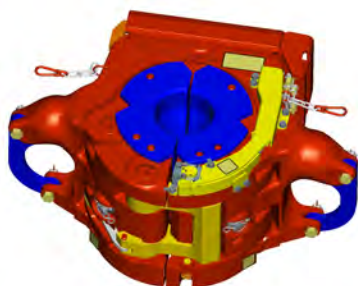


## BX3,4,5

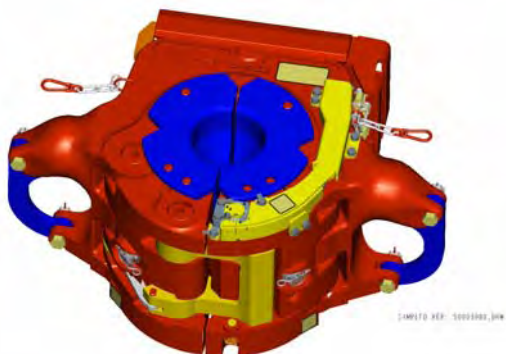
### Hydraulic Elevator



#### Original Instructions

REFERENCE	REFERENCE DESCRIPTION
BX3, BX4-50, BX4-75, BX5	Hydraulic elevators
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DOCUMENT NUMBER	REV
<b>203200-345-MAN-001</b>	<b>G</b>
	<small>July 2009</small>





## User's Manual

BX3,4,5

General Manual

REFERENCE RST375-2G	REFERENCE DESCRIPTION Rotary Support Table	
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DOCUMENT NUMBER <b>203200-345-MAN-001</b>		REV <b>G</b>

## **Revision History**

G	24.07.2009	Update	PGF	LS	AK
F	01.03.2006	Issued for Implementation	PGF	PD	AK
Rev	Date	Reason for issue	Prepared	Checked	Approved

## **Change Description**

Revision	Change Description
F	First Issue
G	CHapter Specifications updated
G	Chapter Appendix updated
G	Chapter Maintenance updated.
G	Chapter Operation updated

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## General information

### 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, Varco 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 general description**

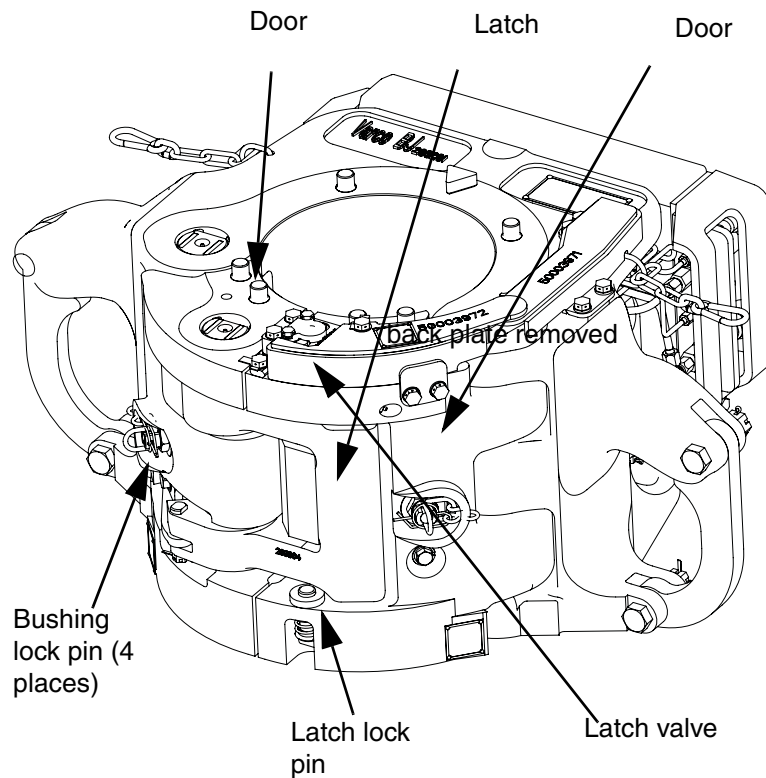
### **BX Elevator limitations**

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.

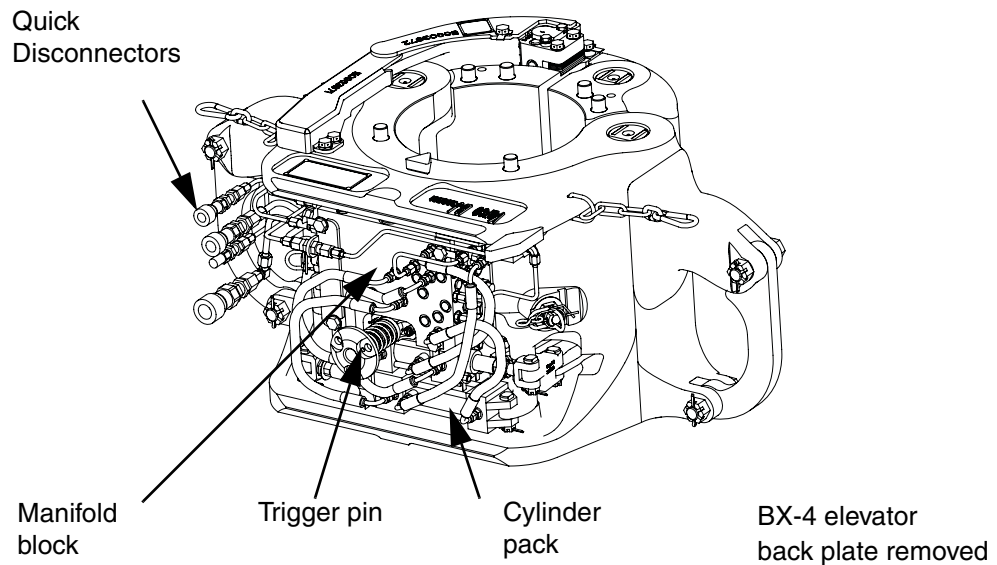
### **Major components**

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-3 specifics**

- ❑ The maximum load-rating of the BX 3 elevator is 350 short tons (318 Mtonnes).
- ❑ The elevator can be used in combination with a rotator, which can rotate the elevator 90° forward (doors pointing down) and 90° backward (doors pointing up).
- ❑ The elevator and rotator combination will fit 350 and 500 tons NOV links.
- ❑ In day to day practice the elevator is used to run drill pipe, casing and drill collars. Under no circumstances should the loads applied to the elevator exceed the rated load on the bushings.

### **BX 4-50+4-75 specifics**

- ❑ The maximum rated load capacity for casing is 500 short tons.
- ❑ The maximum rated load capacity for drill pipe is 500 short tons.
- ❑ The elevator can be used in combination with a rotator, which can rotate the elevator 90° forward (doors pointing down) and 90° backward (doors pointing up).
- ❑ The BX 4-75 elevator is suitable for 500 and 750 tons NOV links.
- ❑ (BX 4-75 only) For riser and B.O.P. stack handling, the maximum rated load capacity is 750 short tons. This operation requires a special square shoulder bushing.
- ❑ In day to day practice the elevator is used to run drill pipe, casing and drill collars. Under no circumstances should the loads applied to the elevator exceed the rated load on the bushings.

### **BX-5 specifics**

- ❑ The maximum rated load capacity for casing is 500 short tons.
- ❑ The maximum rated load capacity for drill pipe is 750 short tons.
- ❑ For riser and B.O.P. stack handling, the maximum rated load capacity of the BX 5 elevator is 1000 short tons. This operation requires a special square shoulder bushing.
- ❑ The elevator can be used in combination with a rotator, which can rotate the elevator 90° forward (doors pointing down) and 90° backward (doors pointing up).
- ❑ The elevator is suitable for 750 and 1000 tons NOV links.

- ❑ The combination of elevator and rotator is suitable for 750 and 1000 tons NOV links.
- ❑ In day to day practice the elevator is used to run drill pipe, casing and drill collars. Under no circumstances should the loads applied to the elevator exceed the rated load on the bushings.

### **Latch valve**

In order to prevent a false “BX Closed” signal due to a combination of poor maintenance and wear, the BX elevator is equipped with a latch valve. Once the latch is closed a pilot port opens at the latch cylinder. Pilot signals from door and latch cylinder have to be present simultaneously to get an elevator closed signal (XP-signal). The latch valve is connected in series with the existing door and latch signals. Pilot signals from door cylinder, latch cylinder and latch valve all have to be present simultaneously to get an elevator closed signal (XP-signal).

### **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.

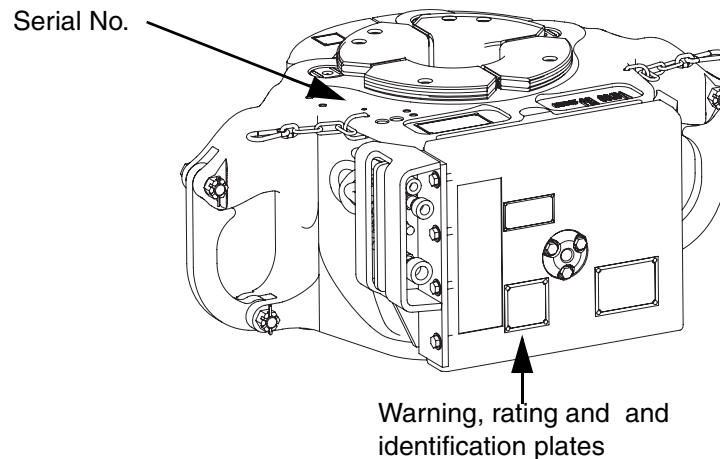
### **Limited warranty**

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**

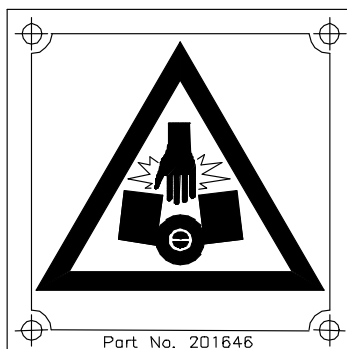
You will find the serial number of the tool stamped into the body.



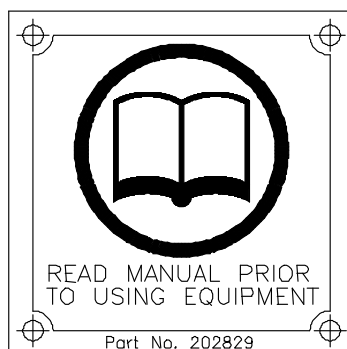
## Warning plates



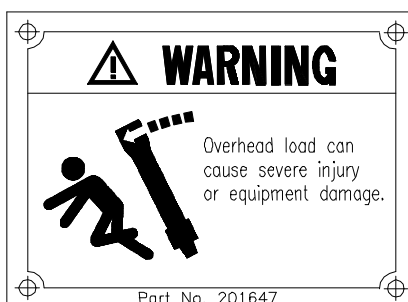
**WARNING: Warning plates must be present on the BX Elevator. Do not remove the labels. When a label or warning plate has disappeared, it must be replaced.**



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



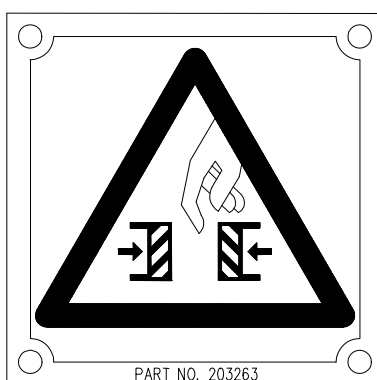
Warning plate part. nr.202829 Read the manual prior to use



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

RATING ELEVATOR				
TUBING :	<input type="text"/>	TONS	<input type="text"/>	MTONNES
DC PLAIN :	<input type="text"/>	TONS	<input type="text"/>	MTONNES
DC WITH ZIP LIFT :	<input type="text"/>	TONS	<input type="text"/>	MTONNES
18" DRILLPIPE :	<input type="text"/>	TONS	<input type="text"/>	MTONNES
CASING :	<input type="text"/>	TONS	<input type="text"/>	MTONNES
SPECIAL :	<input type="text"/>	TONS	<input type="text"/>	MTONNES
READ MANUAL FOR DETAILED RATING INSTRUCTIONS				
PART NO. 203264				

Rate tag part. no. 203264 Allowed Load-Ratings for different types of tubular

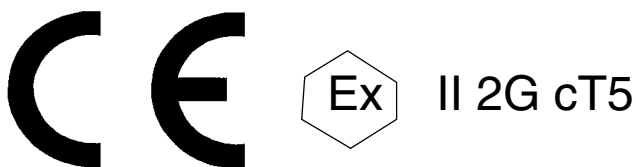


Warning plate part. nr. 203263. Be careful: Keep hands out of range of moving parts. Do not touch the elevator.

### CE marking

The BX-elevator complies with the Machinery Directive 98/37/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.

## General specifications

### General specifications, requirements & sizes

Subject	Description	
Weight and dimensions	BX-3 Elevator without bushings	Up to 2165 Lbs. / 975 kg
	BX-3 Elevator with bushings	Up to 2445 Lbs. / 1100 kg
	BX 4-50, 4-75 Elevator without bushings	Up to 1,700 Lbs. / 770 kg
	BX 4-50, 4-75 Elevator with bushings	Up to 1,900 Lbs. / 865 kg
	BX 5 Elevator without bushings	Up to 2875 Lbs. / 1290 kg
	BX 4-50, 4-75 Elevator with bushings	3100 Lbs. / 1400 kg
Rating BX-3	Pipe mass	Depending on pipe type
	Pipe size	9 5/8" -20"
Rating BX-4	Pipe mass 4-50	Depending on pipe type
	Pipe mass 4-75	Depending on pipe type
	Pipe size	2 3/8" - 9 3/4"
Rating BX-5	Pipe mass	Depending on pipe type
	Pipe size	3 1/2" - 11"
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
	Tubing and hose sizes	All tubing and hoses that connect the elevator to the power unit main ring need to have a minimum nominal size of 1/2" diameter
	Maximum oil temperature	176°F (80°C)
	Filter to be applied in the hydraulic supply line	50 micron
	Minimum allowed ambient temperature	-4°F (-20°C)
Temperature	Maximum allowed ambient temperature	104°F (+ 40°C)
	In case the ambient temperature is outside this range, please contact Varco for guidance	

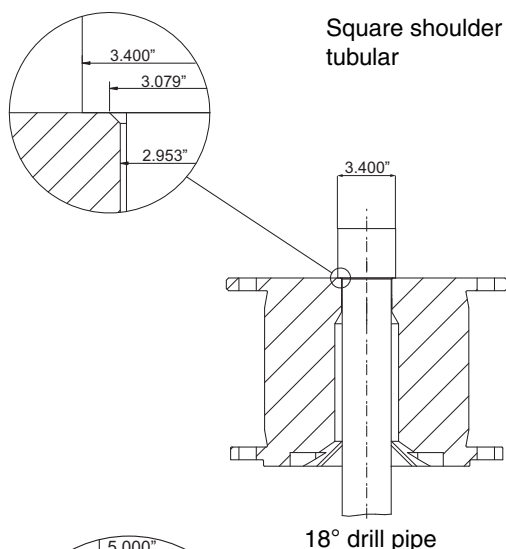
## Load ratings.



**WARNING:** The load rating of the elevator is determined according the following table. However, the type, wall thickness and material of pipe usually determines how heavy the load can be, not the elevator. NOV recommends to verify this with the pipe manufacturer at all times.

			Maximum allowable load rating for the elevator					Link size	
Type	Part no.	Size range	18° Tool Joint	90° Coupling	Special Square Shoulder Riser Bushing	Drill Collars	Min	Max	
3	203300Y10	9 5/8" - 20"	n/a	350 ton	n/a	350 ton	2 3/4"	3 1/2"	
4-50	203290Y10	2 3/8" - 9 3/4"	500 ton	500 ton	n/a	350 ton	2 3/4"	4 3/4"	
4-75	203200Y10	3 3/8" - 9 3/4"	500 ton	500 ton	750 ton	350 ton	3 1/2"	4 3/4"	
5	50004000Y10	3 1/2" - 11"	750 ton	750 ton	1000 ton	350 ton	4 3/4"	5 1/2"	

## Examples of calculation



1) In this example: BX4-75 with 2.875" tube.  
Minimum yield on elevator bushing: 110,000 Psi  
Max. load in bushing: 750 sTons

Area:

$$\frac{\pi}{4} (D^2 - d^2) = \frac{\pi}{4} (3.400^2 - 3.079^2) = 1.633 \text{ sq. inch}$$

Allowable force:

Area x Yield = Lbs

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

Allowable pipe load (static):

$$\frac{179,630 \text{ Lbs}}{2000} = 89.815 \text{ sTons}$$

In this example, the rating is determined by the bushing due to yield as a result of the small shoulder surface of 1.633 sq.inch. Verify with pipe manufacturer!

2) In this example: BX4-75 with 3.1/2" drill pipe.  
Minimum yield on elevator bushing: 110,000 Psi  
Max. load in bushing: 500 sTons

Area:

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

Allowable force:

Area x Yield = Lbs

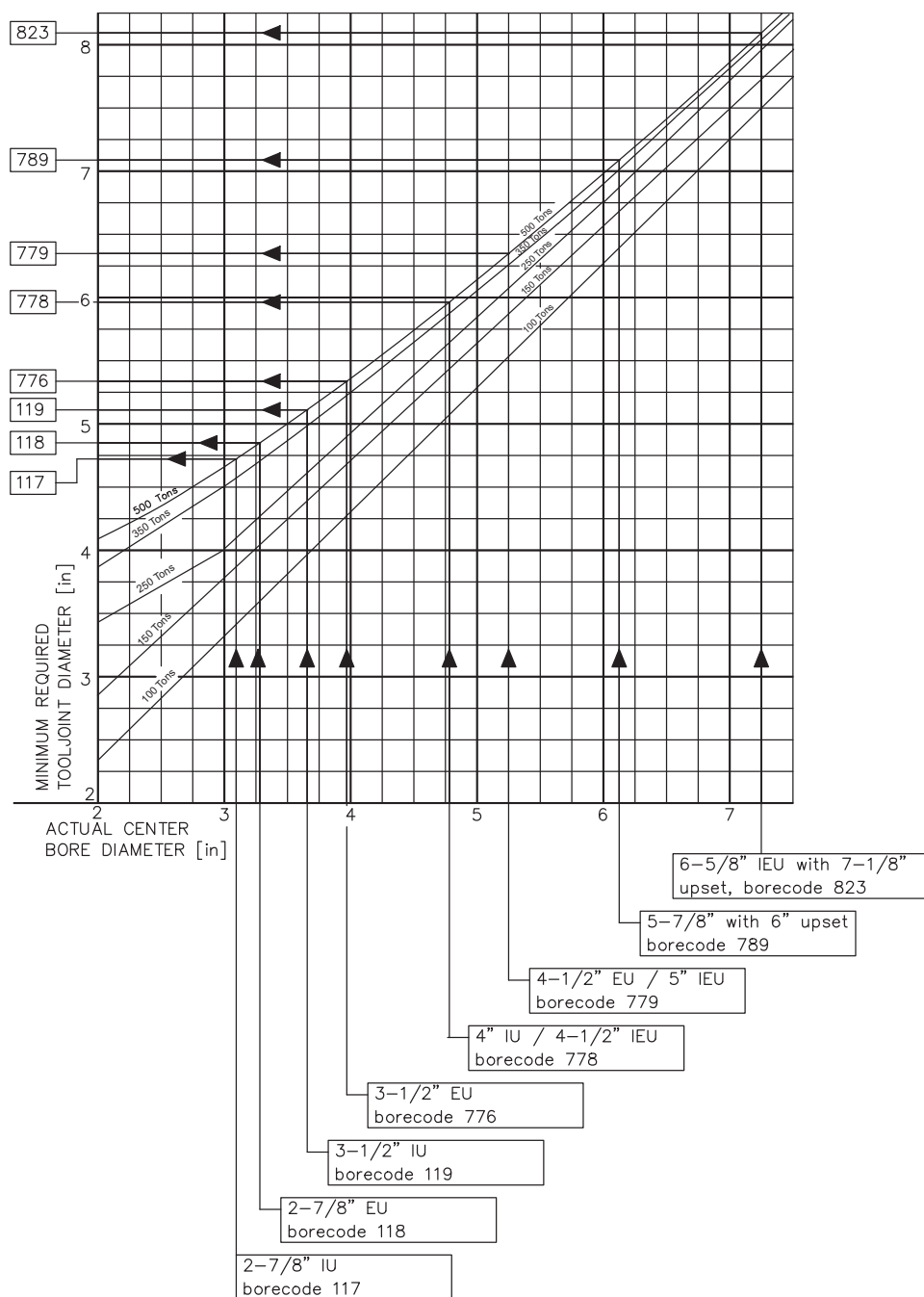
$$7.842 \times 110,000 = 862,620 \text{ Lbs}$$

Allowable pipe load (static):

$$\frac{862,620 \text{ Lbs}}{2000} = 431.31 \text{ sTons}$$

See also the graph.

In this example, the rating is determined by the tubular as the bushing will h500 sTons. However, a pipe with an OD of 3.1/2" will probably not be able to ha load of 431.31 sTons. Verify with pipe manufacturer!

**Minimum required tool joint diameters\***

The lines represent the bushing ratings.

\*For reference only; consult pipe manufacturer!

## Bushing overview

### BX3-bushings

Part number	Size	Max. Rating (sTons / mTons)	Appr. mass 4 segments w/o transport frame kg
<b>CASING</b>			
203310Y141	9 <sup>5</sup> / <sub>8</sub> "	350 / 318	379
203310Y649	9 <sup>7</sup> / <sub>8</sub> "	350 / 318	375
203310Y142	10 <sup>3</sup> / <sub>4</sub> "	350 / 318	362
203310Y453	10 <sup>5</sup> / <sub>8</sub> "	350 / 318	359
203310Y143	11 <sup>3</sup> / <sub>4</sub> "	350 / 318	353
203310Y729	11 <sup>7</sup> / <sub>8</sub> "	350 / 318	351
203310Y345	12 <sup>3</sup> / <sub>4</sub> "	350 / 318	348
203310Y676	12 <sup>7</sup> / <sub>8</sub> "	350 / 318	346
203310Y144	13 <sup>3</sup> / <sub>8</sub> "	350 / 318	346
203310Y596	13 <sup>5</sup> / <sub>8</sub> "	350 / 318	340
203310Y690	14"	350 / 318	309
203310Y145	16"	350 / 318	278
203310Y664	16 <sup>3</sup> / <sub>4</sub> "	350 / 318	260
203310Y723	18"	350 / 318	243
203310Y146	18 <sup>5</sup> / <sub>8</sub> "	350 / 318	225
203310Y147	20"	350 / 318	168

Part number	Size	Max. Rating (sTons / mTons)	Appr. mass 4 segments w/o transport frame kg
<b>DRILL COLLAR PLAIN</b>			
203312Y228	10" DC PLAIN	150 / 136	164
203312Y229	10 <sup>1</sup> / <sub>2</sub> " DC PLAIN	150 / 136	163
203312Y230	11" DC PLAIN	150 / 136	160



**BX4-bushings****PSL2 Bushings**

<b>Part number</b>	<b>Description</b>	<b>Maximum Rating</b>	<b>Appr. mass 4 segments w/o transport frame kg</b>
203210Z131	5" casing bushing PSL2	750 Ston	175
203210Z132	5.1/2" casing bushing PSL2	750 Ston	163
203210Z167	4.1/2" upset tubing PSL2	750 Ston	146
203210Z136	7" casing bushing PSL2	750 Ston	140
203210Z137	7.5/8" casing bushing PSL2	750 Ston	128
203210Z141	9.5/8" casing bushing PSL 2	750 Ston	104
203210Z869	Special 55deg, 8.5/8" riser PSL2	750 Ston	116
203211Z373	6.1/2" DC W. zip lift bushing PSL2	750 Ston	168
203211Z435	4.3/4" DC W. zip lift bushing PSL2	750 Ston	183
203211Z336	8" DC W. zip lift bushing PSL2	750 Ston	143
203211Z387	6.3/4" DC W. zip lift bushing PSL2	750 Ston	165
203211Z422	8.1/4" DC W. zip lift bushing PSL2	750 Ston	137
203211Z370	9.1/2" DC W. zip lift bushing PSL2	750 Ston	117
203212Z118	2.7/8" EU DP bushing PSL2	500 Ston	223
203212Z119	3.1/2" IU DP bushing PSL2	500 Ston	223
203212Z776	3.1/2" EU DP bushing PSL2	500 Ston	223
203212Z777	4" IU DP bushing PSL2	500 Ston	201
203212Z778	4" EU & 4.1/2" IEU DP bushing PSL2	500 Ston	201
203212Z779	4.1/2" EU & 5" IEU DP bushing PSL2	500 Ston	193
203212Z780	5.1/2" IEU DP bushing PSL2	500 Ston	181
203212Z789	5.7/8" DP bushing, 6"upset max. PSL2	500 Ston	179
203212Z782	6.5/8" IEU DP bushing PSL2	500 Ston	165
203213Z338	6.3/4" DC plain bushing PSL2	750 Ston	174
203213Z346	9.1/2" DC plain bushing PSL2	750 Ston	157
203213Z347	8.1/4" DC plain bushing PSL2	750 Ston	168
203214Z784	8.5/8" riser handling bushing PSL2	750 Ston	116

**DC W. zip lift Bushing**

<b>Part number</b>	<b>Description</b>	<b>Maximum Rating</b>	<b>Appr. mass 4 segments w/o transport frame kg</b>
203211Y179	5.1/4" DC W. zip lift bushing	750 Ston	176
203211Y180	5.1/2" DC W. zip lift bushing	750 Ston	174
203211Y337	6.1/4" DC W. zip lift bushing	750 Ston	168
203211Y362	6" DC W. zip lift bushing	750 Ston	174
203211Y373	6.1/2" DC W. zip lift bushing	750 Ston	168
203211Y409	6.3/8" DC W. zip lift bushing	750 Ston	172
203211Y435	4.3/4" DC W. zip lift bushing	750 Ston	183
203211Y530	5" DC W. zip lift bushing	750 Ston	179
203211Y336	8" DC W. zip lift bushing	750 Ston	143
203211Y339	7.3/4" DC W. zip lift bushing	750 Ston	150
203211Y357	7.1/4" DC W. zip lift bushing	750 Ston	157
203211Y361	7" DC W. zip lift bushing	750 Ston	165
203211Y387	6.3/4" DC W. zip lift bushing	750 Ston	165
203211Y422	8.1/4" DC W. zip lift bushing	750 Ston	137

