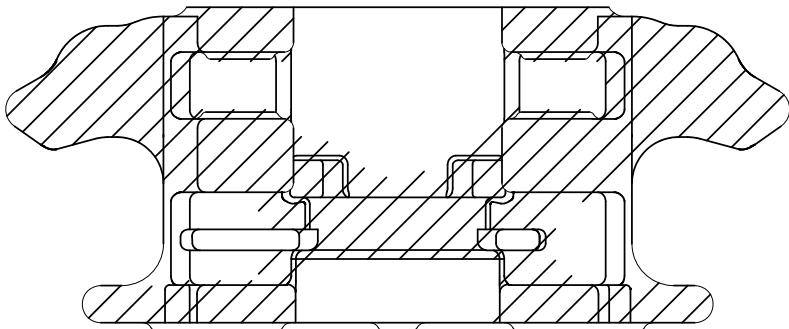
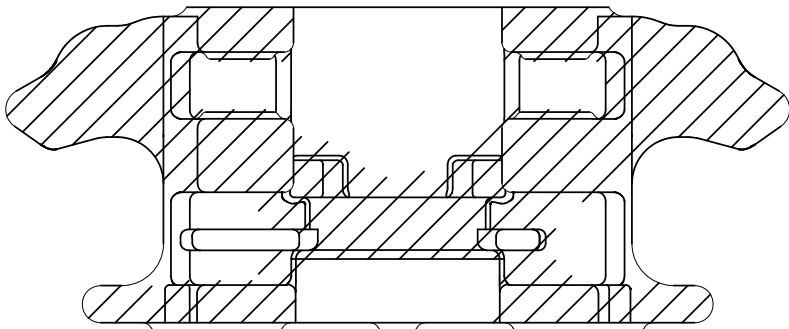
Ø0.236<sup>+0.003</sup><sub>-0.000</sub> DRILL  
EXISTING HOLE IN ITEM 2  
THRU. AFTER ASSEMBLY  
OF ITEM 1.



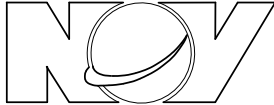
SECTION A-A

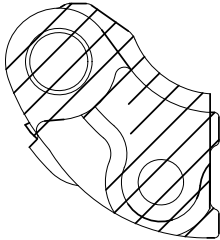
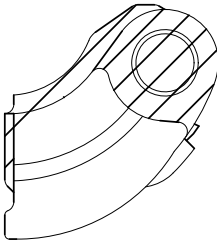
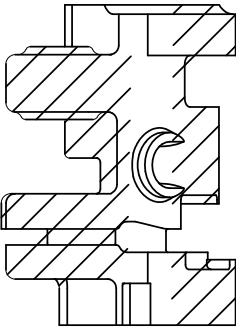
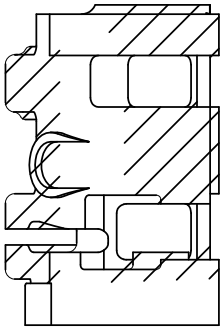
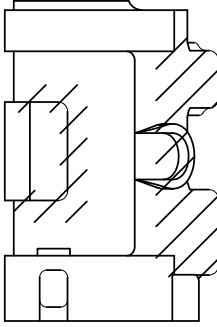
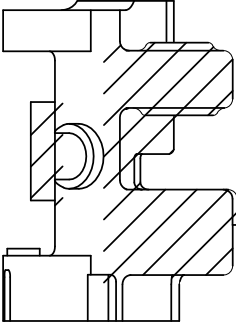


50004051-1				K	-	-	-	-
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.	J	-	-	-	-
<div>Varco. BJ<sup>TM</sup></div> <div>OIL TOOLS</div> <div>ETTEN-LEUR, THE NETHERLANDS</div> <div>THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER</div>				I	-	-	-	-
				H	-	-	-	-
UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250/				G	-	-	-	-
				F	-	-	-	-
MATERIAL				E	-	-	-	-
				D	-	-	-	-
APPROVED A.K. 10/Sept/02 CHECKED A.K. 10/Sept/02 PREPARED P.Dekker 10-Sep-02				C	-	-	-	-
				B	-	-	-	-
TITLE TRIGGER SHAFT ASSY REDRAWN / REPLACED BY:				A	600879	P.Dekker	10/Sept/02	A.K.
				REV.	E.C.N	NAME	DATE	CHECKED
WEIGHT LBS/ KG								
SIZE B				DRAWING NO. 50004051-1				SHEET OF 1