203211Y195	10" DC W. zip lift bushing	750 Ston	104
203211Y367	9.3/4" DC W. zip lift bushing	750 Ston	108
203211Y370	9.1/2" DC W. zip lift bushing	750 Ston	117
203211Y426	8.1/2" DC W. zip lift bushing	750 Ston	130
203211Y427	9" DC W. zip lift bushing	750 Ston	123
203211Y553	8.3/4" DC W. zip lift bushing	750 Ston	130
203211Y177	4.1/8" DC W. zip lift bushing	500 Ston	207
203211Y625	3.1/2" DC W. zip lift bushing	500 Ston	218
203211Y674	4.1/4" DC W. zip lift bushing	500 Ston	196
203211Y735	3.1/8" DC W. zip lift bushing	500 Ston	240
203211Y736	3.3/8" DC W. zip lift bushing	500 Ston	229

#### Tubing

Part number	Description	Maximum Rating	Appr. mass 4 segments w/o transport frame kg
203210Y158	2.3/8" casing/plain tub.bushing	500 Ston	179
203210Y159	2.3/8" OD.EU. tubing bushing	500 Ston	179
203210Y160	2.7/8" plain tubing bushing	500 Ston	170
203210Y161	2.7/8" OD. EU. tubing bushing	500 Ston	170
203210Y162	3.1/2" casing/plain tub.bushing	500 Ston	161
203210Y163	3.1/2" OD. EU. tubing bushing	500 Ston	161
203210Y164	4" OD. plain tubing bushing	500 Ston	154
203210Y165	4" OD. EU. tubing bushing	500 Ston	154
203210Y867	2.88" special gun tube bushing	500 Ston	146
203210Y868	3.50" special gun tube bushing	500 Ston	148

#### Casing bushing

Part number	Description	Maximum Rating	Appr. mass 4 segments w/o transport frame kg
203210Y129	4.1/2" casing/plaine tubing bushing	750 Ston	187
203210Y131	5" casing bushing	750 Ston	175
203210Y132	5.1/2" casing bushing	750 Ston	163
203210Y134	6" casing bushing	750 Ston	160
203210Y135	6.5/8" casing bushing	750 Ston	151
203210Y136	7" casing bushing	750 Ston	140
203210Y137	7.5/8" casing bushing	750 Ston	128
203210Y139	8.5/8" casing bushing	750 Ston	116
203210Y141	9.5/8" casing bushing	750 Ston	104
203210Y167	4.1/2" OD. EU. tubing bushing	750 Ston	146
203210Y505	6.1/4" casing bushing	750 Ston	155
203210Y563	1/16 bevel 7-1/4" casing	750 Ston	140
203210Y649	9.7/8" casing bushing	750 Ston	102
203210Y705	7.3/4" casing bushing	750 Ston	130
203210Y757	8" casing bushing	750 Ston	132
203210Y804	8.3/4" casing bushing	750 Ston	116
203210Y848	4.1/2" casing/plaine tubing bushing	750 Ston	187
203210Y834	6.7/8" 55",45",35" taper bushing	750 Ston	148

203210Y854	7" Hydrill 521 #26 w. Lift plug	750 Ston	140
203210Y883	9.1/8" casing bushing	750 Ston	110

**SQ. Shoulder dp bushing**

Part number	Description	Maximum Rating	Appr. mass 4 segments w/o transport frame kg
203212Y106	5" IEU sq.shoulder DP bushing	750 Ston	187
203212Y107	5.1/2" IEU sq.shoulder DP bushing	750 Ston	179
203212Y101	2.7/8" EU sq.shoulder DP bushing	500 Ston	223
203212Y102	3.1/2" IU sq.shoulder DP bushing	500 Ston	212
203212Y103	3.1/2" EU sq.shoulder DP bushing	500 Ston	212
203212Y104	4" IU sq.shoulder DP bushing	500 Ston	203

**Riser Handling Bushing**

Part number	Description	Maximum Rating	Appr. mass 4 segments w/o transport frame kg
203214Y333	6.5/8" Riser Handling Bushing	750 Ston	120
203214Y563	7.1/4" Riser Handling Bushing	750 Ston	128
203214Y757	8" Riser Handling Bushing	750 Ston	123
203214Y783	8.3/4" Riser Handling Bushing	750 Ston	119
203214Y784	8.5/8" Riser Handling Bushing	750 Ston	116
203214Y788	9 5/8" Riser Handling Bushing	750 Ston	104
203214Y790	7" Riser Handling Bushing	750 Ston	140
203210Y869	Special 55deg, 8.5/8" riser	750 Ston	116

**DP Bushings**

Part number	Description	Maximum Rating	Appr. mass 4 segments w/o transport frame kg
203212Y117	2.7/8" IU DP bushing	500 Ston	223
203212Y118	2.7/8" EU DP bushing	500 Ston	223
203212Y119	3.1/2" IU DP bushing	500 Ston	212
203212Y776	3.1/2" EU DP bushing	500 Ston	212
203212Y777	4" IU DP bushing	500 Ston	201
203212Y778	4" EU & 4.1/2" IEU DP bushing	500 Ston	201
203212Y779	4.1/2" EU & 5" IEU DP bushing	500 Ston	193
203212Y780	5.1/2" IEU DP bushing	500 Ston	181
203212Y781	5.1/2" IF IEU DP bushing	500 Ston	181
203212Y782	6.5/8" IEU DP BUSHING	500 Ston	165
203212Y789	5.7/8" DP bushing 18degr (6"EU MAX.)	500 Ston	179
203212Y798	4" DP with 4.1 max upset	500 Ston	201
203212Y823	6.5/8" DP bushing 7.1/8" upset	500 Ston	165
203212Y880	SK5.1/2" special DP bushing	250 Ston	181

**DC Plain bushing**

<b>Part number</b>	<b>Description</b>	<b>Maximum Rating</b>	<b>Appr. mass 4 segments w/o transport frame kg</b>
203213Y349	6" DC plain bushing	750 Ston	180
203213Y354	4.3/4" DC plain bushing	750 Ston	196
203213Y135	6.1/2" DC plain bushing	750 Ston	174
203213Y338	6.3/4" DC plain bushing	750 Ston	174
203213Y348	6.1/4" DC plain bushing	750 Ston	176
203213Y334	8" DC plain bushing	750 Ston	172
203213Y346	9.1/2" DC plain bushing	750 Ston	157
203213Y347	8.1/4" DC plain bushing	750 Ston	168
203213Y356	9" DC plain bushing	750 Ston	165
203213Y580	8.1/2" DC plain bushing	750 Ston	165
203213Y201	2.1/2" DC plain bushing	500 Ston	262
203213Y203	2.3/4" DC plain bushing	500 Ston	258
203213Y205	3" DC plain bushing	500 Ston	247
203213Y206	3.1/8" DC plain bushing	500 Ston	240
203213Y207	3.1/4" DC plain bushing	500 Ston	229
203213Y209	3.1/2" DC plain bushing	500 Ston	210
203213Y211	3.3/4" DC plain bushing	500 Ston	207
203213Y519	4.1/8" DC plain bushing	500 Ston	196
203213Y548	4.1/4" DC plain bushing	500 Ston	192
203213Y795	3.3/8" DC plain bushing	500 Ston	180

**BX5-bushings**

Part number	Size	Max. Rating (sTons / mTons)	Appr. mass 4 segments w/o transport frame kg
<b>CASING</b>			
50004010Y129	4 1/2"	750 / 680	116
50004010Y130	4 3/4"	750 / 680	114
50004010Y131	5"	750 / 680	112
50004010Y132	5 1/2"	750 / 680	110
50004010Y133	5 3/4"	750 / 680	108
50004010Y134	6	750 / 680	106
50004010Y135	6 5/8"	750 / 680	104
50004010Y136	7"	750 / 680	102
50004010Y137	7 5/8"	750 / 680	100
50004010Y705	7 3/4"	750 / 680	98
50004010Y139	8 5/8"	750 / 680	96
50004010Y141	9 5/8"	750 / 680	94
50004010Y649	9 7/8"	750 / 680	92
50004010Y142	10 3/4"	750 / 680	90
<b>DRILL COLLARS ZIP LIFT</b>			
50004011Y435	4 3/4"	150 / 136	89
50004011Y362	6"	150 / 136	82
50004011Y337	6 1/4"	150 / 136	80
50004011Y373	6 1/2"	150 / 136	76
50004011Y387	6 3/4"	150 / 136	72
50004011Y339	7 3/4"	150 / 136	70
50004011Y336	8"	150 / 136	67
50004011Y422	8 1/4"	150 / 136	65
50004011Y426	8 1/2"	150 / 136	62
50004011Y427	9"	150 / 136	60
50004011Y370	9 1/2"	150 / 136	56
50004011Y367	9 3/4"	150 / 136	52
50004011Y195	10"	150 / 136	46
50004011Y527	10 3/4"	150 / 136	42
50004011Y419	11"	150 / 136	40
<b>DRILL PIPE</b>			
50004012Y766	3 1/2" IEU 18 DEGREE	150 / 136	122
50004012Y777	4" IU DRILL	150 / 136	122
50004012Y778	4" EU & 4 1/2" IEU	150 / 136	120
50004012Y779	4 1/2" EU & 5" IEU	150 / 136	122
50004012Y780	5 1/2" IEU 18 DEGREE	150 / 136	118
50004012Y781	5 1/2" IF	150 / 136	116

50004012Y782	6 <sup>5</sup> / <sub>8</sub> " IEU DRILL	150 / 136	104
50004012Y789	5 <sup>7</sup> / <sub>8</sub> " EU	150 / 136	114
<b>DRILL COLLARS PLAIN (LIFT-PLUG)</b>			
50004013Y354	4 <sup>3</sup> / <sub>4</sub> " PLAIN DRILL	150 / 136	89
50004013Y219	5 <sup>1</sup> / <sub>4</sub> " PLAIN DRILL	150 / 136	82
50004013Y348	6 <sup>1</sup> / <sub>4</sub> " PLAIN DRILL	150 / 136	80
50004013Y135	6 <sup>1</sup> / <sub>2</sub> " PLAIN DRILL	150 / 136	76
50004013Y334	8" PLAIN DRILL	150 / 136	72
50004013Y347	8 <sup>1</sup> / <sub>4</sub> " PLAIN DRILL	150 / 136	70
50004013Y357	8 <sup>1</sup> / <sub>2</sub> " PLAIN DRILL	150 / 136	67
50004013Y356	9" PLAIN DRILL	150 / 136	65
50004013Y346	9 <sup>1</sup> / <sub>2</sub> " PLAIN DRILL	150 / 136	62
50004013Y228	10" PLAIN DRILL	150 / 136	60
50004013Y229	10 <sup>1</sup> / <sub>2</sub> " PLAIN DRILL	150 / 136	56
50004013Y230	11" PLAIN DRILL	150 / 136	52
<b>SPECIAL SQUARE SHOULDER</b>			
50004014Y757	8"	1000 / 907	100
50004014Y783	8 <sup>3</sup> / <sub>4</sub> "	1000 / 907	92
50004014Y784	8 <sup>5</sup> / <sub>8</sub> "	1000 / 907	85
50004014Y788	9 <sup>5</sup> / <sub>8</sub> "	1000 / 907	80

## 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 (BX Elevator 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

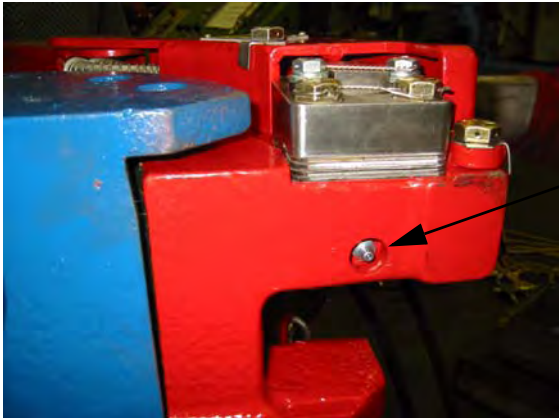
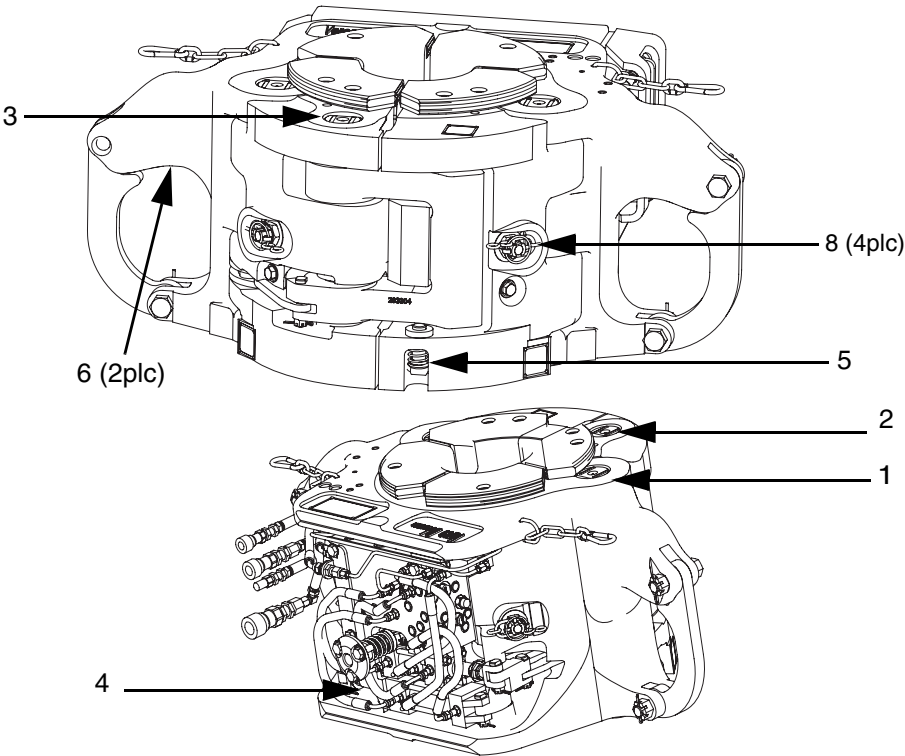


**Daily operational check (cat II) Daily lubrication (cat II)****Procedure****Daily Inspection (cat II) Visually inspect and repair when needed**

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

**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	<input type="checkbox"/> OK
2. Grease hinge pin Right hand door	<input type="checkbox"/> OK
3. Grease hinge pin latch	<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 through one of them.	<input type="checkbox"/> OK



## 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

## Six monthly inspection (cat III) on RIG

### Procedure

#### Procedure on rig

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 Varco BJ 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 Varco BJ repair center for guidance

Check for correct condition of cylinder seals

## Maintenance procedures

### API recommended practice according to API 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.

#### 5 Inspection and maintenance

##### 5.1 General

##### 5.1.1 Criteria

Inspection and maintenance are closely linked. Inspection and maintenance actions may be initiated based on, but not limited to, one or more of the following criteria: specific time intervals; measurable wear limits; load cycle accumulation; non-performance of equipment; environment; experience (history); regulatory requirements.

5.1.2 Safety considerations Operators shall review safety considerations applicable to the site where the maintenance activity is performed.

##### 5.2 Maintenance

##### 5.2.1 General

Maintenance of equipment consists of actions such as adjustments, cleaning, lubrication, and replacement of expendable parts. The complexity of these activities and the safety risks involved shall be considered in the assignment of appropriate resources such as facilities, equipment and qualified personnel.

##### 5.2.2 Procedures

In addition to the procedures developed in accordance with 4.1, the manufacturer should define any special tools, materials, measuring and inspection equipment, and personnel qualifications necessary to perform the maintenance. The manufacturer should also specify those procedures that should be performed solely by the manufacturer, either within the manufacturer's facility or within another approved facility.

##### 5.3 Inspection

##### 5.3.1. General

The existence of cracks can indicate severe deterioration and impending failure. Their detection, identification and evaluation require accurate inspection methods. Prompt attention is then required either to remove the equipment from service immediately or to provide appropriate service and/or repair. Caution shall be exercised to take into account the increased susceptibility to brittle fracture of many steels when operating at low temperatures. If any manufacturing defects are discovered, they should be reported to the manufacturer or supplier.

### 5.3.2

#### Inspection categories

5.3.2.1 General The objective of these inspections is to detect service defects and possible hidden manufacturing defects. Inspection results shall be reported on equipment files and drawings.

#### 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).

### 5.3.3 Frequency

5.3.3.1 Periodic inspection 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.

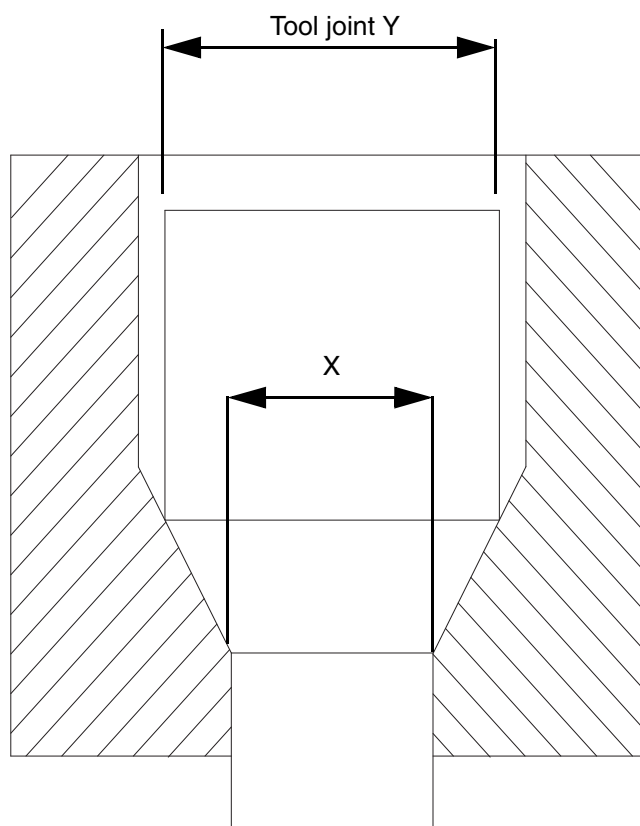
As an alternative, the user/owner may use Table 1 guidelines. Long-term planning shall be adjusted in order not to interfere unnecessarily with the running operations.

5.3.3.2 Non-periodic inspection A complete, on-job, shut-down inspection equivalent to the periodical Category III or Category IV (for the concerned equipment) should be made before (if anticipated) and after critical jobs (e.g., running heavy casing strings, jarring, pulling on stuck pipes and/or operating at extreme low temperatures).

## Tool joint wear data drill-pipe

### Procedure

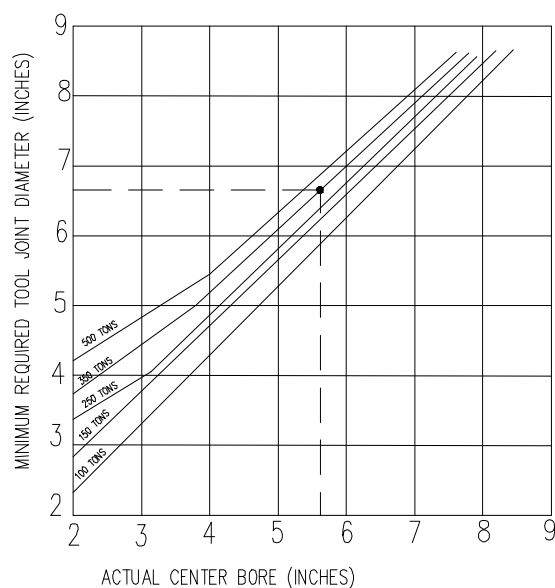
1. Determine the center bore diameter of the bushing in inches (size X)
2. The maximum wear on the diameter of the center bore: Nominal size + 0.25 inch
3. In the table, follow the line corresponding with the rating of the elevator (in short tons)
4. On the left hand side, read out the minimum required 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.



### 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) =  $6 \frac{3}{4}$

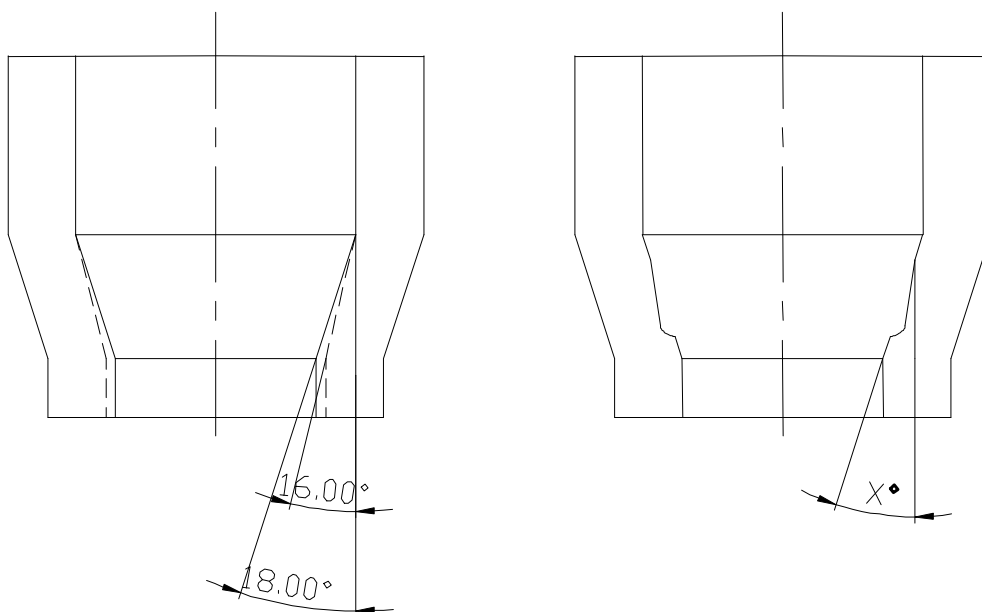


### Center-bore 18° taper profile inspection

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

#### Procedure

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 Varco BJ authorized repair facility is allowed to remanufacture HT BX Elevators which have indications outside the acceptance criteria.

## 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 Varco BJ 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 an Varco BJ 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. 1 cubic centimeter/min (about a teaspoon) is allowed to leak.
- ☐ If there is considerable more leakage, replace seals.



## Wear data/criteria

### Bushing/pin wear data BX-3, 4-50 and 4-75

Allowed total repair clearance hinge & latch pins; max 0.020"

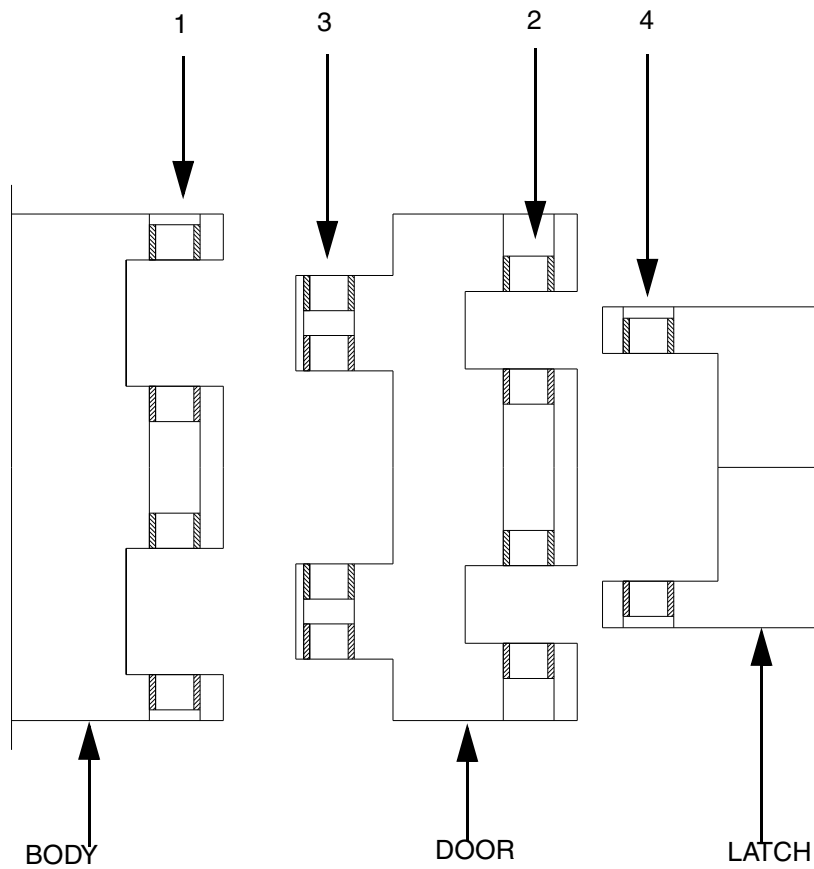
Allowed in-service clearance hinge & latch pins; max 0.030"

Levers	Size (inch)
Lever pin 0.500 diameter new	min 0.5002
Lever bushing 0.500 bore diameter new	max 0.5102
Lever bushing 0.500 bore diameter worn	max 0.5202
Doors	Size (inch)
Hinge pin doors diameter new	min 2.1542
Door bushing bore diameter new	max 2.1642
Door bushing bore diameter worn	max 2.2142
Latch	Size (inch)
Latch pin diameter new	min 1.9673
Latch bushing bore diameter new	max 1.9773
Latch bushing bore diameter worn	max 2.0273
Trigger	Size (inch)
Trigger shaft diameter new	min 0.9827
Trigger shaft bushing bore diameter new	max 0.9863
Trigger shaft bushing bore diameter worn	max 0.9882

### Bushing / pin repair parts

	Part number	Quantity
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

As from serial #NL28481 the BX-4 replaced by: \* 59000010-0812 \*\* 59000010-0808



## Bushing / pin wear data BX-5

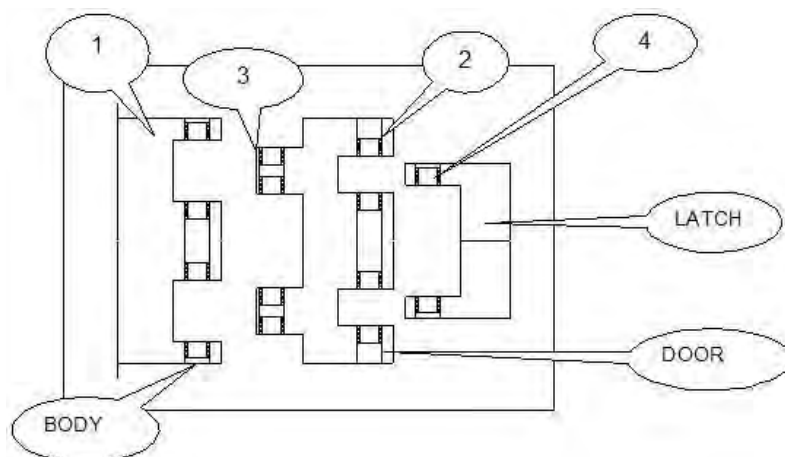
Allowed total repair clearance hinge & latch pins; max 0.020"

Allowed in-service clearance hinge & latch pins; max 0.030"

<b>Levers</b>	<b>Size (inch)</b>
Lever pin 0.500 diameter new	min 0.5002
Lever bushing 0.500 bore diameter new	max 0.5102
Lever bushing 0.500 bore diameter worn	max 0.5202
<b>Doors</b>	<b>Size (inch)</b>
Hinge pin doors diameter new	min 2.7547
Door bushing bore diameter new	max 2.7588
Door bushing bore diameter worn	max 2.8088
<b>Latch</b>	<b>Size (inch)</b>
Latch pin diameter new	min 2.3610
Latch bushing bore diameter new	max 2.3651
Latch bushing bore diameter worn	max 2.4151
<b>Trigger</b>	<b>Size (inch)</b>
Trigger shaft diameter new	min 0.9827
Trigger shaft bushing bore diameter new	max 0.9863
Trigger shaft bushing bore diameter worn	max 0.9882

## Bushing / pin repair parts BX-5

	<b>Part number</b>	<b>Quantity</b>
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



## Repair data



NOTE: In case the guidelines given in this chapter, conflict with the guidelines as set out in the Varco BJ Repair manual, the guidelines set out in the Varco BJ 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.