1	2	3	4	5	6	7	8	
A					PART NUMBER		TYPE	A
					203201		BX ELEVATOR FRAME IV	
					203301		BX ELEVATOR FRAME III	
B					203291		BX ELEVATOR FRAME IV 500ton	B
					50004001		BX ELEVATOR FRAME V	
					50005301YC		BX ELEVATOR FRAME IV 350ton	
C					50000641YC		BX ELEVATOR FRAME IV 500ton	C
					50000651YC		BX ELEVATOR FRAME IV 750ton	
D								D
E								E
F								F

NOTES:  
1. HATCHED AREAS ARE CONSIDERED CRITICAL.  
2. NON HATCHED AREAS ARE CONSIDERED NOT CRITICAL.  
3. THE ACCEPTANCE CRITERIA TO BE APPLIED ARE GIVEN IN THE Varco BJ QUALITY ASSURANCE WORK INSTRUCTION QAW 8.11.1

PARTNUMBER				UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		 THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.	
MATERIAL				BREAK SHARP CORNERS .010±.005 MACHINED SURFACES 250 ✓ TORCHCUT SURFACES 1000 ✓ ALL WELD SYMBOLS ACC. TO ISO			
SURF. FINISH/ PAINT SPEC							
COLOR							
WEIGHT		LBS/		KG			
ORIGINAL DOCUMENT		LATEST REVISION					
NAME	P.D.	NAME	L.S.	REV.	DO NOT SCALE DOCUMENT		
DATE	04 Dec 97	DATE	18 SEP 08	E	THIS DOCUMENT IS DMS CONTROLLED		SCALE NONE
DRAWING TYPE	CA	E.C.N.	700784				UNITS INCH (MM)
TITLE					SIZE	DRAWING NO.	SHEET
CRITICAL AREAS BODY BX ELEVATOR					B	CA-251	1 OF 1

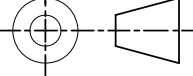
1		2		3		4		5		6		7		8	
A	<div><div></div><div></div></div>		PART NUMBER		TYPE		<div><div></div><div></div></div>		PART NUMBER		TYPE				
			203202		BX ELEVATOR FRAME IV				203203		BX ELEVATOR FRAME IV				
			203302		BX ELEVATOR FRAME III				203303		BX ELEVATOR FRAME III				
			50004002		BX ELEVATOR FRAME V				50004003		BX ELEVATOR FRAME V				
			50005302YC		BX ELEVATOR FRAME IV-35				500005303YC		BX ELEVATOR FRAME IV-35				
			50000652YC		BX ELEVATOR FRAME IV-50/75				50000653YC		BX ELEVATOR FRAME IV-50/75				
B															
C															
D															
E															
F															