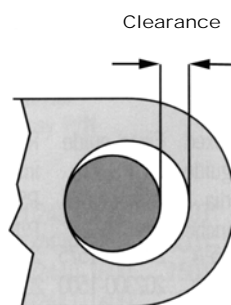
### Allowed repair clearance

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"



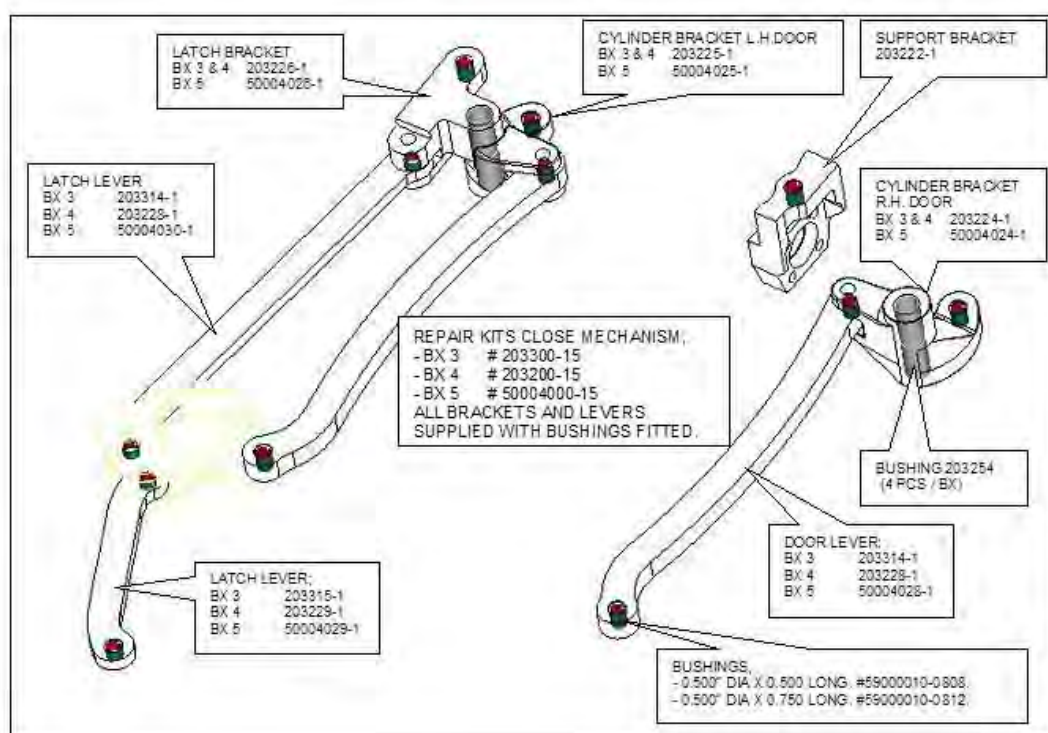
## Elevator Close mechanism;

### 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
Lever bushings 0.500 ID (fitted) 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
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

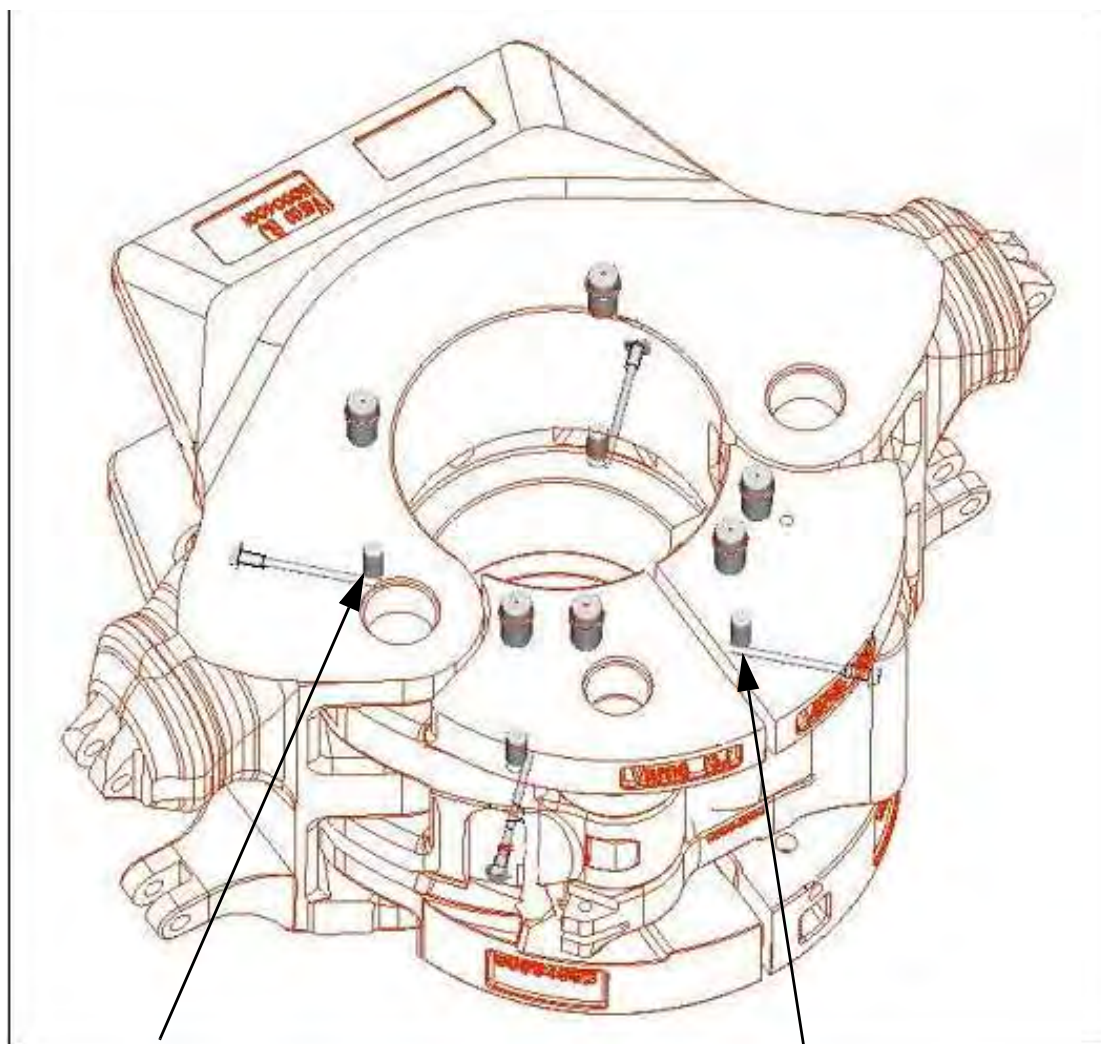


View on close-mechanism, as fitted from serial #NL28481 onwards.

## Position pins for elevator bushings

### 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 BX 4-50 / 4-75 Min. 0.8665
Pin fitment hole in Body / Door BX 4-50 / 4-75 Max. 0.8668
Locating hole in Elevator bushing (Insert) Max. 1.0600
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
Locating hole in Elevator bushing (Insert) Max. 1.6348
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
Locating hole in Elevator bushing (Insert) Max. 1.3986
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, 4 and 5 Max. 0.8710
Locating hole in Elevator bushing (Insert). BX 3, 4 and 5 Max. 1.0500



**Locating pin**  
BOTTOM #203258

**Locating pin top**  
BX 3 203317  
BX 4 203234  
BX 5 50004034

Inserts Locating Pins

Hinge pins



## .Trigger sizes

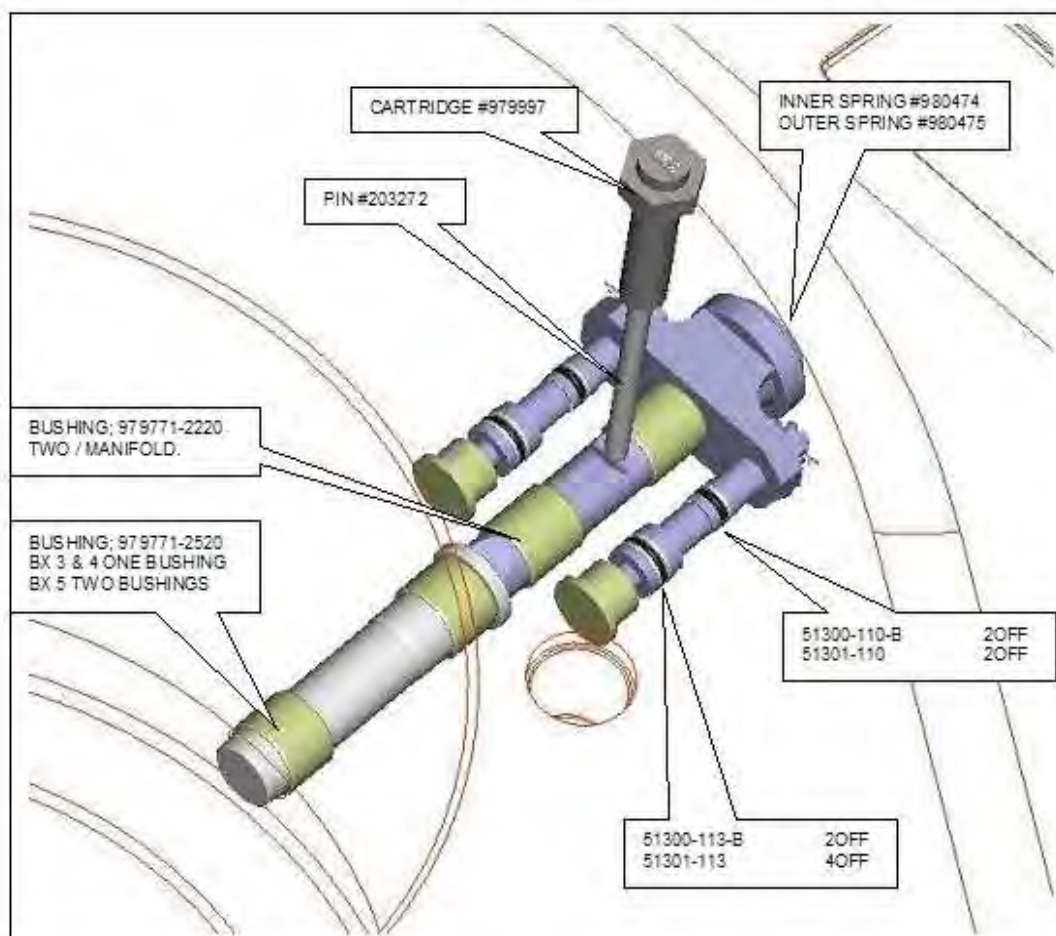
### Trigger sizes (inches)

#### Trigger Shaft #203238 & 50004038

Trigger shaft diameter new	Min 0.9819
Trigger shaft bushing ID (fitted) new	Max 0.9863
Trigger shaft bushing ID worn	Max 0.9903
Trigger shaft bushing fitment bore	Max 1.0252

#### Trigger Shaft #203271 in Manifold Size (inch)

Trigger shaft diameter new	Min 0.8653
Trigger shaft bushing ID (fitted) new	Max 0.8682
Trigger shaft bushing ID worn	Max 0.8714
Trigger shaft bushing fitment bore	Max 0.9851
Inner Trigger Spring #980474. Length new	2.933" Min. 2.785
Outer Trigger Spring #980475. Length new	4.134" Min. 3.920



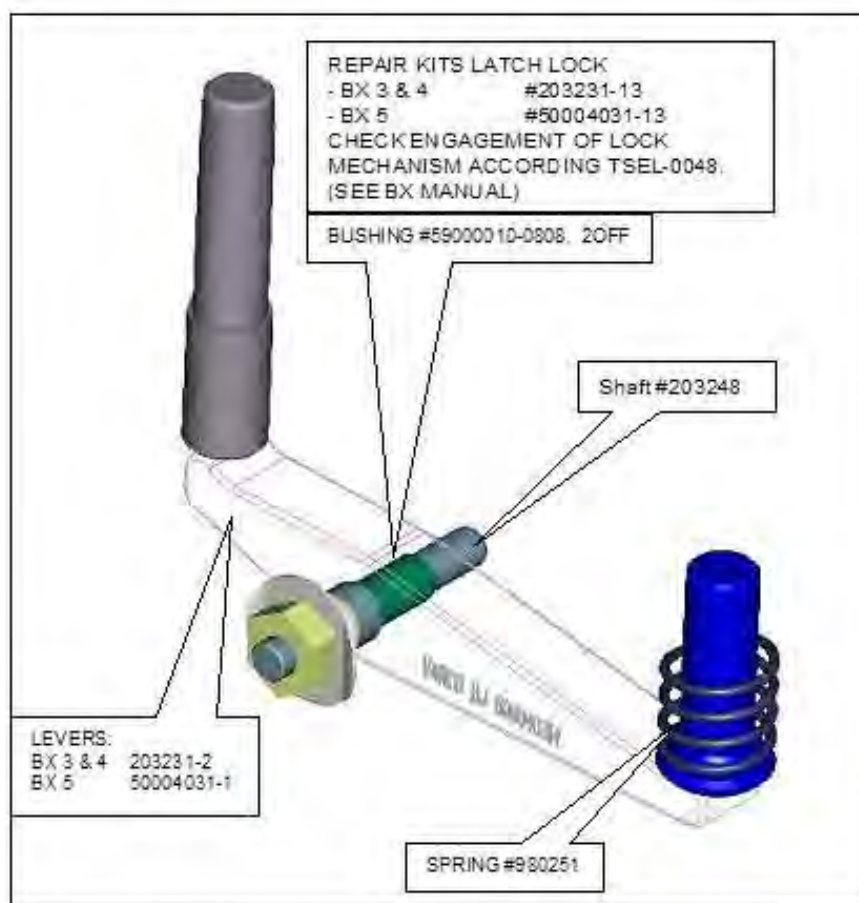
Trigger Mechanism.



## Lock shaft bushings

### 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



Latch Lock as fitted from serial #NL28481 onwards .

## Hinge pins

### Hinge Pins

#### Door Hinge Pins BX 3 & 4 #203206-1 Size (inch)

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 BX 3 & 4 #203207-1 Size (inch)

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

#### Doors Hinge Pins BX 5 50004006 Size (inch)

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 (inch)

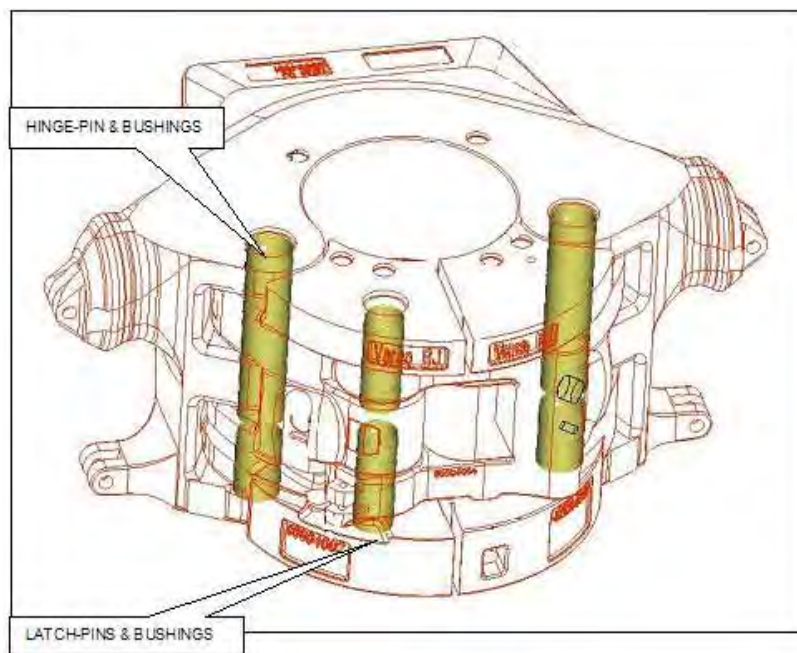
Latch pin diameter new Min 2.3610

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

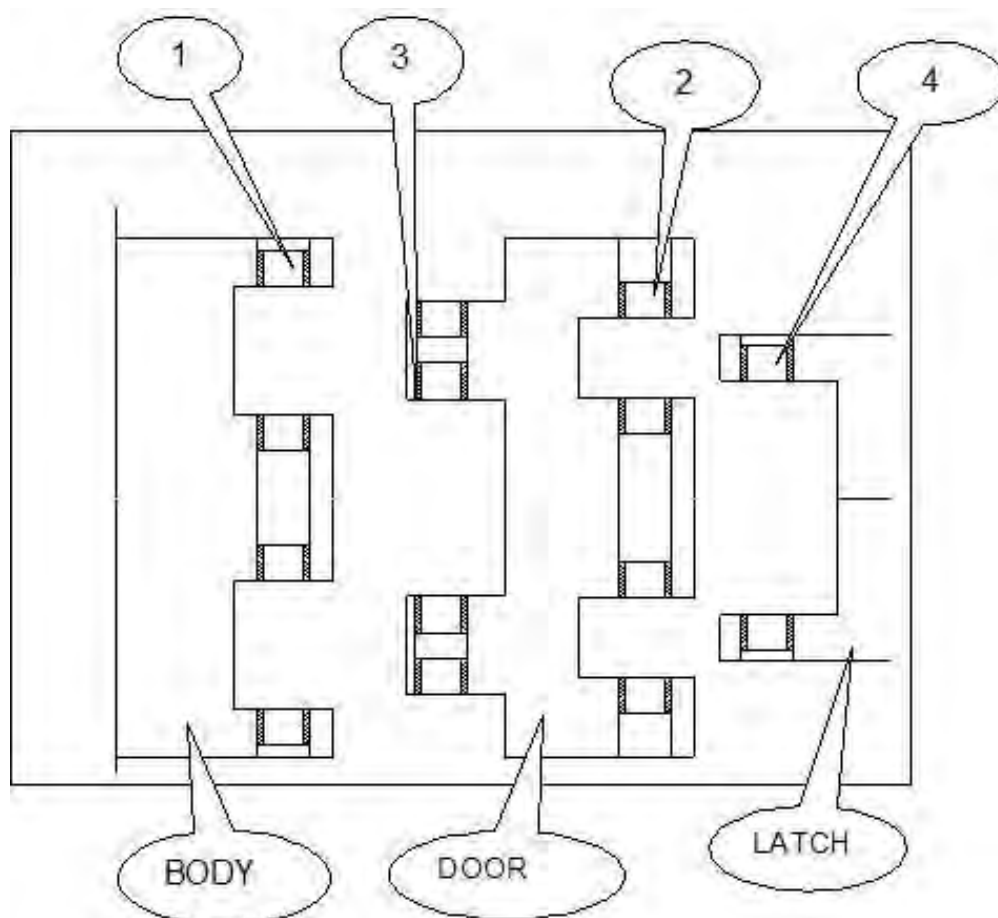


**Bushing / pin repair parts BX-3, BX-4-50 & 4-75**

Part	Number	Quantity;
Cylinder bracket bushing ½"	203260-1	4*
Door/Latch lever bushing ½"	203247-1	10**
Bracket pin bushing ¾"	203254	4
Latch lock lever bushing	203247-1	2**
Trigger shaft	203238	1
Trigger shaft wear bushing	979771-2520	1
Doorhinge-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

As from serial #NL28481 on BX replaced by: \* 59000010-0812

\*\* 59000010-0808

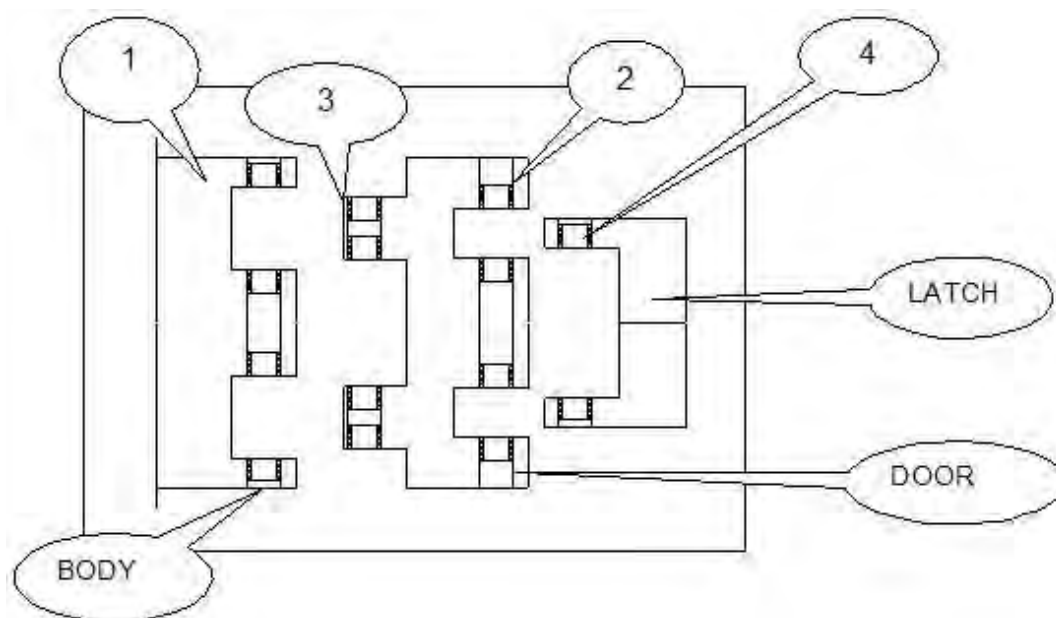


**Body door / latch pin bushing repair parts BX-5**

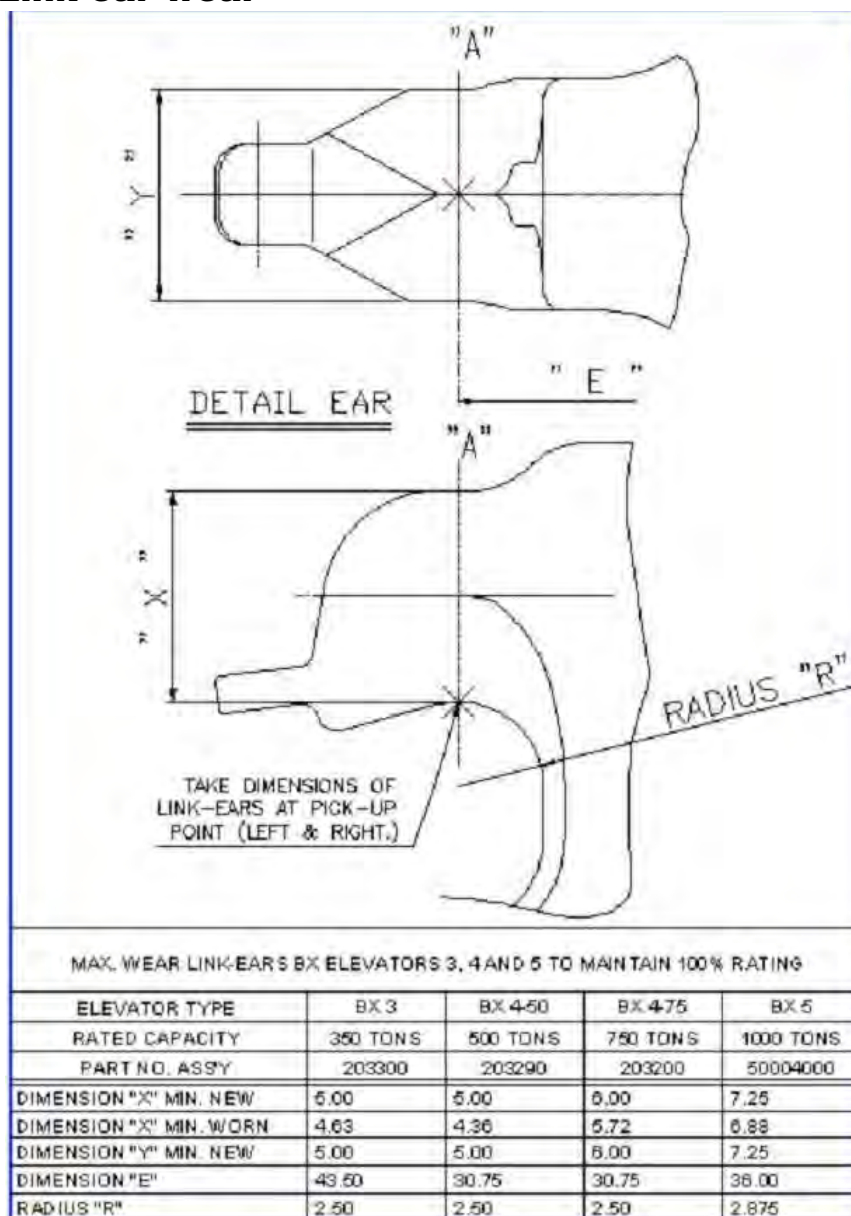
Part number	Part number	Quantity
Cylinder bracket bushing ½"	203260-1	4 *
Door/Latch lever bushing ½"	203247-1	8 **
Bracket pin bushing	203254	4
Latch lock lever bushing	203247-1	2 **
Door hinge-pin assembly with bushings	40004006-1	2
1. Door hinge-pin wear-bushing in body	979770-7050	8
2. Latch hinge-pin 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

As from serial #NL28481 on BX replaced by: \* 59000010-0812

\*\* 59000010-0808



Hinge Latch Pin Bushings BX 5

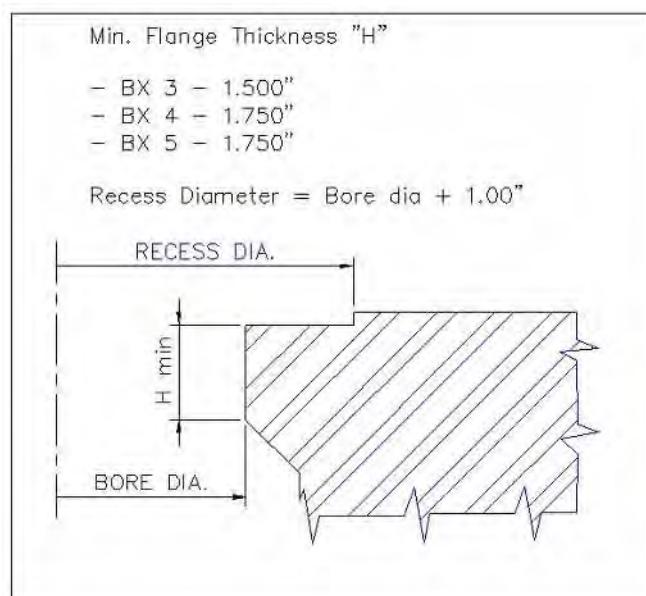
**Link ear wear**

## Casing (collar type).

### Bore wear

- 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 Varco repair facility for guidance.

### Minimum allowed Collar Flange thickness.



### Collar Flange Thickness.

- If the measured collar flange thickness on a worn bushing set, still exceeds the minimum specified values, please contact your nearest authorized Varco repair facility for guidance. If the measure flange thickness falls below the minimum values, the bushing must be taken out of service.

## Zip-lift drill-collar

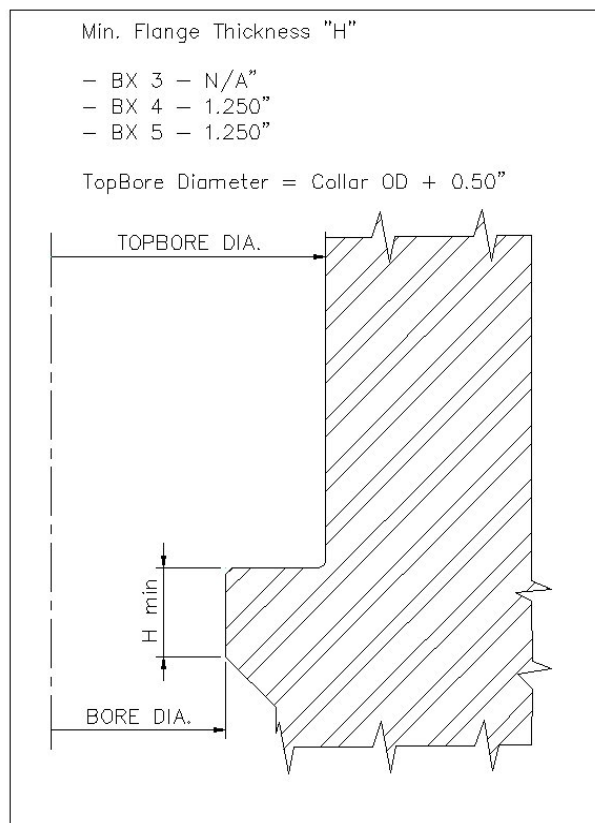
### Bore wear.

- 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 Varco repair facility for guidance.

### Flange Thickness.

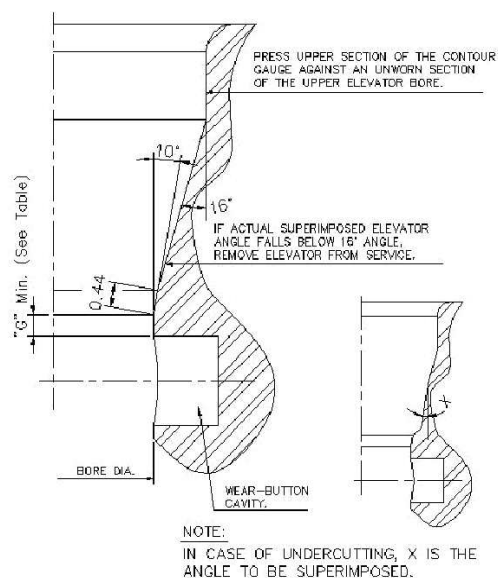
- If the measured ZIP collar flange thickness on a worn bushing set, still exceeds the minimum specified values, please contact your nearest authorized Varco repair facility for guidance.
- If the measure flange thickness falls below the minimum values, the bushing must be taken out of service





### 18° Degree type bore wear.

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 Varco repair facility for guidance.







# 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 TDS-power unit or rig main ring have a minimum of ½" nominal diameter.	<input type="checkbox"/> OK
Check maximum system-oil temperature: Maximum 180°F (82°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: 2000 – 2500 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 250 Psi (1,723 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.

## 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 Varco top drive a control manifold will be mounted on the top drive (no drawing added, see TDS manual).

## Universal Rotator

Please refer to the User's Manual of the Universal Rotator for information about the Rotator.

## Installing the Hook Up Kit

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

When customer has a new Varco Top Drive, the following hose kits need to be used:

### BX without rotator

Varco Part Number	Qty.	Description
203120	1	Hose connection from S2 to XP (BX)
203121	1	Hose connection T to T (BX)
203122	1	Hose connection from P to P (BX)

### BX with rotator

Varco Part Number	Qty.	Description
203120	1	Hose connection from S2 to XP (BX)
203121	1	Hose connection T to T (BX)
203122	1	Hose connection from P to P (BX)
994011-200	2	Hose assembly ½" – length 200"
56504-8-8-S	2	Tee, male swivel-8JIC
203123	1	Hose connection X (FM) to B5 (BX)
203124	2	Hose connection Tee to ½" QD Rotator
203125	2	Hose connection Tee to 3/8" QD Rotator



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 Varco BJ 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 linch 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) at rotator and elevator QD's.	<input type="checkbox"/> OK

## After connecting the BX

### Elevator without rotator:

<b>Exercise each control on the drillers console.</b>	
Put switch in "ELEVATOR OPEN" position.	<input type="checkbox"/> OK
Elevator opens (XP = 2000 Psi / 13,790 KPa)	<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:

<b>Exercise each control on the drillers console.</b>	
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.

---

☐ OK

## 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.



**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.

### Hydraulic filters

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)

### 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.



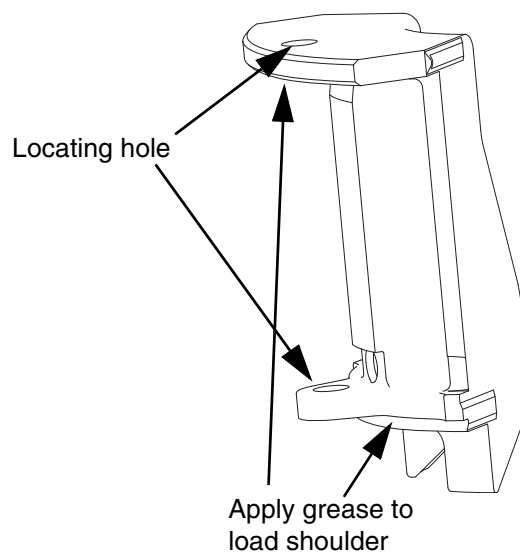
NOTE: For the rotators to fit on 500 Ton links, the rubber liners should be removed.

2. Bring the rotator to the drill-floor.
3. Remove the link block from the elevator and replace it by the rotator link block p/n 203241-1
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 3/8" and 1/2" quick disconnect couplings for proper positioning links and hoses).
11. Lift elevator from the drill floor.

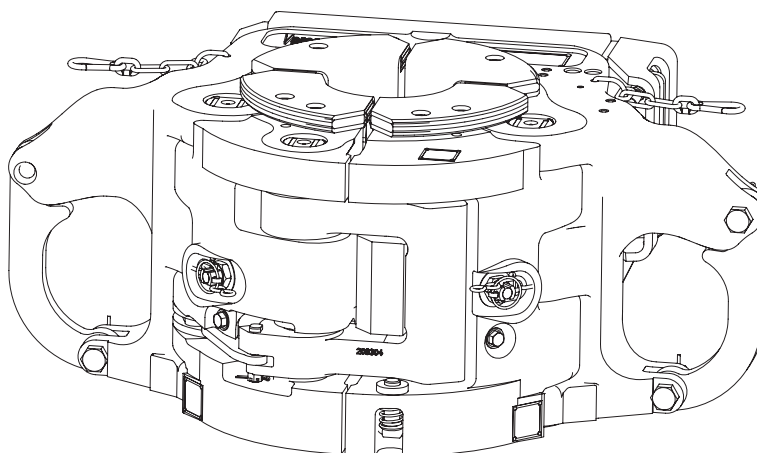
## **Installing bushings in elevator**

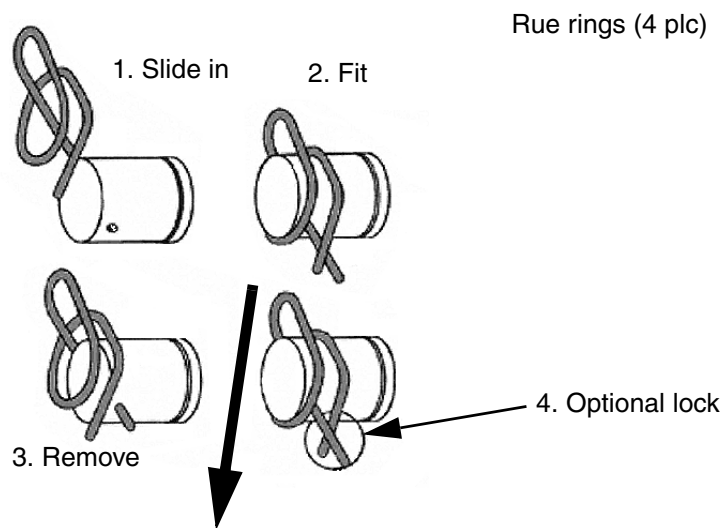
### **Procedure**

1. Open the doors.
2. Make sure that all hydraulic lines are disconnected before ANY work is performed on the elevator.
3. 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.
4. Apply grease to the back of the bushings, the locating-holes and load-shoulder.



5. Locating hole
6. Load-shoulder and locating hole
7. Remove bushing-lock rue rings (4 x).



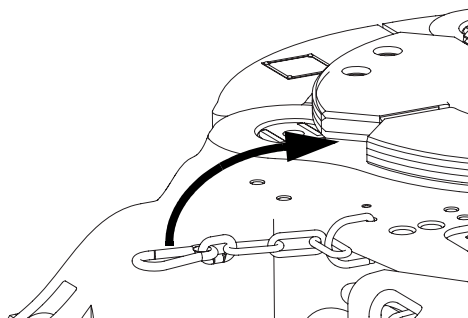


8. Pick up a door bushing segment from the bushing support frame and place it horizontally in to the elevator.



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





12. Attach the snaps of the safety chains (2x).

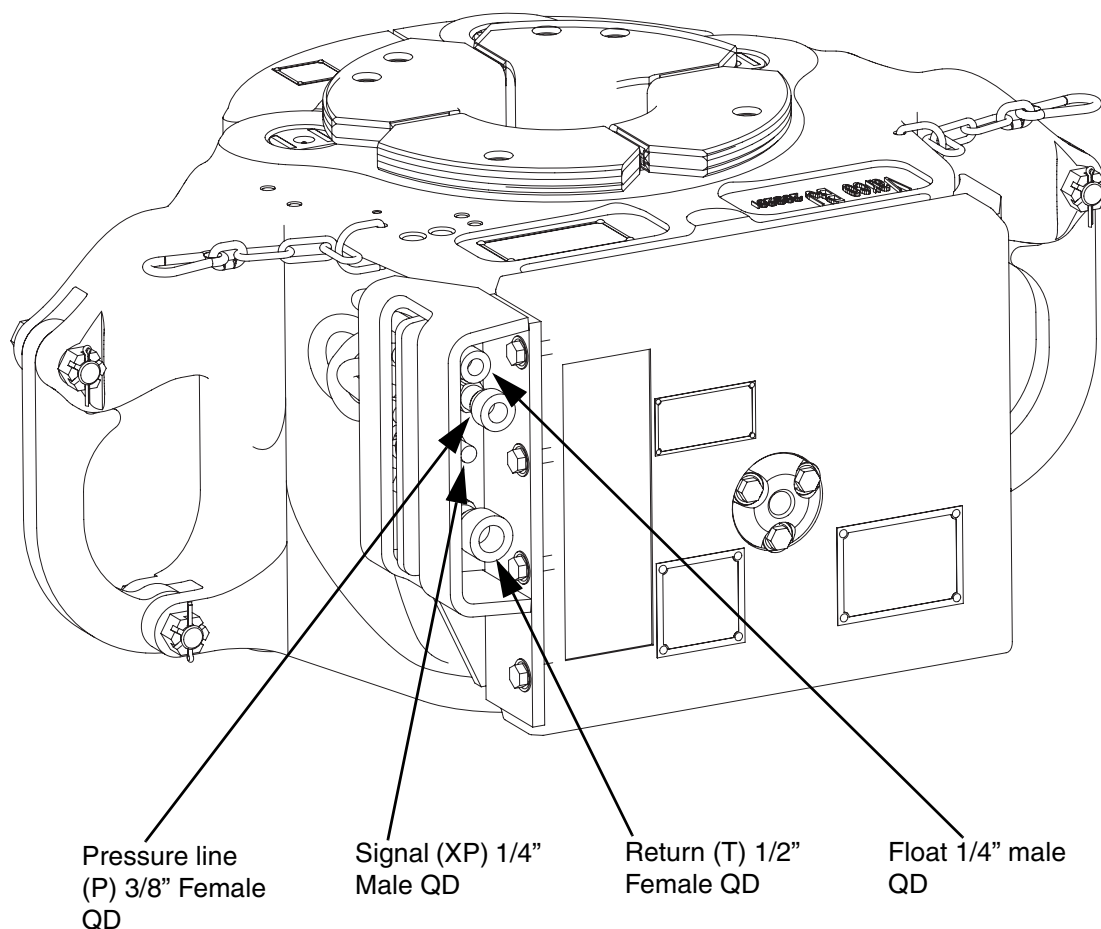
13. Snaps and safety chains

### **Bushing storage frame.**



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

## Connecting the hoses to the elevator



## Disconnecting the elevator.

### Procedure

1. Give command-to-close and close elevator
2. Switch off the hydraulic power supply.
3. Close the ball valve in P line and disconnect the P-line.
4. Remove the XP-line



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



## 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

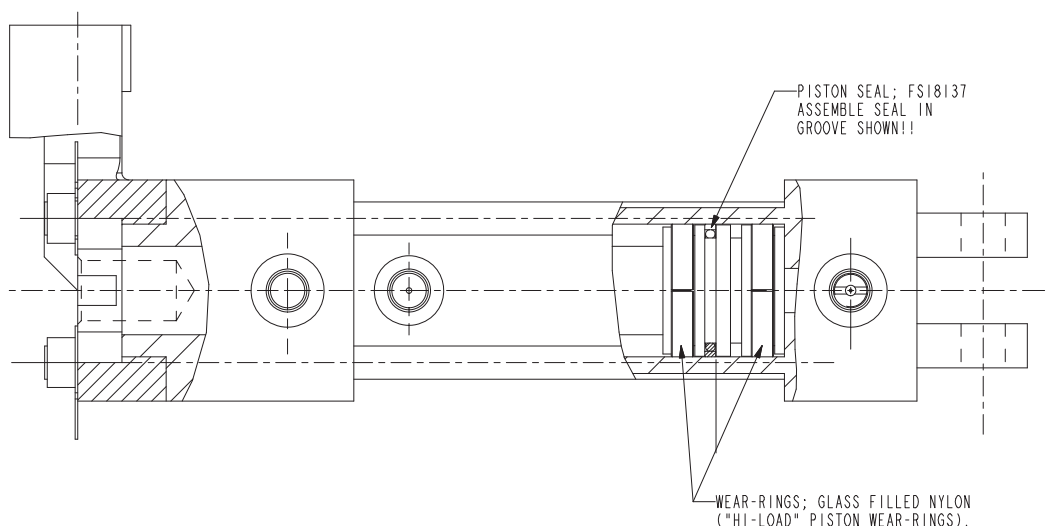
1. Remove cotter pins
2. Unscrew nuts
3. Remove screws, washers and bolts (3x)
4. Remove the cylinder package

## Disassembly cylinders

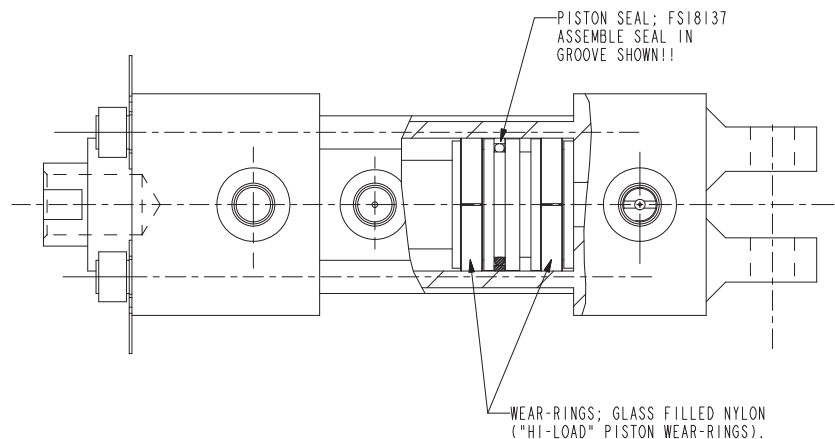
### Procedure

1. Remove nuts and washers.
2. Remove washer and rod end.
3. Use a plastic hammer to remove the cylinder top. Remove piston and sleeve. Take extra care with the seal-assembly. It consists of one seal-ring with 'O' ring and should always be inspected and -when damaged- replaced before assembly of the cylinder

!



### Latch cylinder



## Door cylinder

**Exchanging seals****Procedure**

1. The O-ring seal can be replaced by hand.
2. The white PTFE-fiber seal needs to be warmed in clean hydraulic oil up to 75° C



**CAUTION: DO NOT OVER STRETCH the PTFE seal.**  
Just slip it over the piston after lubricating the seal-ring with fresh hydraulic fluid. The seal **MUST** be put in the groove shown.

**Disassembly latch-doors-lever package****Procedure**

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

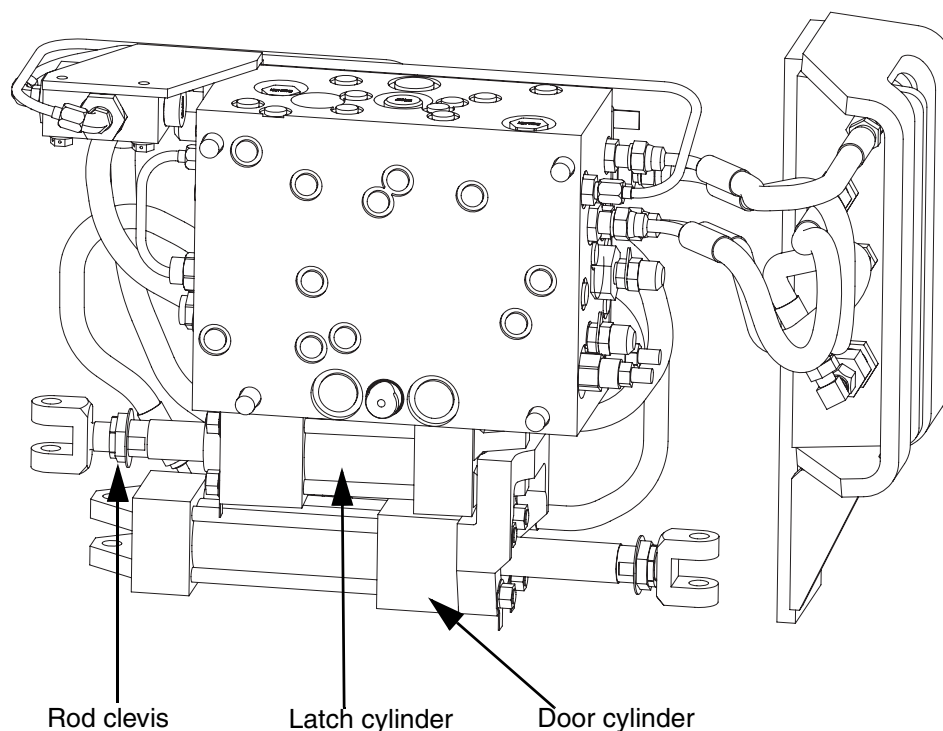
1. Assembly can be done by doing disassembly in reverse sequence.
2. Lock all parts as indicated on the assembly drawings.
3. Check the elevator according the Test Procedure (see TSEL-0048).

## 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 lock-nuts #944422-12 and SS lock-tabs #203268 are still in good condition. When necessary replace these before doing the re-adjustment.

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. This only applies for elevators fitted with the so-called check-valve kit #203270-13.
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.**



## Trouble shooting



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

### 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
<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>	Ccheck 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.

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 PD-10-40-NS-110

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 (DPBO-LAN) 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 (DCCC-XXN) 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 (KCB-XEN) probably stuck in closed position, check functions and replace if necessary

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

P = system pressure

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 nut and lock tab 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 (CVCV-XEN) 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 (CVCV-XEN) 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 = System pressure or higher.

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 equal or higher than 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 (DPBO-LAN) 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 (DCCC-XXN), 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 (CKCB-XEN), 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 H, 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 = system pressure or higher

1. Is component E (DPBO-LAN) 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 (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



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



**NOTE:** Use drawings #203270-1+13, "manifold assy" & #203270-3+31 "hydraulic schematic". The numbers mentioned on the schematic #203270-3+31 correspond with the numbers on drawing #203270-1 sheet 2.

### Procedure

1. Before trouble shooting connect three pressure gauges to the standard gauge connectors that are mounted on the BX manifold. The connectors can be found on dwg #203270-1 sheet 1 and dwg #203270-1 sheet 2:
  - ☐ "T": Tank line, left-hand side of the manifold, bottom connector
  - ☐ "P": Pressure line, right-hand side of manifold, top connector.
  - ☐ "XP" Signal pressure, left-hand side of the manifold, top 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 at least equal or higher than P-line pressure.
6. Check the pressure in the return (Tank) line. Pressure may not exceed 250 Psi / 1,724 KPa.

## Functioning hydraulics

When looking at schematic 203270-3, the elevator is open, door cylinder and latch cylinders are in. Valve F is in the middle position.

## Elevator Closing Sequence

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 4 and the float port. Valve D reduces the system pressure 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.

## Elevator Opening Sequence.

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 equal 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 8 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.

## 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

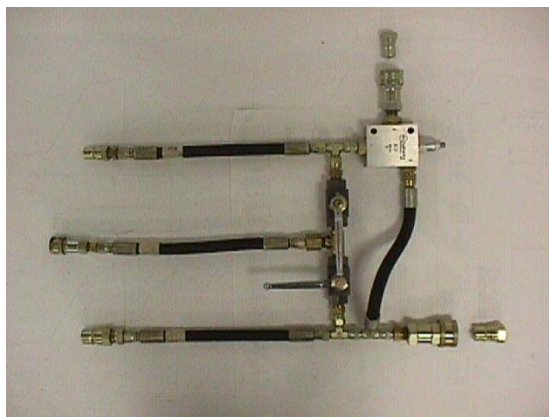


Fig 2



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.

## Appendixes

### Risk assessment acc. to NEN EN1050

#### 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 rather than on visual signals from deckhand etc.

**Torque values (US) for bolts**

		Bolts Lubricated with Light Machine Oil Grade 8			Bolts lubricated with Anti-seize compound Grade 8		
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 = 120,000 psi to 1" dia. Proof Strength = 85,000 psi

		Bolts Lubricated with Light Machine Oil Grade 8			Bolts lubricated with Anti-seize compound Grade 8		
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 = 120,000 psi to 1" dia. Proof Strength = 85,000 psi

**Torque values (metric) for bolts**

		Bolts Lubricated with Light Machine Oil Grade 8			Bolts lubricated with Anti-seize compound Grade 8		
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 Grade 8			Bolts lubricated with Anti-seize compound Grade 8		
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

## **Frequently asked questions**

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

This depends on the type of bushing.

An BX 4/75 elevator weights about 770 kg (1,710 Lbs), the heaviest bushing bout 70 kg (155 Lbs), An BX-3 elevator weights about 2,165 Lbs. / 975 kg, the heaviest bushing about 165 kg (365 Lbs).

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 Varco BJ 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 NON Varco BJ origin ?**

All Varco BJ 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).



## **Storage, transport & scrapping.**

### **Storage**

When the elevator is not being used for a longer period then 3 days the following steps should be carried out:

- ❑ Remove the bushings.
- ❑ Clean elevator and bushings.
- ❑ Grease elevator and bushings as described in checklist lubrication.
- ❑ Place elevator in closed position.
- ❑ Grease all blank parts.
- ❑ Use an extreme pressure, multi-purpose, lithium based grease of No. 1 or No. 2 consistency and multi grade motor oil.
- ❑ Grease trigger finger-shaft.
- ❑ Clean and cap hydraulic Quick Disconnect Couplings.
- ❑ Recommended rust preventative (slushing compound) for bare metal surfaces: Kendall Grade 5(GE-D6C6A1) or equivalent.

### **Transport**

- ❑ Lift the BX-elevator by the lifting ears only
- ❑ The best way of transporting the BX-elevator is in its original crate. Use oiled paper and seal the box with plastic from leaking when stored outside. Secure the top safely.

### **Scrapping**

- ❑ The tool contains hydraulic fluids, grease, aluminum, steel, rubbers, plastic and several assembled components from undefined consistency or mixtures. The tool can be contaminated with mud.
- ❑ When the tool is taken out of permanent service it is recommended to disassemble the tool in a place where drainage for waste fluids is possible.
- ❑ Hydraulic fluids, mud and grease are unsafe when touched by the skin. Always wear gloves and safety goggles when disassembly the tool.
- ❑ Remove all quick-disconnects, hoses, cylinders and manifold block and bleed of hydraulic oil.
- ❑ Clean the tool with a steam cleaner.
- ❑ Remove the doors, latch, trigger valve, levers and discs and remove all bronze wear bushings from the parts.
- ❑ Carry of to proper place for final storage or destruction.