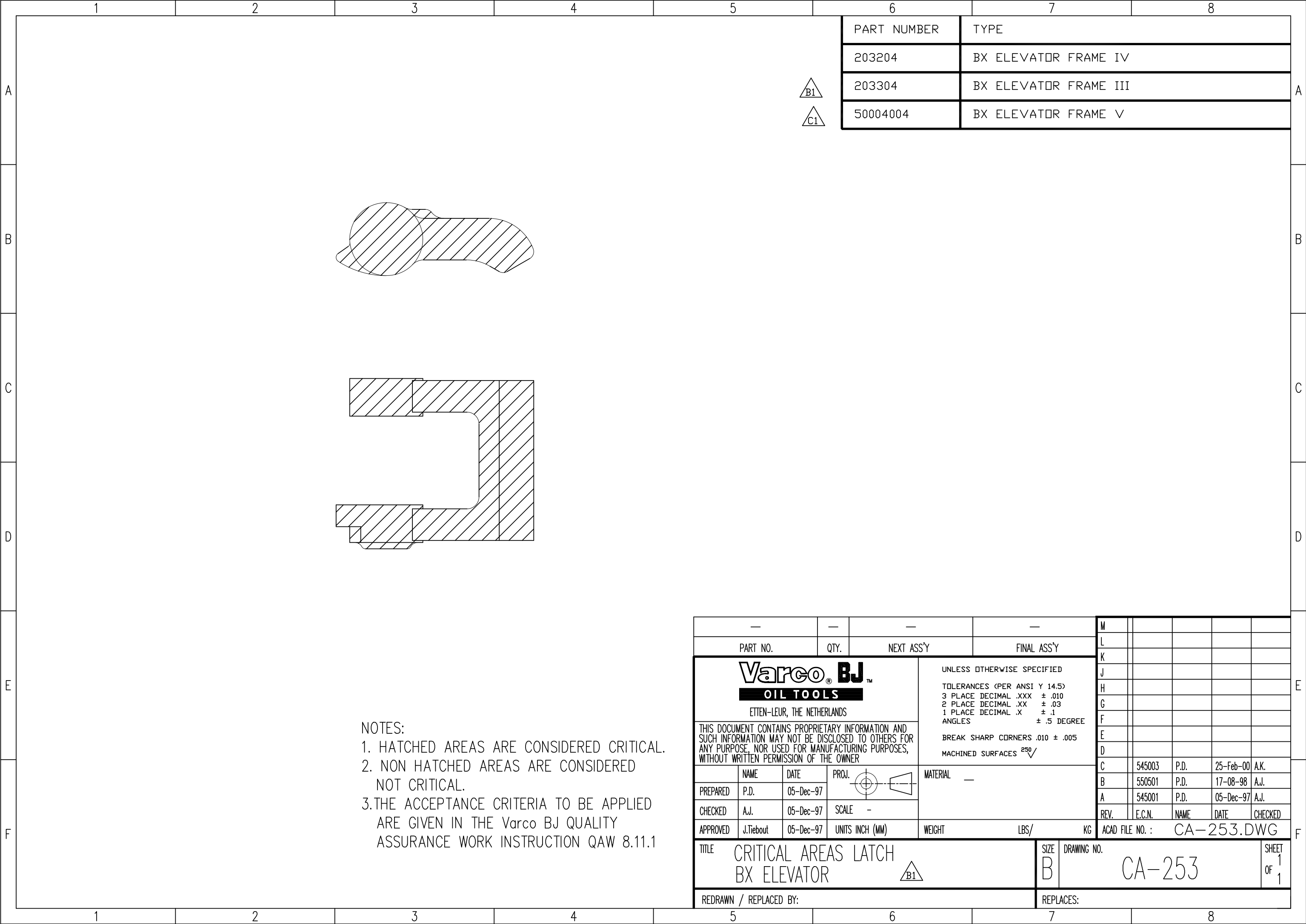
NOTES:

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PARTNUMBER				UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5)		<div><div>NOV</div><div>NATIONAL OILWELL VARCO</div><div><div>THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.</div></div></div>					
MATERIAL				3 PLACE DECIMAL .XXX ± .010							
SURF. FINISH/PAINT SPEC				2 PLACE DECIMAL .XX ± .03							
COLOR				1 PLACE DECIMAL .X ± .1							
WEIGHT		LBS/ KG		ANGLES ± .5 DEGREE							
ORIGINAL DOCUMENT		LATEST REVISION		BREAK SHARP CORNERS .010±.005		<div><div>DO NOT SCALE DOCUMENT</div><div>THIS DOCUMENT IS DMS CONTROLLED</div><div>SCALE NONE</div><div>UNITS INCH (MM)</div><div></div></div>					
NAME		P.D.		NAME				L.S.		REV.	
DATE		04-DEC-07		DATE				18 SEP 08		D	
DRAWING TYPE		CA		E.C.N.				700784			
TITLE		CRITICAL AREAS DOORS BX ELEVATOR		SIZE				DRAWING NO.		SHEET 1 OF 1	

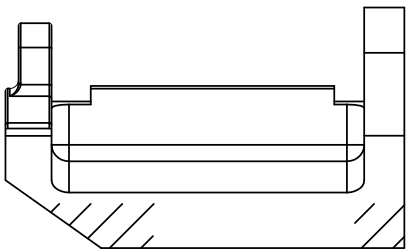
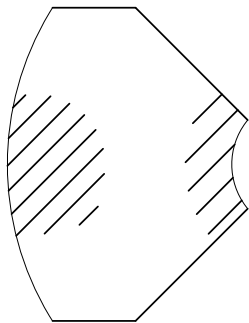
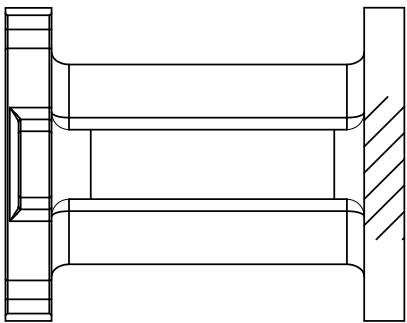
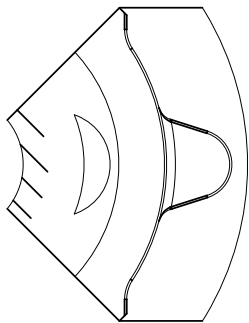