## Spare parts

### BX3 #203300-12 Commissioning spares

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 ¼" 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 #203300-11 Operational spares 1 year

Part number	Name	Quantity
53201	Grease fitting	7
980254	'Polon' PTFE cylinder seal ring	2
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 ¾"	4
51402-12	Pin, cotter	8
979785-10	Tab washer, long tab	4
979785-12	Tab washer, long tab	4
944422-12	Flexloc, nut, commercial	4

**BX4 #203200-12 Commissioning spares**

Part number	Name	Quantity
979796-25-S	Filter element for BX	2
203251	Lock ring 0.875" x 1.625"	3
203262	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
979878-63	Chain, fishing	2
980293-4	Connection link 1/4" Crosby	2
7903	Pull loop	2
979860-2	Linch pin, 6mm	4
203239	Pull loop	4
203240	Lock ring 1.19" x 2.13"	4
948042-85	Machine chain straight	4
51435-14	Pin, Cotter	4
948051-2	S-hook	4

**BX4 #203200-11 Operational spares 1 year**

Part number	Name	Quantity
53201	Grease fitting	7
980254	'Polon' PTFE cylinder seal ring	2
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
51425-8	Pin, cotter	2
203239	Pull loop	4
203240	Lock ring 1.19" x 2.13"	4
980250	Compression spring D210	4
979860-2	Linch pin 6mm	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
203262	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
979785-12	Tab washer, long tab	4

944422-12	Flexloc, nut, commercial	4
50506-C	Nut, hex-slotted (UNC 2B)	2
980249-7	Nut 1.3/16-12 UNF	4
50508-C	Nut, hex slotted (UNC 2B)	8
55908-8-8	Valved coupler, Qck disc.	1
55909-8-8	Valved nipple Qck disc.	1
55908-6-6	Valved coupler, Qck disc.	1
55909-6-6	Valved nipple, Qck disc.	1
55908-4-4	Valved coupler, Qck disc.	2
55909-4-4	Valved nipple, Qck disc.	2
7903	Pull loop	2
979855-4	Snap standard	2
980293-4	Connection link 1/4" Crosby	2
203276-1	Hydraulic hose	6
203276-2	Hydraulic hose	4
203216	Wear Button Drill Pipe bushing	12
979878-62	Chain, fishing	8
979878-63	Chain, fishing	2
980474	Compression spring D-270	1
980475	Compression spring D-320	1
979485-13	Lock washer 16	
59000010-0808	Bushing Fiberglide 0.500"x0.500"	10
59000010-0812	Bushing Fiberglide 0.500"x0.750"	4

**BX5 #50004000-12 Commissioning spares**

Part number	Part Description	Qty
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 #50004000-11 Operational spares 1 year**

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

**BX Manifold #203270-11 Spares**

Part number	Part Description	Qty
53201	Fitting,grease,straight	1
203271	Control shaft manifold	1
203272	Initiator pin manifold	1
203273	Retract carrier manifold	1
203274	Retract plunger manifold	2
203275	Tube ass'y.	1
979997	Piloted 3-way spool, external vent	1
980252	COMPRESSION SPRING D-253	2
107029-175N	Pilot to open check valve	2
108087-1OAN	Sun dir. control valve cartridge	1
109858-1BN	Pressure reducing valve,	1
50506-C	Nut, Hex.-slotted (UNC-2B)	2
51300-110-B	O-ring I.D. 357/.367 thick.100/.106	2
51300-113-B	O-ring I.D. 544/.554 thick	2
51301-110	Ring,back up-O-ring	2
51301-113	Ring,back up-O-ring	4
51425-8	Pin, cotter	2
56529-4-4-S	Connector, O-ring Boss /37'	8
979798-1	Pressure gauge connector	3
93547-1B75N	Sun pilot to open check valve	2
94536-130N	Sun check valve cartridge	1
979512-3	Plug 7/16" -20" SAE O-ring socket t	10
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
980045-10-4	Filter plug for gauge connector	1

55908-8-8	Valved coupler, quick disconnect/ i	1
55908-6-6	Valved coupler, quick disconnect in	1
55908-4-4	Valved coupler, quick disconnect in	1
55909-4-4	Valved nipple, quick disconnect/ in	1



## Drawings & test procedures

### Test procedures

Number	Name
TSEL-0140	Test specification hydraulic BX elevator
TSEL-0066	Test specification frame + rotator
TSEL-0040	Test specification
TSEL-0128	Test specification Frame 4 latch valve upgrade
PSEL-0002	Pre installation sheet

### Drawings

Number	Name
203300-30	BX elevator, final assembly Frame 3
203200-30	BX elevator, final assembly Frame 4
50004000-30	BX elevator, final assembly Frame 5
203206-1	Hinge pin assembly door BX-elevator Frame 4
203207-1	Hinge pin assembly latch BX-elevator Frame 4
203212	Wear button ass'y
50004020	'Door cylinder assembly BX-5
50004021	Latch cylinder assembly BX-5
203318-1	Door cylinder assembly BX-3
203220-5	Door cylinder BX-4
203220-1	Door cylinder assembly BX-4
203221-5	Latch cylinder BX-4
203221-1	Latch cylinder assembly BX-4
203236-1	Bushing lock assembly BX-4
50004012-1	Wear bushing assembly
50004036-1	Bushing lock assembly
203200-1	Pressure shut valve
50004048-1	Manifold BX Frame 4
203872	Mountingplate BX&Rotator EEXD 24V/DC ATOS
204472	Mountingplate BX&Rotator EEXD 24V/DC ATOS
203270-32	Hydraulic schematic BX-frame 4
203447	Installation schematic BX-elevator & rotator 3 free ports on TDRH
204682	General hook-up kit drawing BX-elevator with rotators
202539	Test kit BX elevator + PS
DD-203300	Dimensional drawing BX frame 3
DD-203200-30	Dimensional drawing BX frame 4
DD-50004000-30	Dimensional drawing BX frame 5
CA-251	Critical areas body BX - elevator
CA-252	Critical areas doors BX - elevator
CA-253	Critical areas latch BX - elevator
CA-254	Critical areas bushings BX - elevator
203270-13	Retrofit Kit manifold check valve
50003980	BX-4 Elevator hydraulic schematic Latch Valve
50004060	BX-5 Elevator hydraulic schematic Latch Valve





## TEST SPECIFICATION

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

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

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

Order Number : \_\_\_\_\_

Test Technician Name : \_\_\_\_\_ Date: \_\_\_\_\_  
Semi-Finished.

Test Technician Name : \_\_\_\_\_ Date: \_\_\_\_\_  
Load-Test and MPI

Test Technician Name : \_\_\_\_\_ Date: \_\_\_\_\_  
Final-Assembly

3rd Party Witness:  
Agency-Name, Name,  
Signature and Date : \_\_\_\_\_

Final Inspection:  
Inspectors: name, signature  
and stamp : \_\_\_\_\_

Remarks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

			G				
			F				
			E				
			D				
	Name:	Date	C				
Prepared	N.de Keijzer	23 Jul 04	B				
Checked	P.Dekker	23 Jul 04	A	601442	N.de Keijzer	23 Jul 04	P. Dekker
Approved	A.Krijnen	23 Jul 04	Rev.	ECN	Name	Date	Checked
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE NOR USED FOR MANUFACTURING PURPOSES WITHOUT THE WRITTEN PERMISSION OF THE OWNER.			Document No.:  <b>TSEL 0140</b>		Title: <b>HYDRAULIC BX ELEVATOR FRAME III/IV/V (with latch valve detection)</b>		Sheet:  <b>1 of 10</b>

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

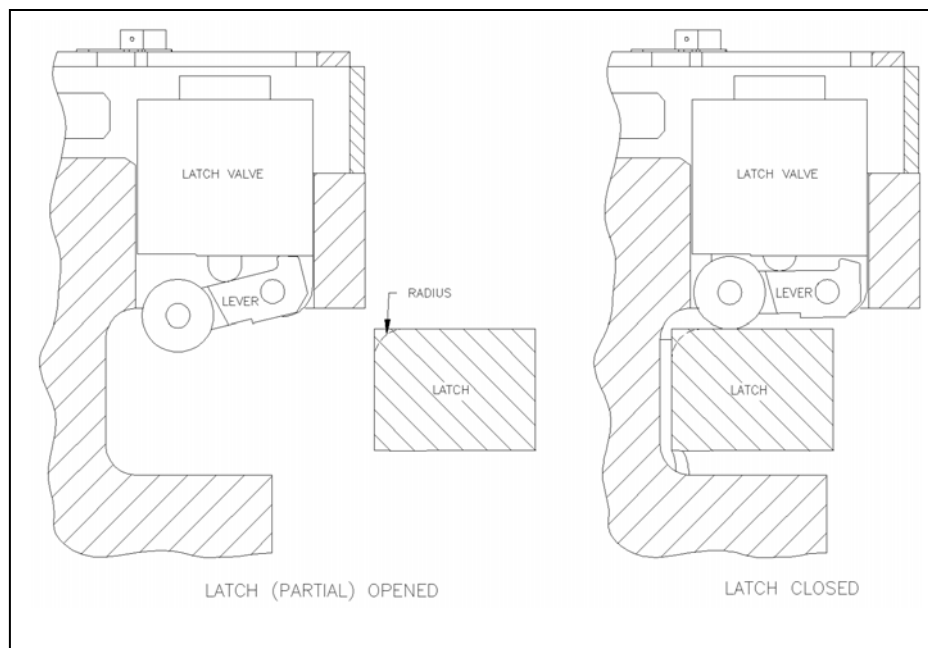
Initials:

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: 12 3/8" - 12 5/8" for Frame IV  
22 1/2" - 23 1/2" for Frame III  
12 5/8" - 12 7/8" for Frame V \_\_\_\_\_
6. Open and close latch, check for smooth operation and  
correct contact with Hard-Stops. \_\_\_\_\_
7. Open and close both doors; check for smooth operation  
and correct contact with Hard-Stops. \_\_\_\_\_
8. 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. \_\_\_\_\_

9. 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. \_\_\_\_\_
10. Fill in the table for Heat-numbers, Part-number and Elevator Serial number on page 8 \_\_\_\_\_
11. **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 \_\_\_\_\_
12. Check that elevator has been load tested. \_\_\_\_\_
13. 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 203270-32):

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, 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: 5 sec. max. BX 3  
3 sec. max. BX 4  
5 sec. max. BX 5 \_\_\_\_\_
13. Elevator cycle-to-close: 5 sec. max. BX 3  
3 sec. max. BX 4  
5 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 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	Manifold
Part No. _____	Serial Number _____

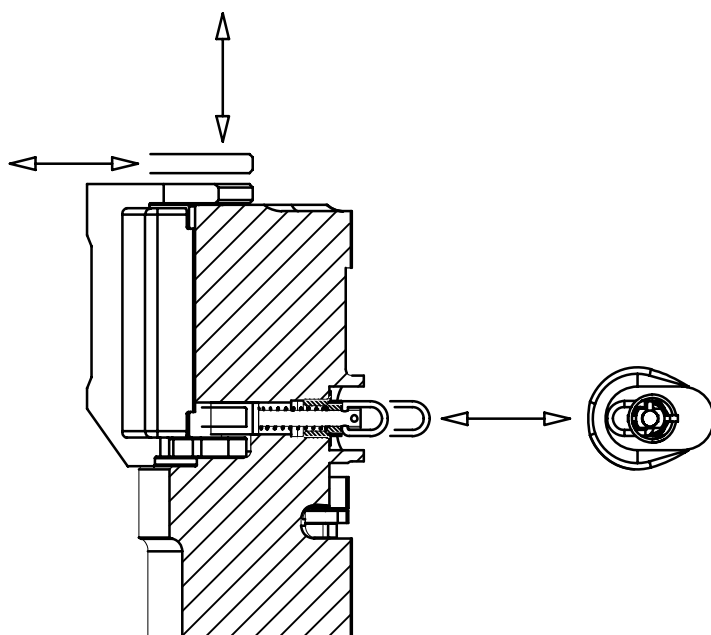


fig 1. Check functioning of bushing lock-pins and proper fitting of bushings.

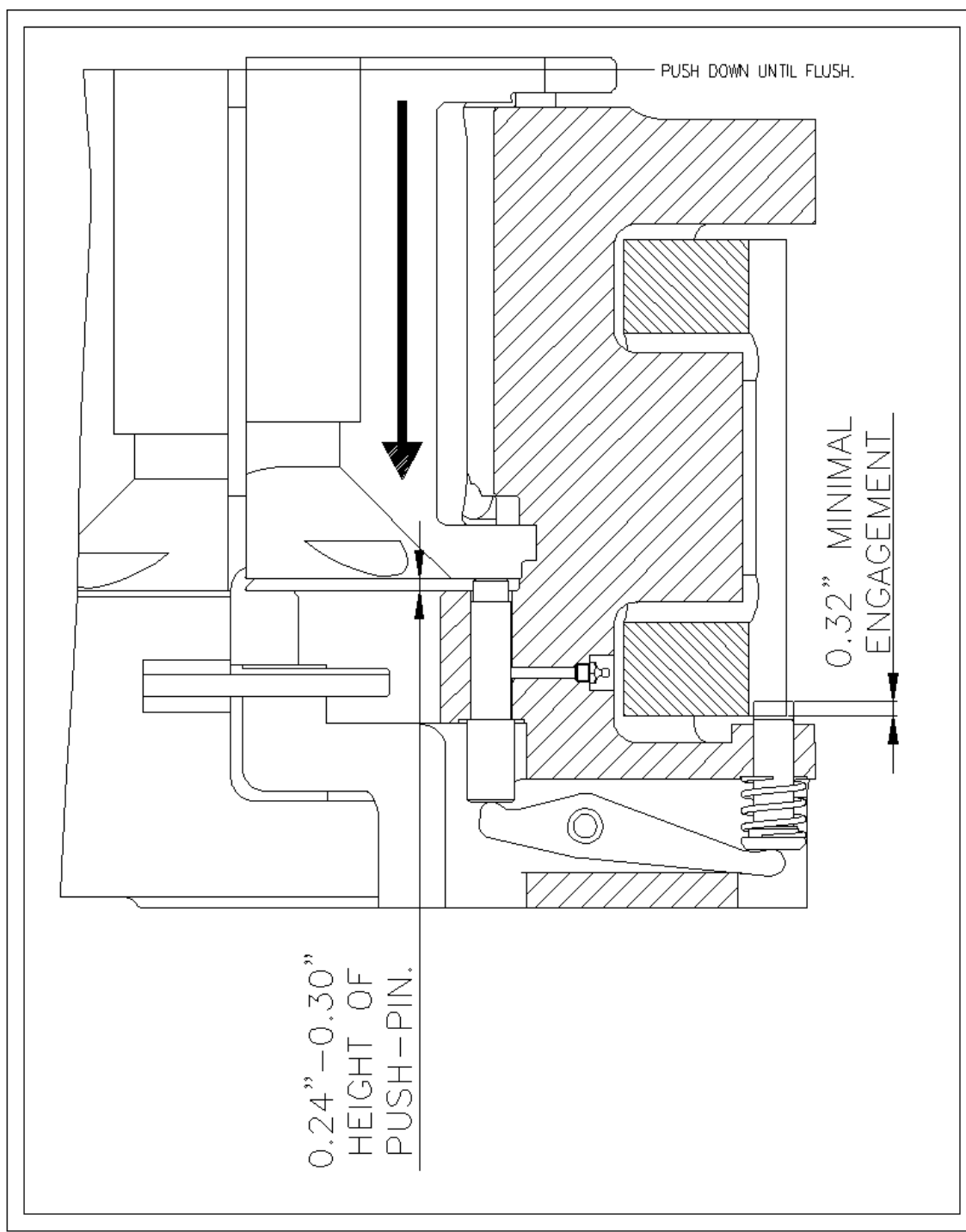


fig 2. Check functioning of moveable door-bushing and proper functioning of latch-lock.



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	C	600835	P. Dekker.	June 2 <sup>nd</sup> 2002	A. Krijnen
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 COMMISSIONING 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

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- 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

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### 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: Hydr. schematics 203270-3 & 203447):

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:

5 sec. max. BX 3

3 sec. max. BX 4

5 sec. max. BX 5

\_\_\_\_\_sec.

OK

Elevator cycle-to-close:

5 sec. max. BX 3

3 sec. max. BX 4

5 sec. max. BX 5

\_\_\_\_\_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

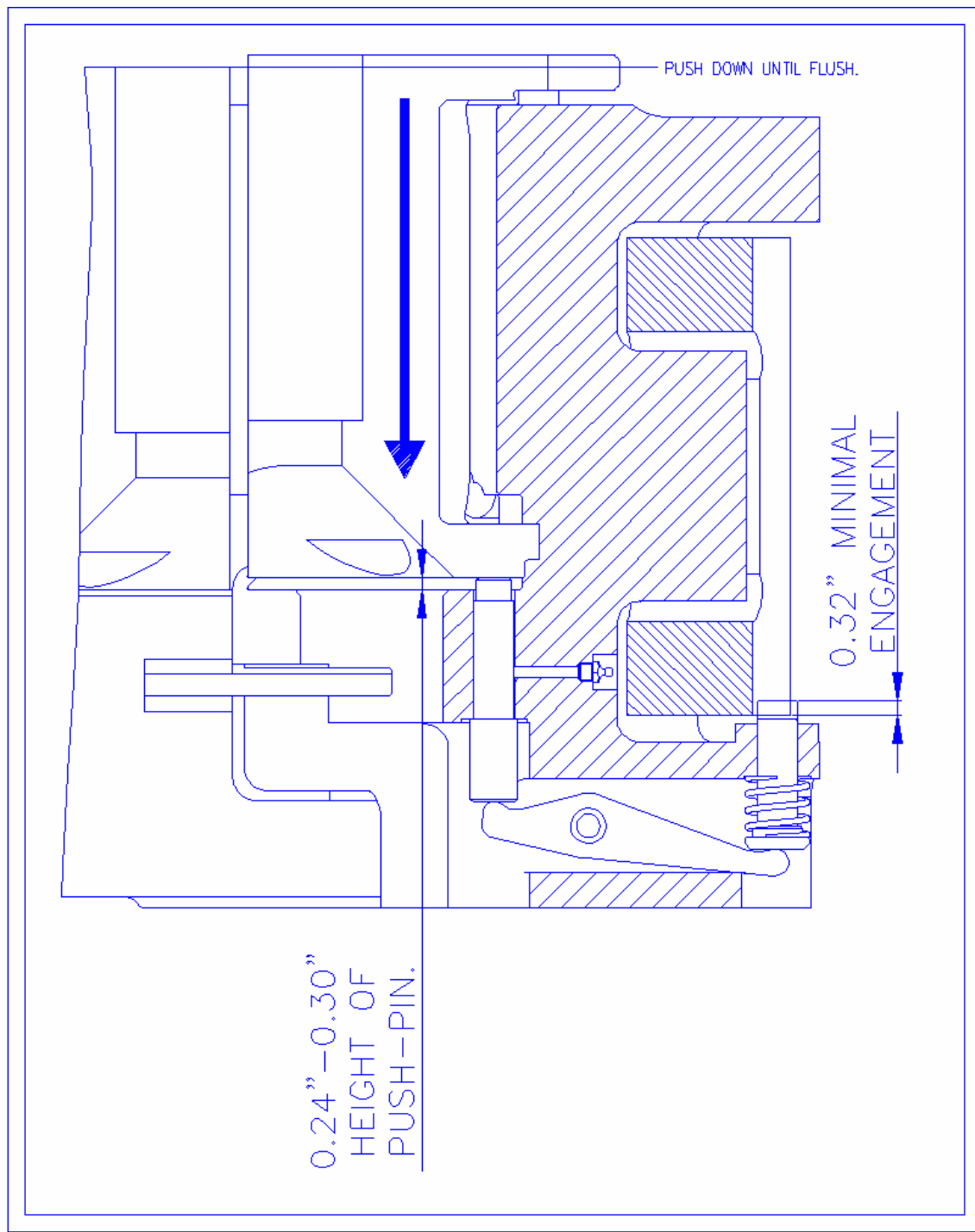


fig 1. Check functioning of moveable door-bushing and proper functioning of latch-lock.





# TEST SPECIFICATION

## PART NUMBER 203270-1

Test Technician Name : \_\_\_\_\_

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

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

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

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

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

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**SERIAL NUMBER**

\_\_\_\_\_

			E	588401	P.Dekker	19-Apr-2K	A.Krijnen
			D	545004	P. Dekker	10-Mar-99	A. Dekkers
	Name:	Date	C	545003	A. Jacobs	22-Apr-98	P. Dekker
Prepared	A. Jacobs	08-Jan-98	B	545002	A. Jacobs	16-Jan-98	P. Dekker
Checked	P. Dekker	08-Jan-98	A	545001	A. Jacobs	08-Jan-98	P. Dekker
Approved	J. Tiebout	08-Jan-98	Rev.	ECN	Name	Date	Checked
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This specification defines the production testing and inspection of BX manifolds. Part number: 203270-1

Each unit is to be tested and inspected according to the following procedure.

Any discrepancy is cause for discontinuing the test until the discrepancy has been eliminated. All these discrepancies will also be noted and signed off by the test technician on the front page of this test sheet. In the event of a major discrepancy whose repair would affect items previously inspected or tested, the affected items shall also be re-tested or re-inspected after the discrepancy has been eliminated.

## 1.0 FLUSHING BEFORE AND AFTER ASSEMBLY

Before and after assembly, the manifold needs to be flushed according to NAS class 8 specifications

\_\_\_\_\_ OK

## 2.0 TRIGGER-SHAFT AND BORE.

After assembly of bearing bushings for trigger-shaft, check bore-diameter 0.945" min - 0.948" max.

\_\_\_\_\_ OK

Assemble trigger-shaft, check smooth functioning of shaft prior to assembly of initiator-pin and trigger-valve.

No noticeable stick-slip effects allowed, when controlling trigger-shaft, without initiator-pin and trigger-valve in place.

\_\_\_\_\_ OK

## 3.0 PRESSURE TESTING

The manifold shall be tested in 8 different conditions (2 = T to tank)  
(Reference document: Hydraulic schematic drawing 203270-3):

Test Port	1.	2.	3. #	4.	5.	6. #	7.	8.
<b>1 = P</b>	X	X	X	X	X	X	X	X
<b>3 = XP</b>	NP	X	X	NP	NP	RP	X	X
<b>4 = FLOAT</b>	NP	NP	NP	NP	NP	SP	NP	NP
<b>TRIGGER</b>	-	-	-	@	@	@	@	@
<b>7 (door out)</b>	NP	NP	NP	SP	SP	SP	NP	NP
<b>9 (door in)</b>	NP	NP	SP	NP	NP	NP	NP	SP
<b>10 (signal door)</b>	NP	NP	NP	NP	X	X	NP	NP
<b>11 (latch out)</b>	NP	NP	NP	NP	SP	SP	NP	NP
<b>12 (signal latch)</b>	NP	NP	X	NP	NP	X	NP	X
<b>14 (latch in)</b>	NP	SP	SP	NP	NP	NP	SP	SP
<b>OK</b>								

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Document No.:

**TSEL 0040**

Title:

**MANIFOLD  
BX ELEVATOR**

Sheet:

**2 of 3  
(Rev. E)**



X = add system pressure to manifold (2000 psi);  
SP = measure system pressure (2000 psi);  
RP = measure reduced pressure (1000 psi);  
NP = measure no pressure (50 psi back pressure max.)  
@ = Trigger shaft initiated (see 4.0)

# Once the condition gives the read outs as per the above table, pressure shall be raised to 3000 psi and held for 5 minutes minimum.  
No leakage shall occur. \_\_\_\_\_ OK

#### **4.0 T-PORT PRESSURE TEST**

Pressurize T-port at 450 psi for 5 minutes minimum,  
other ports blocked, no leakage shall occur \_\_\_\_\_ OK

#### **5.0 RETRACT MECHANISM TEST**

Triggershaft should retract automatically after being pressed  
for max. 0.10". ( @ only in conditions 4, 5 and 6)  
In condition 8, the retract plungers and trigger-shaft  
should return to their original position. \_\_\_\_\_ OK

#### **6.0 ADDITIONAL CHECKS:**

All cartridges are installed according OE manufacturers  
recommendations. (torque-value, lubrication, etc.) \_\_\_\_\_ OK

Pressure reducing valve D (PRDB-LBN) set at 1000 psi \_\_\_\_\_ OK

Sequence valve E (DPBO-LAN) set at 1500 psi \_\_\_\_\_ OK

Filter elements and compression springs are assembled  
according to the latest revision of drawing 203270-1 \_\_\_\_\_ OK

Pressure gauge connectors are assembled according to  
the latest revision of drawing 203270-1 \_\_\_\_\_ OK

#### **7.0 NAS CLASS 8 QUALIFICATION**

Is manifold flushed according NAS class 8 specifications? \_\_\_\_\_ OK



## TEST SPECIFICATION, BX frame III-IV-V LATCH VALVE UPGRADE KIT



### - BX3 -

Part no. :203300Y....  
203300Z....  
Serial no. :NL\_\_\_\_\_



*upgrade*

Part no. :203300Y30  
203300Z30



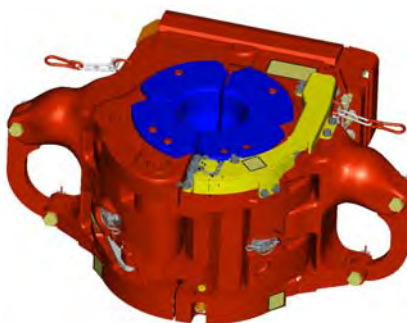
### - BX4-50 -

Part no. :203290Y....  
203290Z....  
Serial no. :NL\_\_\_\_\_



*upgrade*

Part no. :203290Y30  
203290Z30



### - BX4-75 -

Part no. :203200Y....  
203200Z....  
Serial no. :NL\_\_\_\_\_



*upgrade*

Part no. :203200Y30  
203200Z30



### - BX5 -

Part no. :50004000Y....  
50004000Z....  
Serial no. :NL\_\_\_\_\_



*upgrade*

Part no. :50004000Y30  
50004000Z30

	Name:	Date	C	601184	N.de Keijzer	18-May-05	P. Dekker
Prepared	N.de Keijzer	12-Nov-03	B	601184	N.de Keijzer	26-Oct-04	P. Dekker
Checked	P. Dekker	12-Nov-03	A	601184	N.de Keijzer	12-Nov-03	P. Dekker
Approved	A.krijnen	12-Nov-03	Rev.	ECN	Name	Date	Checked
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			TSEL 0128		HYDRAULIC BX ELEVATOR FRAME III/IV/V LATCH VALVE UPGRADE		1 of 14



# NATIONAL OILWELL VARCO

Order Number : \_\_\_\_\_

Test Technician Name : \_\_\_\_\_ Date: \_\_\_\_\_  
Semi-Finished.

Test Technician Name : \_\_\_\_\_ Date: \_\_\_\_\_  
Load-Test and MPI

Test Technician Name : \_\_\_\_\_ Date: \_\_\_\_\_  
Final-Assembly

3rd Party Witness:  
Agency-Name, Name,  
Signature and Date : \_\_\_\_\_

Final Inspection:  
Inspectors: name, signature  
and stamp : \_\_\_\_\_

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

	Name:	Date	C	601184	N.de Keijzer	18-May-05	P. Dekker
Prepared	N.de Keijzer	12-Nov-03	B	601184	N.de Keijzer	26-Oct-04	P. Dekker
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Approved	A.krijnen	12-Nov-03	Rev.	ECN	Name	Date	Checked
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This specification defines the testing of the BX elevator, equipped with latch valve detection. 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 Before upgrading BX

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:  
22 ½ - 23 ½" for Frame III  
12 ¾" - 12 ⅝" for Frame IV  
12 ⅝ - 12 ⅞" for Frame V \_\_\_\_\_
6. Open and close latch, check for smooth operation and correct contact with Hard-Stops. \_\_\_\_\_
7. Open and close both doors; check for smooth operation and correct contact with Hard-Stops. \_\_\_\_\_
8. 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. \_\_\_\_\_
9. 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. \_\_\_\_\_



10. Fill in the table below, for Heat-numbers \_\_\_\_\_



















	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	_____	



## 2.0 Latch valve upgrade, step by step

Checked: \_\_\_\_\_






**PICTURES AT PAGE 10 & 11 CAN BE USED AS A REFERENCE**

1. Clean BX 
2. Disassemble BX 
3. Rework Body according applicable drawing 
4. Rework Right Door according applicable drawing 
5. Rework manifold according drawing 50003969-11 sheet 1 
6. Assemble expander(s) and fittings according drawing 50003969-11 sheet 2. 
7. Assemble all other cartridges and fittings according drawing 203270 sheet 1. 
8. Test manifold according drawing 50003969-11 sheet 3. 
9. Before assembling upgraded manifold check if old part number 203270 is masked and new part number 50003969 is stamped in block. 
10. Assemble BX according applicable assembly drawing (-30) 
11. Assemble adapters in body (2x) 
12. Assemble new tubes to manifold according applicable drawing 
13. Assemble latch valve pn 50003960-11. 
14. Assemble fittings and hoses between latch valve and adapters. 
15. Assemble protection cover at body. 
16. Assemble protection cover at door. 
17. Assemble bushing chain body. 
18. Make sure all bolts are properly lock wired. 

Initials \_\_\_\_\_

## 2.1 Part and serial number.

### **BX 3 – 4 – 5 ;**

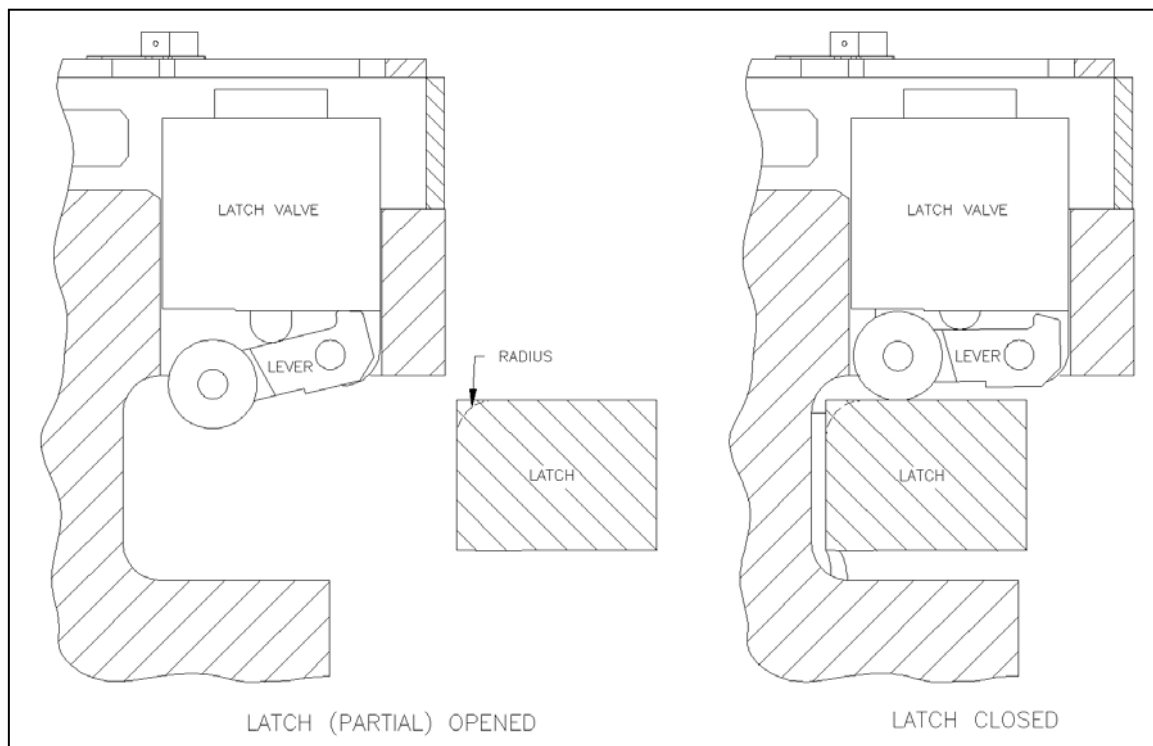
1. Grind out old part number, but keep the old serial number 
  - BX 3: 203300Y10 (or Z10)
  - BX 4-50: 203290Y10 (or Z10)
  - BX 4-75: 203200Y10 (or Z10)
  - BX 5: 50004000Y10 (or Z10)
2. Stamp new part number at indicated area shown at page 11, using 0.5" high characters. 
  - BX 3: 203300Y30 (or Z30)
  - BX 4-50: 203290Y30 (or Z30)
  - BX 4-75: 203200Y30 (or Z30)
  - BX 5: 50004000Y30 (or Z30)
3. Stamp serial number (NL) below the new part number using 0.5" high characters. (see page 11) 
4. - 
5. Replace old nameplate by new one and fill in as shown at page 12/13 





## 2.2 Latch (valve) adjustment.

1. Make sure all steps as mentioned in paragraph 2.0 are finished.
2. Unblock tank line, so pressure in BX can bleed of (otherwise latch won't open manually).
3. Open latch (manually).
4. Close latch (manually) and check if the latch valve is set at correct height. See picture below.



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

Initials \_\_\_\_\_

## 2.3 Pressure test.

1. **Grease all greasing points before (cycle)testing!**
  - 1: Hinge pins.
  - 2: Latch pin.
  - 3: Latch Lock pin and Push-pins
  - 4: Trigger shaft manifold.
  - 5: Right door

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Title:

**HYDRAULIC BX  
ELEVATOR FRAME III/IV/V  
LATCH VALVE UPGRADE**

Sheet:

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(Rev. C)**



2. 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 203270-32):

Test 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	2000 psi	NP
TRIGGER	-	-	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

3. Check setting of adjustable cartridge, 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.

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

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

5. Remove wedge and open elevator.

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

6. Which obstacle-size prevents latch to close (no XP signal)?  
If obstacle size is over 1 1/2", re-adjust door-cylinder, repeat test item 5.

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

Elevator cycle-to-open: 3 sec. max. BX 4 / 5 sec max. BX 3 & 5

Elevator cycle-to-close: 3 sec. max. BX 4 / 5 sec max. BX 3 & 5



8. 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.

\_\_\_\_\_

9. Check for loose parts, cotter pins, lock-tabs etc.

\_\_\_\_\_

10. Inspect for wear on movable parts / hoses after cycle test.

\_\_\_\_\_

11. When check items 1 thru 10 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.

\_\_\_\_\_

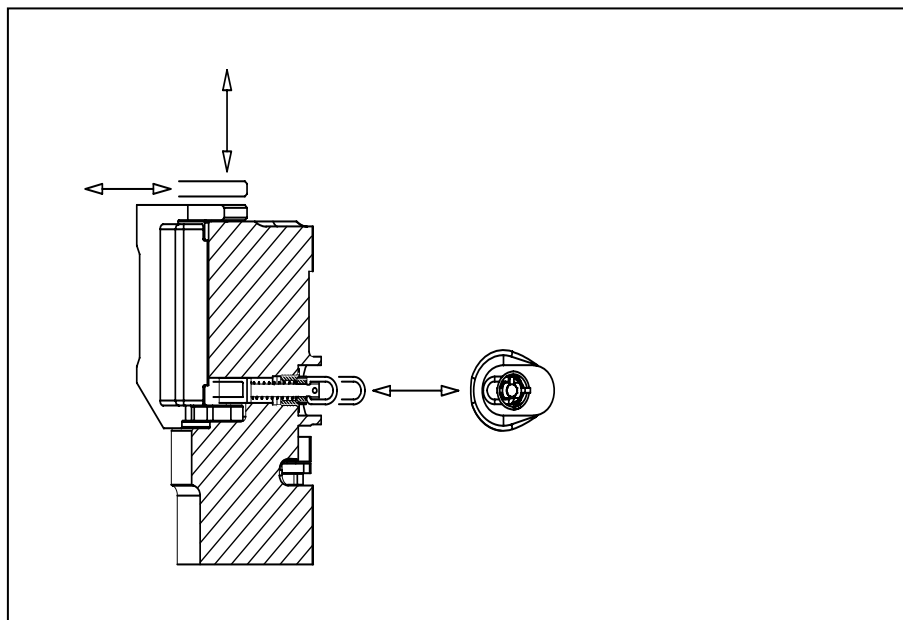
12. Verify NAS class 8 oil cleanliness

\_\_\_\_\_

### 3.0 FINAL ASSEMBLY INSPECTION.

1. Check smooth functioning of the 4 bushing lock pins (see pic. below)

\_\_\_\_\_



2. Functioning of the mechanical latch-lock (page 14).

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 14). \_\_\_\_\_

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)  
Use a 0.006" feeler gauge.(minimum thickness) \_\_\_\_\_

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

9. Inspect for wear on movable parts. \_\_\_\_\_

## 4.0 FINAL INSPECTION

1. Verify that the elevator is assembled according to the  
latest revision of the final assembly drawings. \_\_\_\_\_

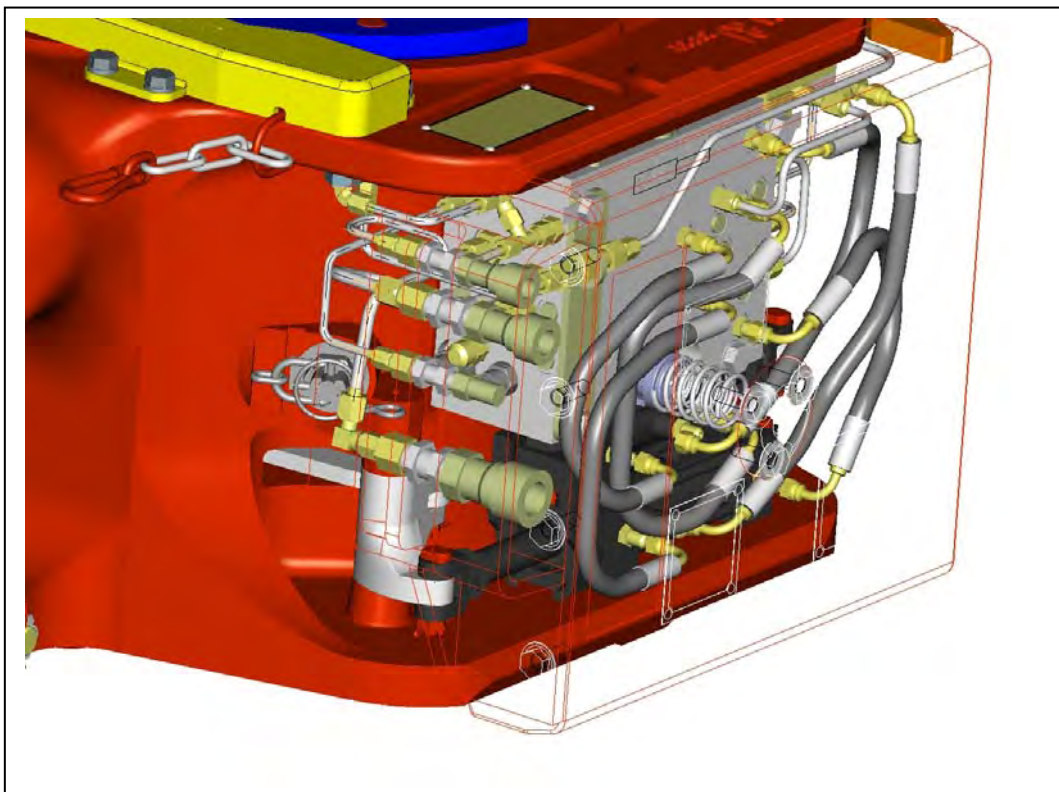
2. Verify that all bolts and nuts are tightened to the correct  
torque-value and secured by lock tabs or cotter pins. \_\_\_\_\_

3. Verify that all grease points are greased. \_\_\_\_\_

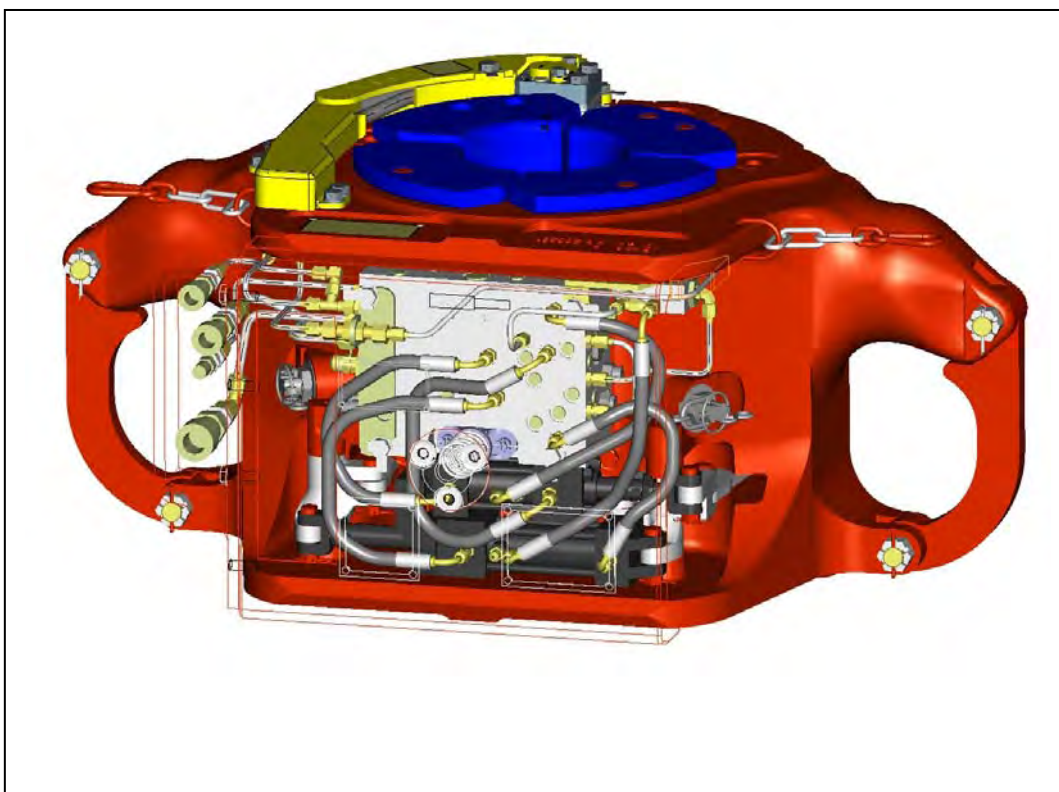
4. Verify that latch and hinge pins are properly locked. \_\_\_\_\_

5. Verify that correct Quick Disconnects are installed. \_\_\_\_\_

6. Verify presence and correctness of markings. \_\_\_\_\_



▲ ▼ Assemble tubes and hoses.



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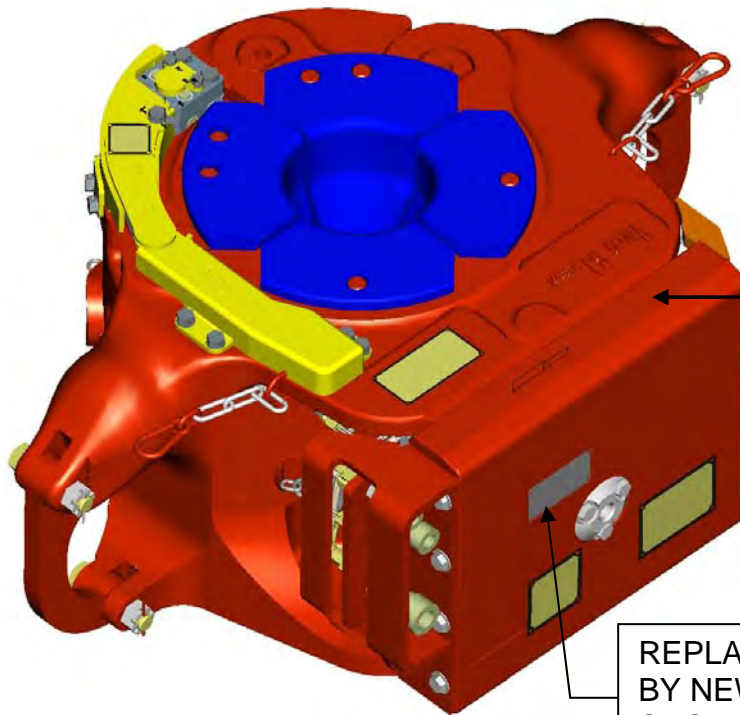
Title:

**HYDRAULIC BX  
ELEVATOR FRAME III/IV/V  
LATCH VALVE UPGRADE**

Sheet:

**10 of 14  
(Rev. C)**

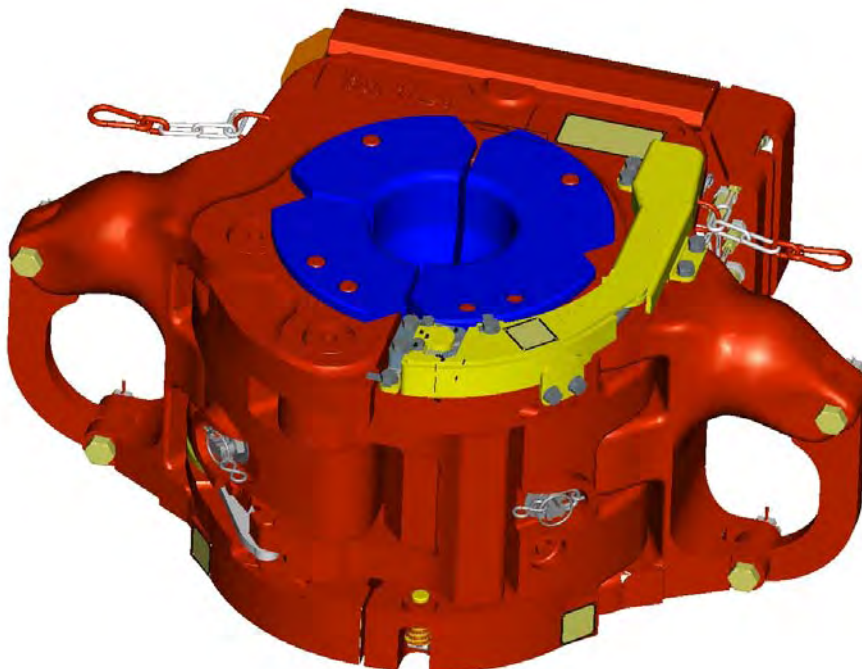




STAMP ;  
- NEW PN  
- Serial Number (NL)

REPLACE OLD NAMEPLATE  
BY NEW ONE. FILL IN AS  
SHOWN AT PAGE 12/13.

▲ ▼ Final ass'y BX-IV with latch valve.





<b>Varco<sup>®</sup> BJ<sup>™</sup></b>		<b>PART NO. 250284</b>
<b>OIL TOOLS</b>		
EQUIPMENT TYPE	<input type="text" value="BX ELEVATOR"/>	
MODEL NUMBER	<input type="text" value="FRAME 3"/>	
ASSEMBLY NUMBER	<input type="text" value="203300Y30 or Z30"/>	
SERIAL NUMBER	<input type="text" value="NL"/>	
MADE IN	<input type="text" value="HOLLAND"/>	DATE <input type="text" value="/ /"/>

▲ **New nameplate for BX3.** Fill in as shown above.

Additional info:

Assembly number to be Y30 or Z30.

Serial number: Enter NL number.

Date: Enter date of upgrade

<b>Varco<sup>®</sup> BJ<sup>™</sup></b>		<b>PART NO. 250284</b>
<b>OIL TOOLS</b>		
EQUIPMENT TYPE	<input type="text" value="BX ELEVATOR"/>	
MODEL NUMBER	<input type="text" value="FRAME 4-50"/>	
ASSEMBLY NUMBER	<input type="text" value="203290Y30 or Z30"/>	
SERIAL NUMBER	<input type="text" value="NL"/>	
MADE IN	<input type="text" value="HOLLAND"/>	DATE <input type="text" value="/ /"/>

▲ **New nameplate for BX4-50.** Fill in as shown above.

Additional info:

Assembly number to be Y30 or Z30.

Serial number: Enter NL number.

Date: Enter date of upgrade.





<b>Varco<sup>®</sup> BJ<sup>™</sup></b>		<b>PART NO. 250284</b>
<b>OIL TOOLS</b>		
EQUIPMENT TYPE	<b>BX ELEVATOR</b>	
MODEL NUMBER	<b>FRAME 4-75</b>	
ASSEMBLY NUMBER	<b>203200Y30 or Z30</b>	
SERIAL NUMBER	<b>NL</b>	
MADE IN	<b>HOLLAND</b>	DATE <b>/ /</b>

▲ **New nameplate for BX4-75.** Fill in as shown above.

Additional info:

Assembly number to be Y30 or Z30.

Serial number: Enter NL number

Date: Enter date of upgrade.

<b>Varco<sup>®</sup> BJ<sup>™</sup></b>		<b>PART NO. 250284</b>
<b>OIL TOOLS</b>		
EQUIPMENT TYPE	<b>BX ELEVATOR</b>	
MODEL NUMBER	<b>FRAME 5</b>	
ASSEMBLY NUMBER	<b>50004000Y30 or Z30</b>	
SERIAL NUMBER	<b>NL</b>	
MADE IN	<b>HOLLAND</b>	DATE <b>/ /</b>

▲ **New nameplate for BX5.** Fill in as shown above.

Additional info:

Assembly number to be Y30 or Z30.

Serial number: Enter NL number

Date: Enter date of upgrade.

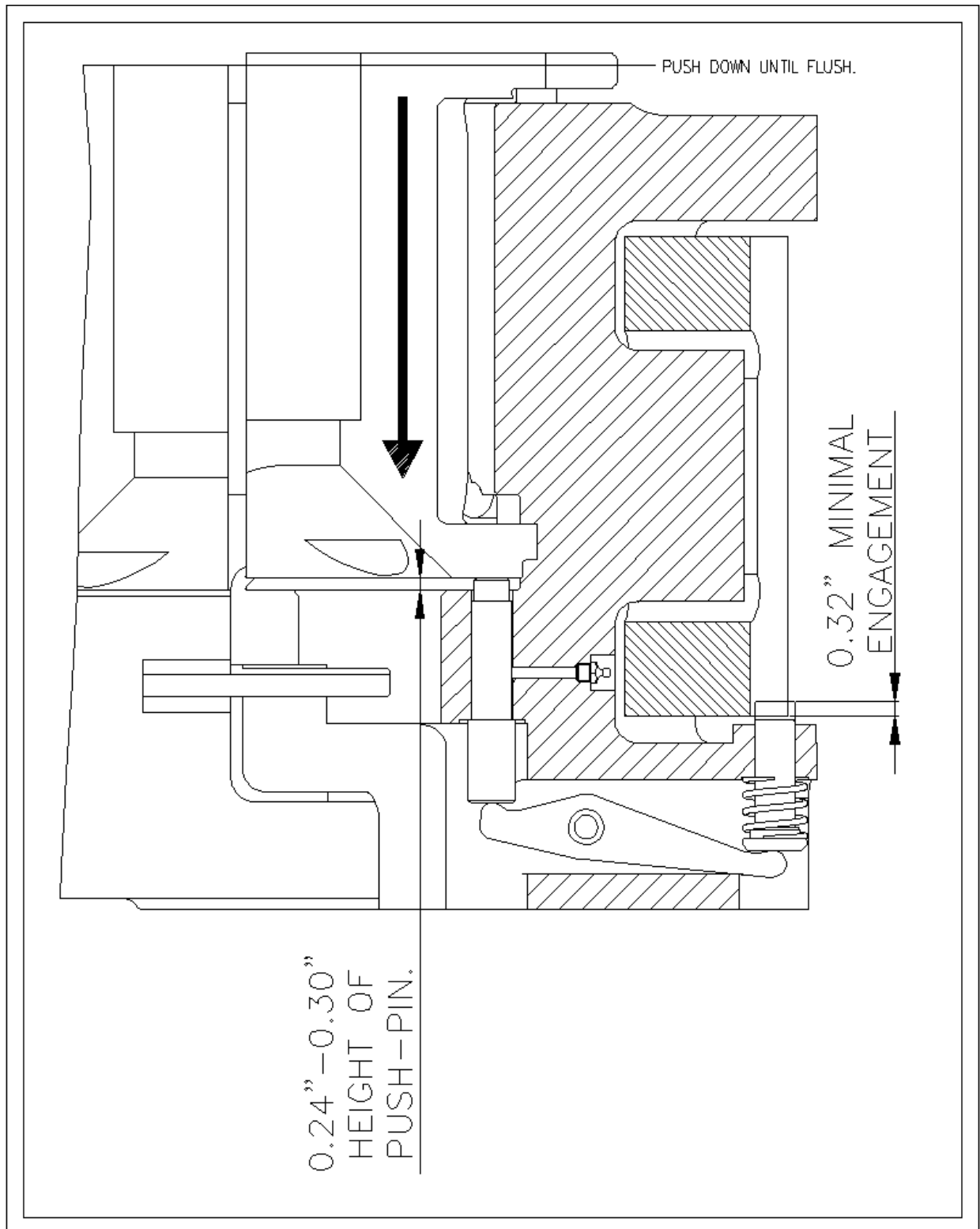


fig 2. Check functioning of moveable door-bushing and proper functioning of latch-lock. (Latch valve not shown)





## FLOW CHART HOOK-UP KIT PS-21/30, BX-ELEVATOR&ROTATORS HYDRAULIC SPIDER/ELEVATOR

The following must be defined for the successful completion of a BX-elevator and/or PS-21/30 or Hydraulic Spider/Elevator installation. This information needs to be completed by the customer at or before the time the final purchase order is placed with Varco BJ. This information helps to ensure that our customers and Varco BJ are working with the same information and will help ensure that nothing is overlooked or assumed prior to installation.