PART NUMBER	TYPE
203204	BX ELEVATOR FRAME IV
203304	BX ELEVATOR FRAME III
50004004	BX ELEVATOR FRAME V

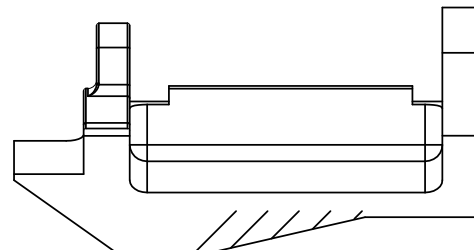
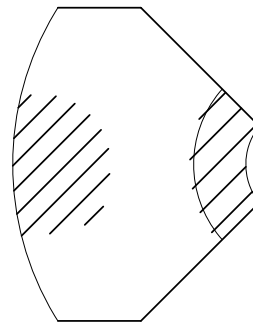
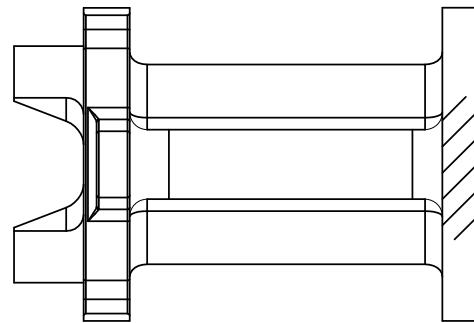
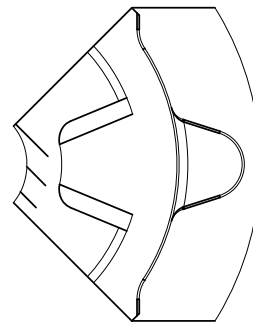
NOTES:  
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—		—		—		—		M					
PART NO.		QTY.		NEXT ASS'Y		FINAL ASS'Y		L					
<div><div><div>Varco<sup>®</sup> BJ<sup>™</sup></div><div>OIL TOOLS</div><div>ETTEN-LEUR, THE NETHERLANDS</div></div><div>THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER</div></div>						UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250√		K					
	NAME	DATE	PROJ.			MATERIAL —		J					
PREPARED	P.D.	05-Dec-97						H					
CHECKED	A.J.	05-Dec-97	SCALE	-				G					
APPROVED	J.Tiebout	05-Dec-97	UNITS	INCH (MM)		WEIGHT		F					
						LBS/		KG	E				
TITLE CRITICAL AREAS LATCH BX ELEVATOR								REV.		E.C.N.	NAME	DATE	CHECKED
REDRAWN / REPLACED BY:								ACAD FILE NO. :		CA-253.DWG			
SIZE B								DRAWING NO.		CA-253			SHEET 1 OF 1
REPLACES:													

PART NUMBER	TYPE
203210Y	BX ELEVATOR FRAME IV
50004010Y	BX ELEVATOR FRAME V



PART NUMBER	TYPE
203212Y	BX ELEVATOR FRAME IV
50004012Y	BX ELEVATOR FRAME V



- NOTES:
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—				M						
—				L						
—				K						
—				J						
—				H						
—				G						
—				F						
—				E						
—				D						
—				C	586101	P.D.	24-Feb-00	A.K.		
—				B	545002	P.D.	22-July-98	A.J.		
—				A	545001	A.J.	19-May-98	P.D.		
—				REV.	E.C.N.	NAME	DATE	CHECKED		
—				ACAD FILE NO. : CA-254.DWG						
—				SHEET 1 OF 1						

UNLESS OTHERWISE SPECIFIED			
TOLERANCES (PER ANSI Y 14.5)			
3 PLACE DECIMAL .XXX ± .010			
2 PLACE DECIMAL .XX ± .03			
1 PLACE DECIMAL .X ± .1			
ANGLES ± .5 DEGREE			
BREAK SHARP CORNERS .010 ± .005			
MACHINED SURFACES 250√			

NAME	DATE	PROJ.	MATERIAL
PREPARED A.J.	19-May-98		—
CHECKED P.D.	19-May-98	SCALE -	
APPROVED J.Tiebout	19-May-98	UNITS INCH (MM)	WEIGHT LBS/ KG

TITLE	SIZE	DRAWING NO.	SHEET
CRITICAL AREAS BUSHINGS	B	CA-254	1
BX ELEVATOR FRAME IV & V			OF 1

REDRAWN / REPLACED BY:	REPLACES:
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