Customer name: \_\_\_\_\_

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

Customer contact.

Rig manager and tool pusher:

Name:

Phone number:

Fax number:

E-mail:

Name:

Phone number:

Fax number:

E-mail:

PS Type:

Rotary Table configuration:

BX Type:

Rotator:

Topdrive Make & Type:

			D	601202	P.Dekker	01-Sept-2003	L.Sonneveld
	Name:	Date	C	601122	L.Sonneveld	19 may 2003	R. Mulder
Prepared	L.Sonneveld	23 mar 1999	B	600823	L.Sonneveld	21-jun-02	R. Mulder
Checked	H.Bakkers	23 mar 1999	A	549601	L. Sonneveld	23 mar 1999	H.Ba.23 mar '99
Approved	L. Sprey	23 mar 1999	Rev.	ECN	Name	Date	Checked
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## 1. Flowchart, to order Hook-up Kit.

The reason for filling in the flowchart is to obtain information required to build the Hook-up Kit which is needed for controlling our equipment.

**Rig name:**

**Customer :**

**Part Number Hook-up Kit:**

(to determine by Varco BJ Holland)

Model Numbers:    How to develop them – how to decode them					Hookup Kits														
H.U.K. CODE:					01	02	03	04	05	06	07	08	09						
	Feature	Description	page	Sym bol	▲	▲	▲	▲	▲	▲	▲	▲							
01	Equipment	PS 21 PS 30 Hydraulic Spider 14-24"	3	P2 P3 HS															
02	Equipment	BX-Elevator BX-Elevator & Rotator Hydraulic Elevator 14-24"	3	B C D															
03	Electric System Supply Voltage	24 V/DC 110 V/ 50 Hz 120 V/ 60 Hz 220V/ 50 Hz 240 V/ 60 Hz	5	24 15 16 25 26															
04	Air Valve	PS Air Operated BX Air Operated PS&BX Air Operated	9	A1 A2 A3															
05	PS, Type of Hydraulic Connection	Hose to power slip Hardtubing Q.D. Couplings Special features	5	3H HT QD SF															
06	Top Drive	1 Free port 2 Free ports 3 Free ports 4 Free ports 5 Free ports No topdrive		R1 R2 R3 R4 R5 N															
07	Thread size, Q.D. size	For Code See Appendix B		*1															
08	Control Panel	Control Plate Control Box Special Feature Third Party	7	C1 C2 C3 C4															
09	Electrical Cable	Yes No		Y N															



## 2. Equipment

### 2.1 Power Slip, Hydraulic Spider 14-24" (01)

Type of PS : - PS-21  
- PS-30  
- Hydraulic Spider 14-24"

Configuration Rotary Support Table: - Continental Emsco  
- Ideco  
- National  
- Oilwel  
- Varco

The H.U.K. for the PS includes the next functions.

- 1) Controls slips up/down
- 2) Automated greasing system
- 3) Flushing Kit

When you also ordered a Rotary Support Table (RST) the Manifold for controlling the Power Slip is, mounted on a Control Station with the controls for the RST.

In this case you do not have to fill in the Flowchart, for the PS and Hydraulic Spider 14-24".

For a general idea what the Hook-up Kit for the Power Slip looks like, and how to install see the drawings in Appendix A.

### 2.2 BX-Elevator & Rotators, Hydraulic Elevator 14-24" (02)

Type of Top drives:

1. Varco Top drive.

Serial number:

Are the Elevator controls included in the Top drive controls.

Elevator controls: YES NO

Rotator controls: YES NO

On the Varco Top drive the manifolds are a separate line item, we must check that the Manifolds for controlling the Elevator & Rotators are supplied by Varco Systems.

If Varco Systems has supplied the manifold then Varco BJ (Holland) will only supply the Elevator & Rotators, and the hoses for connecting the Elevator & Rotators with the Top drive.

2. Maritime Hydraulics Top Drive.

Varco BJ (Holland) will only supply the Elevator & Rotators and Float Manifold 116023-8. Float Manifold is **not needed** when you order the BX-Elevator without Rotators.

Float manifold is a separate line item.

3. Hydralift Top Drive.

Varco BJ (Holland) will supply a standard Hook-up Kit part number 204762. This Hook-up Kit consist of the next items, Elevator control manifold with air valve p.n. 202524-4 and Elevator Float Manifold 116023-8. In addition the Q.D.'s for connection the hoses to the Elevator & Rotators. Hydralift has to supply the hoses.

4. National Top Drive

Check if the Elevator controls are supplied by National.

Elevator controls:            YES            NO

Rotator controls:            YES            NO

Varco BJ (Holland) will only supply the Elevator & Rotators.

National has to supply all controls, valves and hoses for the Elevator & Rotators on the Top Drive.

For a general Idea what the Hook-up Kit for the BX-Elevator consists of, and where to install see the drawings in Appendix A.


## 2.2.1 Separate Line Items on Sales Order for BX-Elevator & Rotator.

The following list shall be completed by the Customer, so that Varco BJ can determine which size components must be added to the sales order, as separate line items in Varco BJ quotations for The BX-Elevator.

(always use the table which indicates which BX frame fits which Varco Links)

### **BX ELEVATOR FRAMES;**

CHECK THE BOXES WITH THE BX ELEVATORS FRAME NUMBERS (e.g. BX 4-50) TO WHICH THE UNIVERSAL ROTATOR WILL BE HOOKED UP.

Quote Link Block adapter KIT (1 per Rotator) 

<u>BX FRAME 1</u>	<u>#201550***</u>	<u>50004100-210</u>
<u>BX FRAME 2</u>	<u>#201600***</u>	<u>50004100-210</u>
<u>BX FRAME 3</u>	<u>#203300***</u>	<u>50004100-340</u>
<u>BX FRAME 4-50</u>	<u>#203290***</u>	<u>50004100-340</u>
<u>BX FRAME 4-75</u>	<u>#203200***</u>	<u>50004100-340</u>
<u>BX FRAME 5</u>	<u>#50004000***</u>	<u>50004100-50</u>

### **LINK-SIZES IN USE;**

CHECK THE BOXES WITH THE LINK SIZES TO WHICH THE UNIVERSAL ROTATOR WILL BE HOOKED UP.

Quote Link Wear Button Kit. (1 per Rotator) 

<u>250 Ton</u>	<u>#16363***</u>	<u>50004100-3</u>
<u>350 Ton</u>	<u>#26940***</u>	<u>50004100-3</u>
<u>500 Ton</u>	<u>#25469***</u>	<u>50004100-2</u>
<u>750 Ton</u>	<u>#16143***</u>	<u>50004100-1</u>
<u>1000 Ton</u>	<u>#70101***</u>	<u>50004100-4</u>

The Link Length:.....



## BX Elevator / Link Compatibility.

<u>Elevator</u>	<u>BX Frame 1 DP &amp; Casing Elevators</u>		<u>BX Frame 2 Casing Elevator</u>
<u>Links</u>	350 T Drill Pipe.	350 T sq shoulder	500 T sq shoulder
<b>250 Ton; P/N 16363</b>	Yes	Yes	No
<b>350 Ton; P/N 26940*</b>	Yes	Yes	Yes
<b>500 Ton; P/N 25469</b>	Yes	Yes	Yes
<b>750 Ton; P/N 16143</b>	No	No	No
<b>1000 Ton; P/N 70101</b>	No	No	No
<u>Elevator</u>	<u>BX Frame 3 Casing Elev.</u>	<u>BX Frame 4-50 D.P. &amp; Casing Elev.</u>	
<u>Links</u>	350 T	500 T D.P.	500 T sq shoulder
<b>250 Ton; P/N 16363</b>	Yes	No	No
<b>350 Ton; P/N 26940*</b>	Yes	Yes	Yes
<b>500 Ton; P/N 25469</b>	Yes	Yes	Yes
<b>750 Ton; P/N 16143</b>	No	Yes	Yes
<b>1000 Ton; P/N 70101</b>	No	No	No



## BX Elevator / Link Compatibility.

<u>Elevator</u>	<u>BX Frame 4-75 D.P.&amp; Casing Elev.</u>		<u>BX Frame 5 D.P.&amp; Casing Elev.</u>	
	<u>Links</u>	500 T D.P.	750 T sq shoulder	750 T D.P.
250 Ton; P/N 16363	No	No	No	No
350 Ton; P/N 26940*	No	No	No	No
500 Ton; P/N 25469	Yes	Yes	No	No
750 Ton; P/N 16143	Yes	Yes	Yes	Yes
1000 Ton; P/N 70101	No	No	Yes	Yes

\* Big Eye link

### Notes:

- 1) Compatibility is based on API 8C contact radii unless link part # listed.
- 2) If a link part # is not listed, fit with the Elevator is to be confirmed.
- 3) In some cases special links are required for use on Top Drive Solid Body Elevators to permit proper operation of Link Tilt.
- 4) In general, elevators fit one size larger and one size smaller nominal rated link. However, fit should always be confirmed when combining links and elevators.



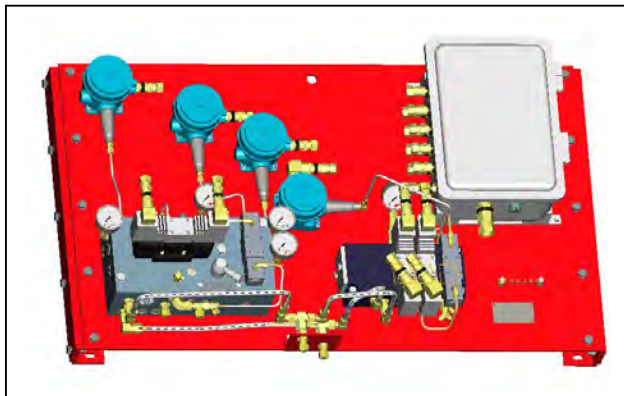
### 2.3 BX Rotators Controlled by Top drive Link Tilt

When you combine the controls for the Rotators with the Link Tilt, then there are 2 disadvantages then when you control the Rotators and Link Tilt separate.

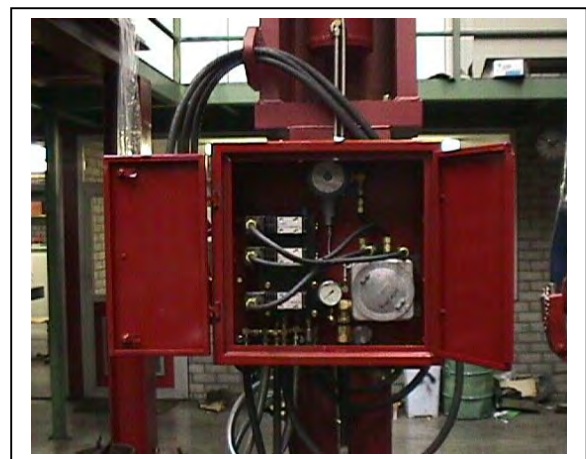
- 1) Because you control the Rotators and the Link Tilt simultaneously, you will get different resistance in your hydraulic system, this different resistance has influence on the rotation of BX-Elevator and movement of the Links.
- 2) The Pipe Handler System must be more accurate to give the pipe to the Elevator in the same position every time.

### 3 Mounting Plate Cabinet

The next items determine which Mounting Plate the customer will need for controlling the equipment. The Elevator and the Power Slip each have their own Mounting Plate.



Control plate PS-21/30



Control plate Elevator & Rotator

### 3.1 Electrical Components

All our electrical components are certified for use in potentially explosive atmospheres (Hazardous Areas). The verification and type test have been made in accordance with the requirements of the European Standards, Atex. All our electrical components are classified for zone: 1.

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## 3.2 Electric System: Supply Voltage (03)

We need the supply voltage in order to determine the Solenoid Valve and the Control Panel/Box (see chapter 6).

## 3.3 Air valve (04)

### Power Slip

If the customer is going to use an air foot pedal to control the Power Slip then it is necessary to mount an Air valve on the Control manifold.

If an air foot pedal is required to control the Power Slip, the following connection size and working pressure is required:

Working pressure: minimum 84 PSI (6 Bar)

Connection size: O.D. 3/8" thread size JIC, 9/16-18 UNF

### BX-Elevator

When the customer have an Air-operated Elevator and want to switch over to a Hydraulic BX-Elevator. Than we use the existing control valve wich is already installed for operating the Elevator. (see drawing: 203451)



## 4 Type of Hydraulic connection between Control Manifold and Power Slip. (05)

There are 4 possible Options:

### 1. Hoses to Power Slip. 3H

Varco supplies all applicable Hydraulic Hoses with Aeroquip Quick Disconnect Couplings. The hoses are 590" (ca. 15 meter) long.

**The Hoses for the P and T from the power unit to the Control manifold must be supplied by the customer.**

### 2. Hard Tubing + hoses HT

This Option is recommended by Varco because hard tubing is more rig proof than hydraulic hoses.

When hardtubing is preferred, the installation has to be done by the original manufacturer of the Rig. Varco supplies all applicable Hydraulic jumper Hoses with Aeroquip Quick Disconnect Couplings.

**The connection for P and T from the power unit to the Control manifold must be supplied by the customer.**

Hoses H.T. to PS are 100" (ca 2.5 meter) long.

Hoses Control Manifold to H.T. are 40" (ca 1 meter) long.

### 3. Only Q.D. Couplings QD

This option is when the customer supplies all the hydraulic hoses. Than Varco has to supply the Aeroquip Quick Disconnect Couplings, 1x hose assembly with ball valve.

### 4. Special Feature. SF

- Specify the lengths of hoses according to customer specifications.

- Stainless Steel fittings: Yes No

## 5. Top drive. (06)

Information about the number of ports which are free on the top drive is required when Varco Oil Tools has to supply the Hook-up Kit for the BX-Elevator.

The number of spare ports on the top drive defines the type of Hook-up Kit for the Elevator. For information see a Schematic drawing in Appendix A.

### 5.1 Specify thread size and type or Q.D. size of free spare ports Top Drive. (07)

	THREADSIZE and TYPE	Q.D. SIZE
PORT 1	.....	.....
PORT 2	.....	.....
PORT 3	.....	.....
PORT 4	.....	.....
PORT 5	.....	.....

<sup>1</sup>  
\* For the Symbol for in the code see Appendix B.

## 6 Control Panel (08)

There are 4 options for the control panel:

- 1) A control plate which can be built in the existing drillers console if there is enough free space.
- 2) A control panel in a Junction Box mounted to the wall of the Drillers cabin.
- 3) Special Features.
- 4) Third Party.

## 7 Electrical Cable (09)

Must Varco BJ supply the Electrical cables: YES NO

When yes, specify required cable lengths.

Cable from control plate to control box in drillers cabin, (10 cores, 1.5mm<sup>2</sup>):

L=.....

Power cable for control panel, (3 cores, 1.5mm<sup>2</sup>):

L=.....



## APPENDIX A

DRAWINGS PS-21/30: 50004446

DD-50004465

DD-50004466

DRAWINGS BX&ROT: 204682

203447

203451

50004487

## APPENDIX B

### TYPE OF THREADSIZE SPAREPORTS ROTATINGHEAD

TABEL 1: BSP

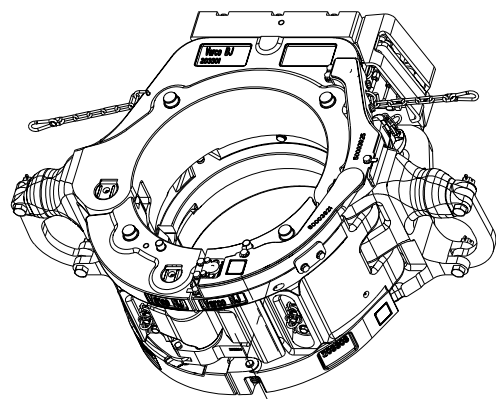
THREAD SIZE	CODE
1/4"-19 BSP	B4
3/8"-19 BSP	B6
1/2"-14 BSP	B8
5/8"-14 BSP	B10
3/4"-14 BSP	B12

TABEL 2: NPT

THREAD SIZE	CODE
1/4"-18 NPT	N4
3/8"-18 NPT	N6
1/2"-14 NPT	N8
3/4"-14 NPT	N12
1"-11 1/2 NPT	N16
1 1/4"-11 1/2 NPT	N20
1 1/2"-11 1/2 NPT	N24
2"-11 1/2 NPT	N32

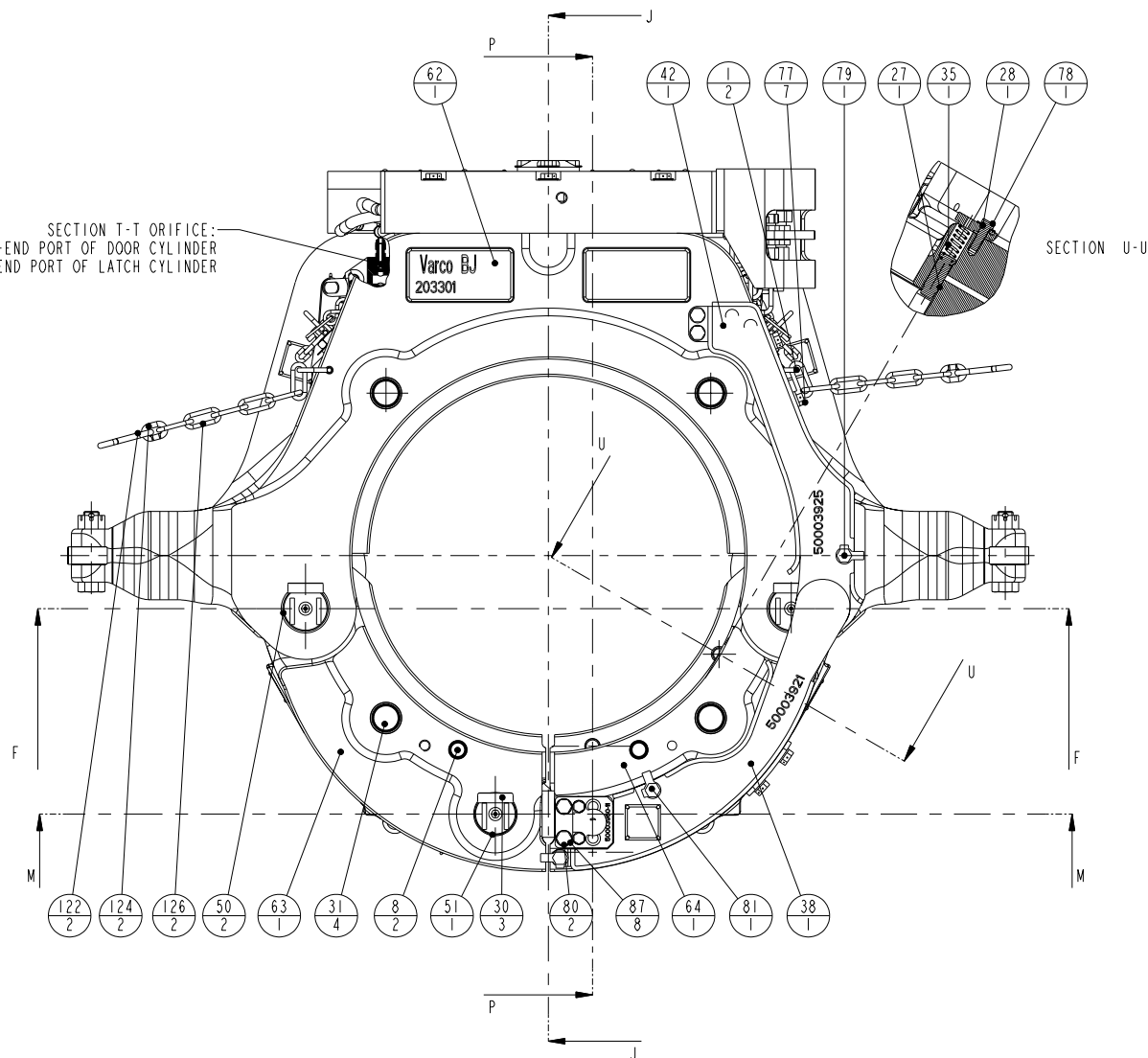
TABEL 3: O-RING BOSS

THREAD SIZE	CODE
7/16"-20 UNF	O4
9/16"-18 UNF	O6
3/4"-16 UNF	O8
7/8"-14 UNF	O10
1 1/16"-12 UNF	O12
1 5/16"-12 UNF	O16
1 5/8"-12 UNF	O20
1 7/8"-12 UNF	O24
2 1/2"-12 UNF	O32



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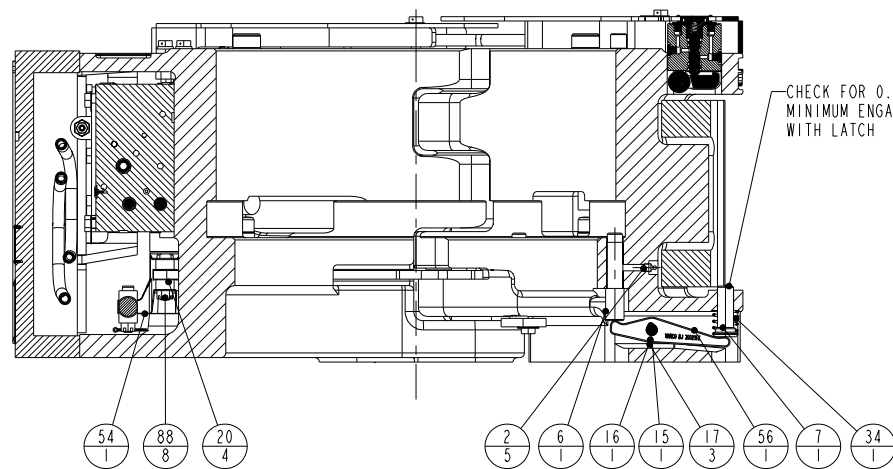
SECTION T-T ORIFICE:  
0.6 mm IN CAP-END PORT OF DOOR CYLINDER  
0.6mm IN CAP-END PORT OF LATCH CYLINDER



SECTION U-U

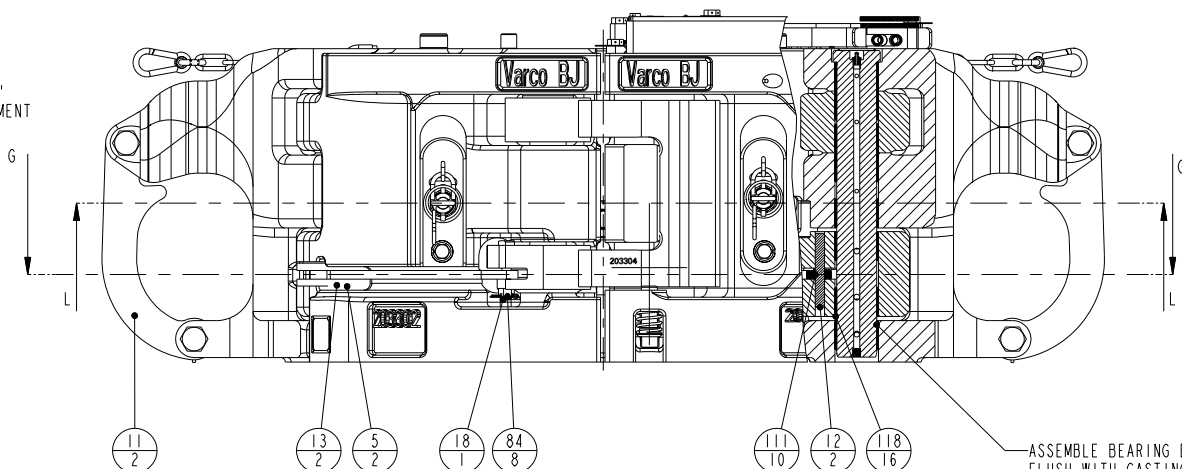
RATING ELEVATOR BX 3					
TUBING	NA	TONS	NA	MTONNES	
DC PLAIN	150	TONS	136	MTONNES	
DC WITH ZIP LIFT	NA	TONS	NA	MTONNES	
18" DRILLPIPE	NA	TONS	NA	MTONNES	
CASING	350	TONS	318	MTONNES	
SPECIAL	---	TONS	---	MTONNES	
READ MANUAL FOR DETAILED INSTRUCTIONS					

TEST ACCORDING TO TSEL-0140.



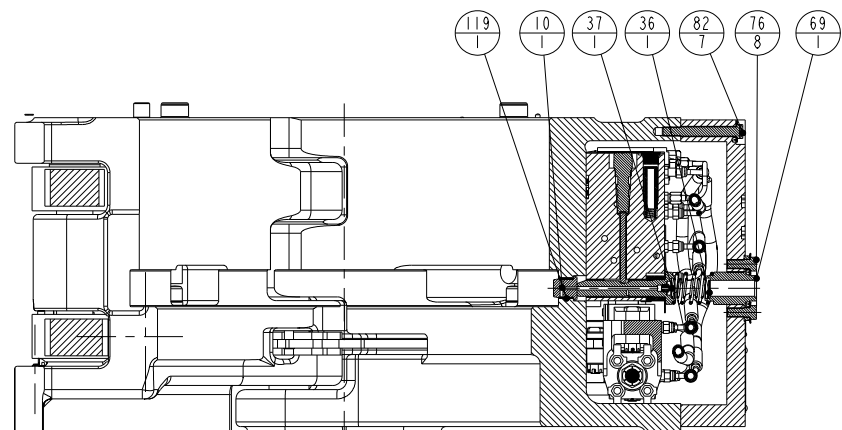
SECTION P-P

CHECK FOR 0.32"  
MINIMUM ENGAGEMENT  
WITH LATCH






SECTION F-F

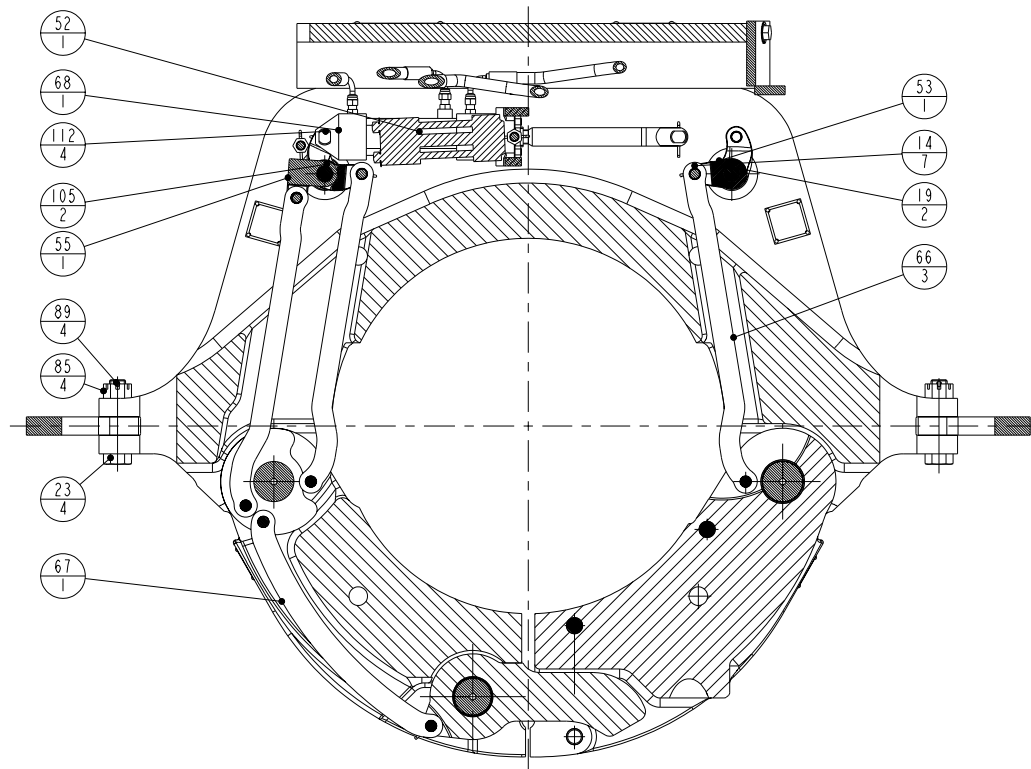
ASSEMBLE BEARING BUSHINGS  
FLUSH WITH CASTING  
AT INDICATED PLACES



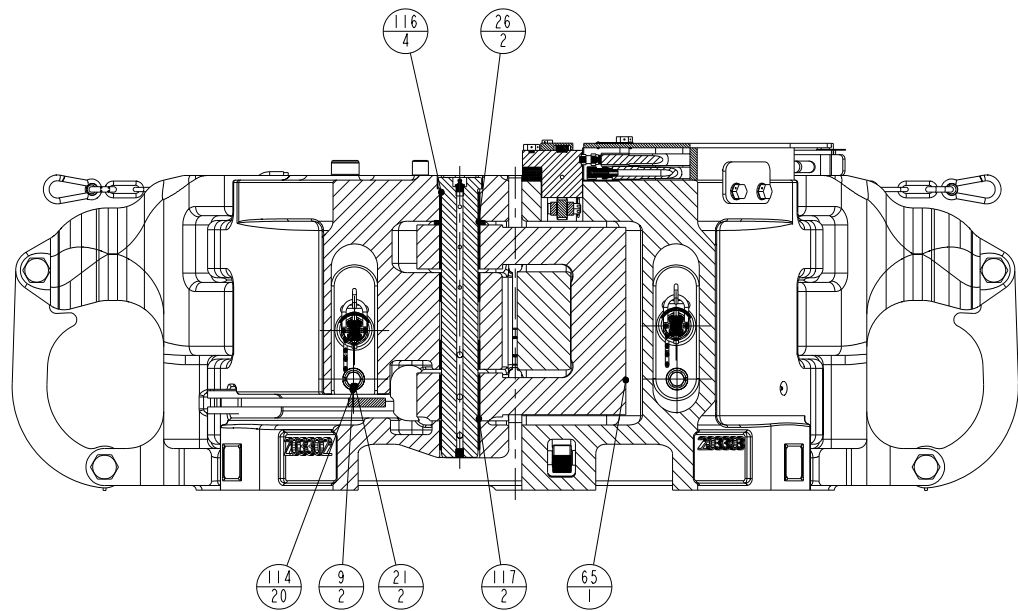
SECTION J-J

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SURF. FINISH / PAINTSPEC.	-			BREAK SHARP CORNERS .010 ± .005				
COLOR	-			MACHINED SURFACES 				
WEIGHT	3951.1 lbs		1792.2 kg		TORCHOUT SURFACES 	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		
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT			SCALE 1:5	PROJ.
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DATE	23-Aug-04		DATE	Aug-13-04				
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BX ELEVATOR FRAME III				D				

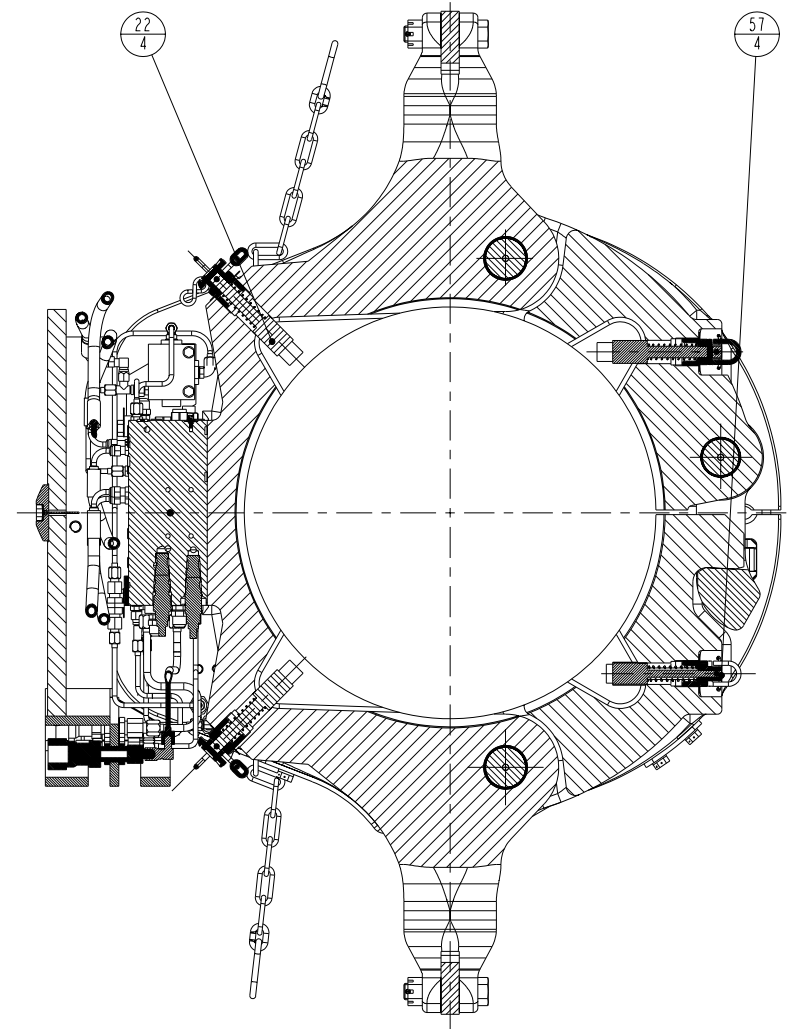





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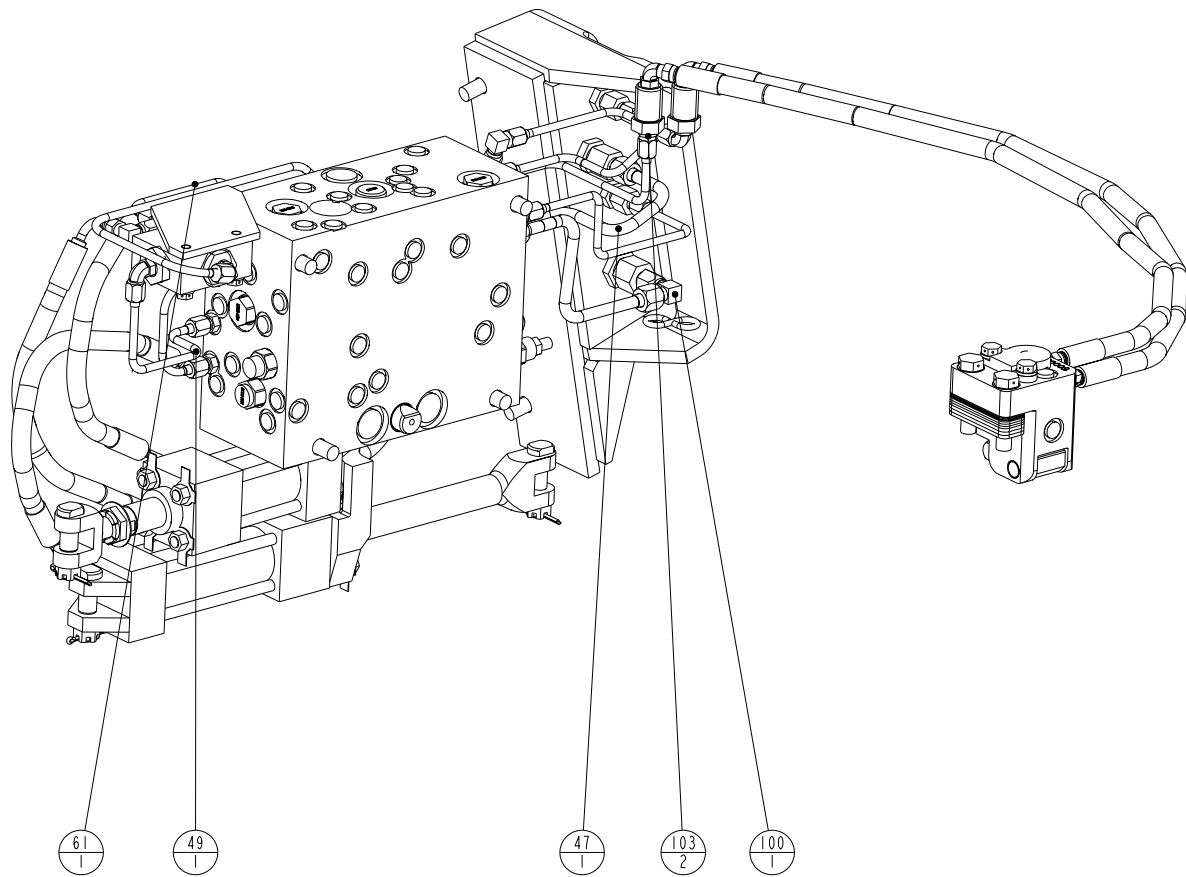
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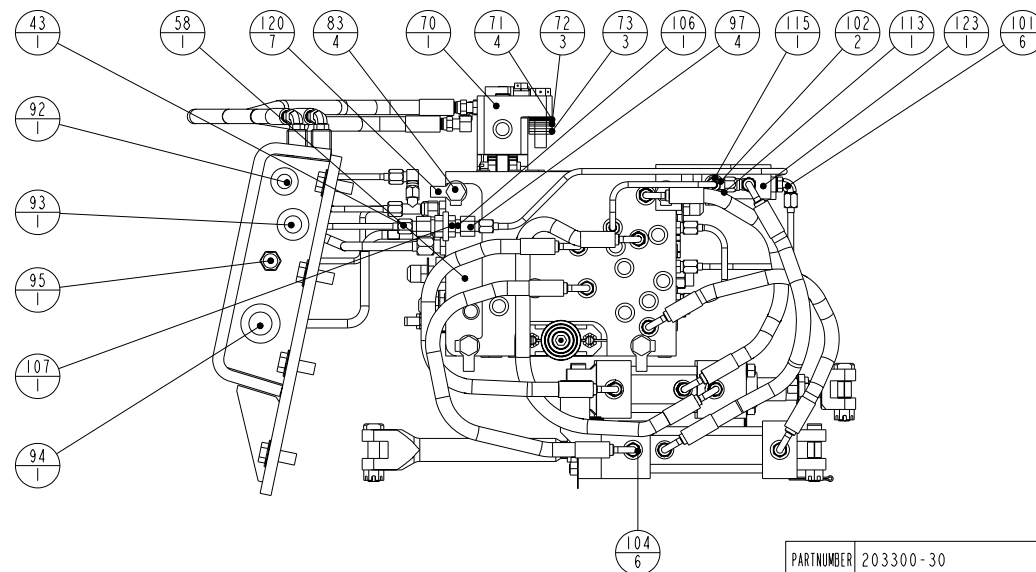
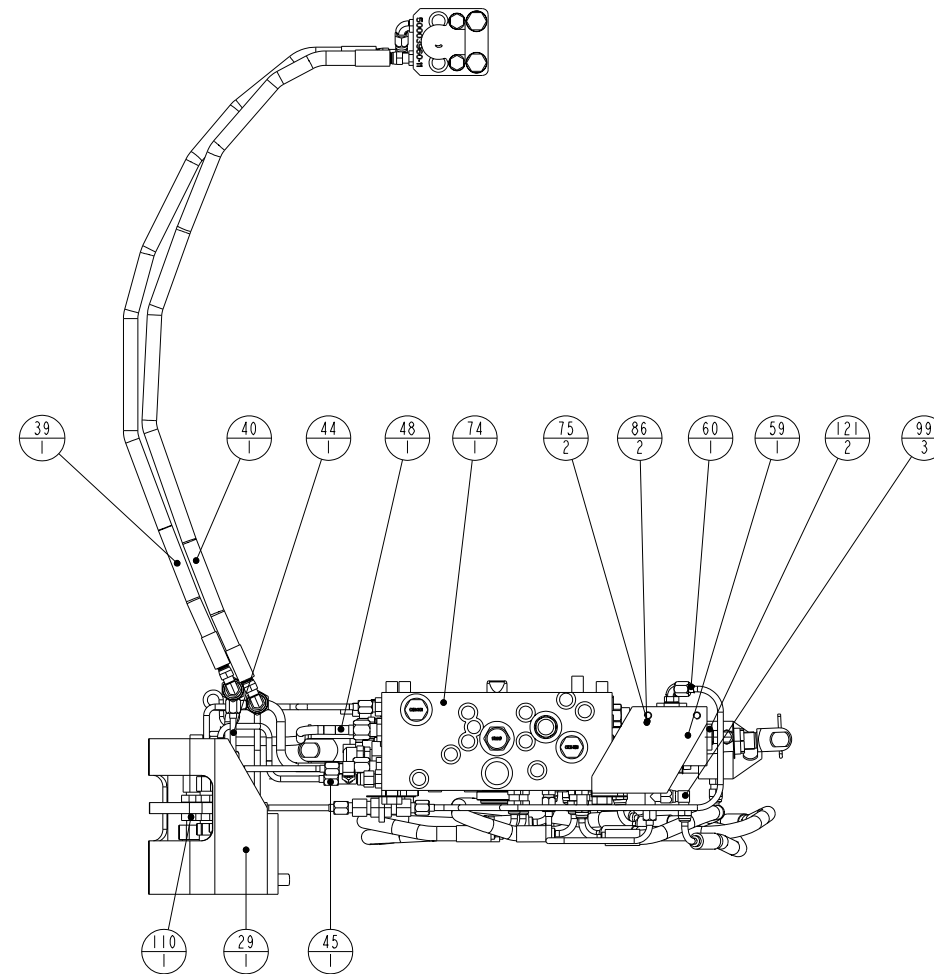
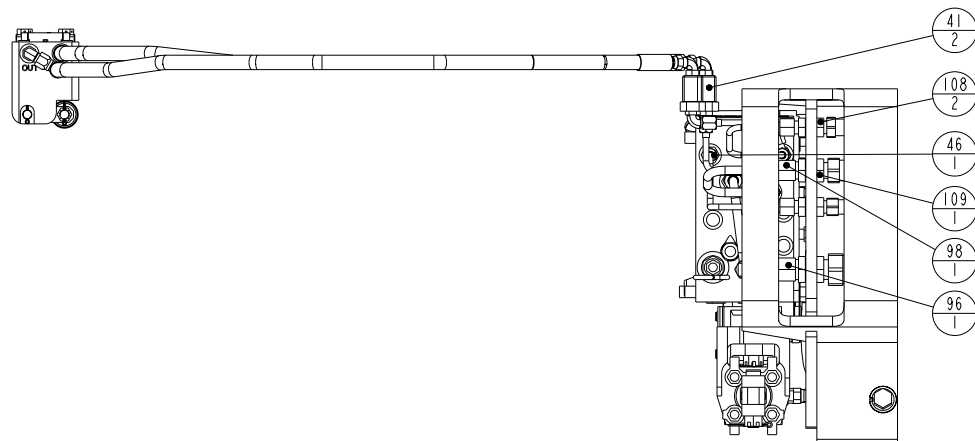
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MATERIAL		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE			
SURF. FINISH / PAINTSPEC.		BREAK SHARP CORNERS .010 ± .005			
COLOR		MACHINED SURFACES 250			
WEIGHT 3951.1 lbs 1792.2 kg		TORCHCUT SURFACES 1000			
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	
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DATE 12-Aug-04	DATE Aug-12-04		THIS DOCUMENT IS DMS CONTROLLED		UNITS 1/8" (mm)
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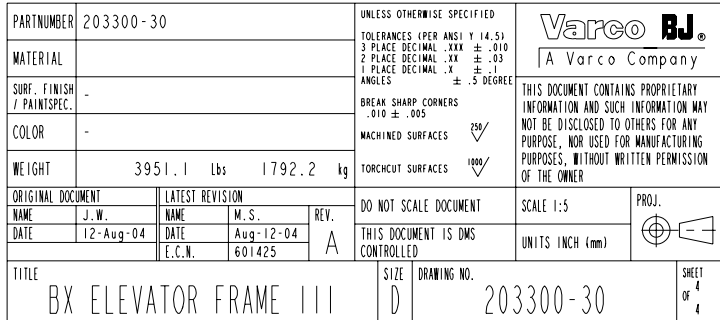


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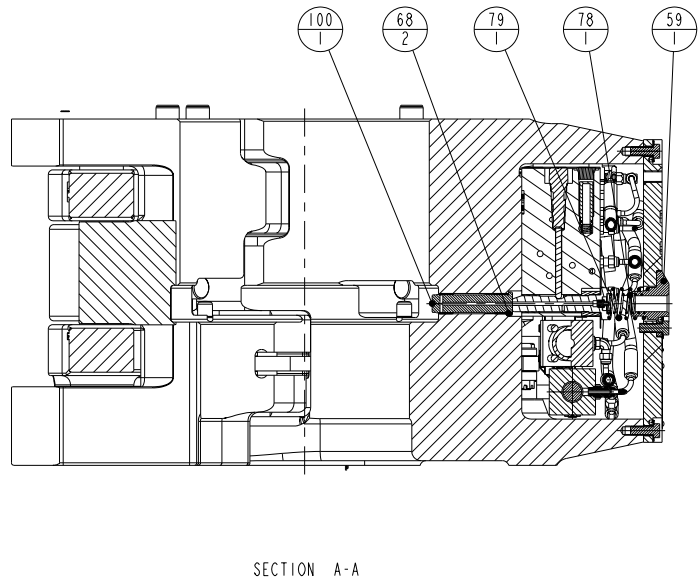
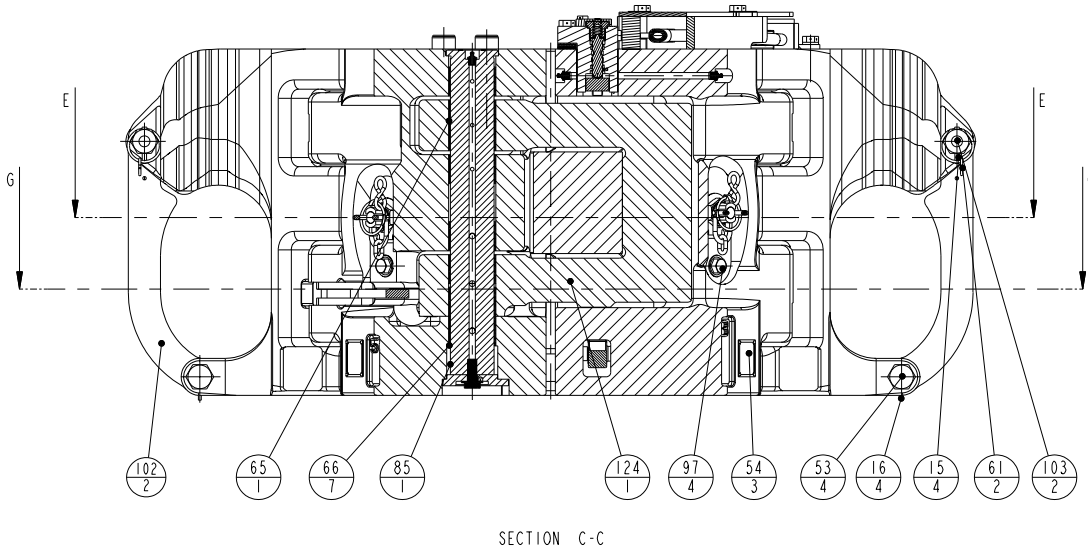
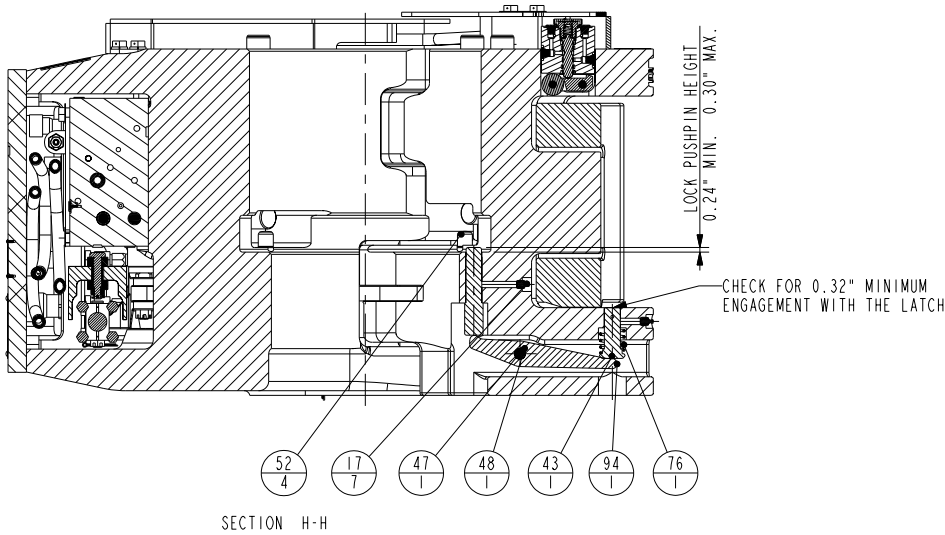
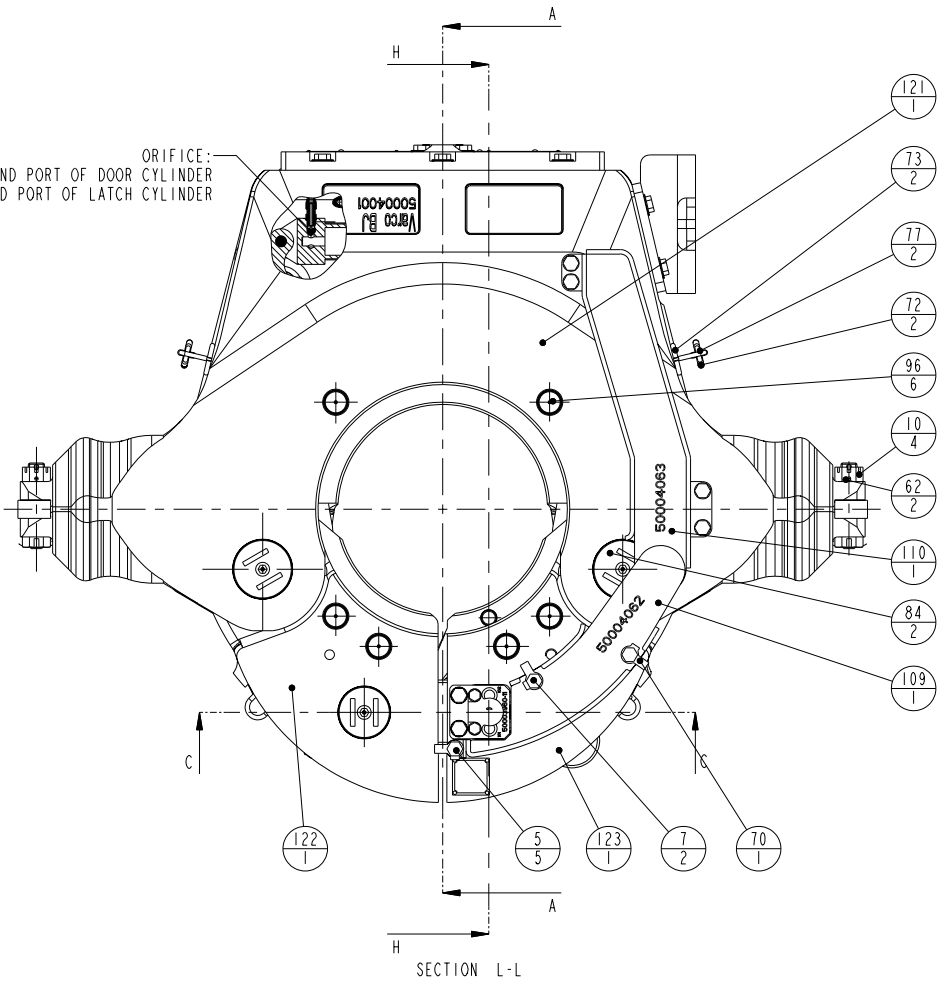
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SURF. FINISH / PAINTSPEC.		BREAK SHARP CORNERS .010 ± .005			
COLOR		MACHINED SURFACES 250✓			
WEIGHT 3951.1 Lbs 1792.2 kg		TORNCUT SURFACES 1000✓			
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	
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DATE 12-Aug-04		DATE Aug-12-04		PROJ.	
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				SHEET 3 OF 4	

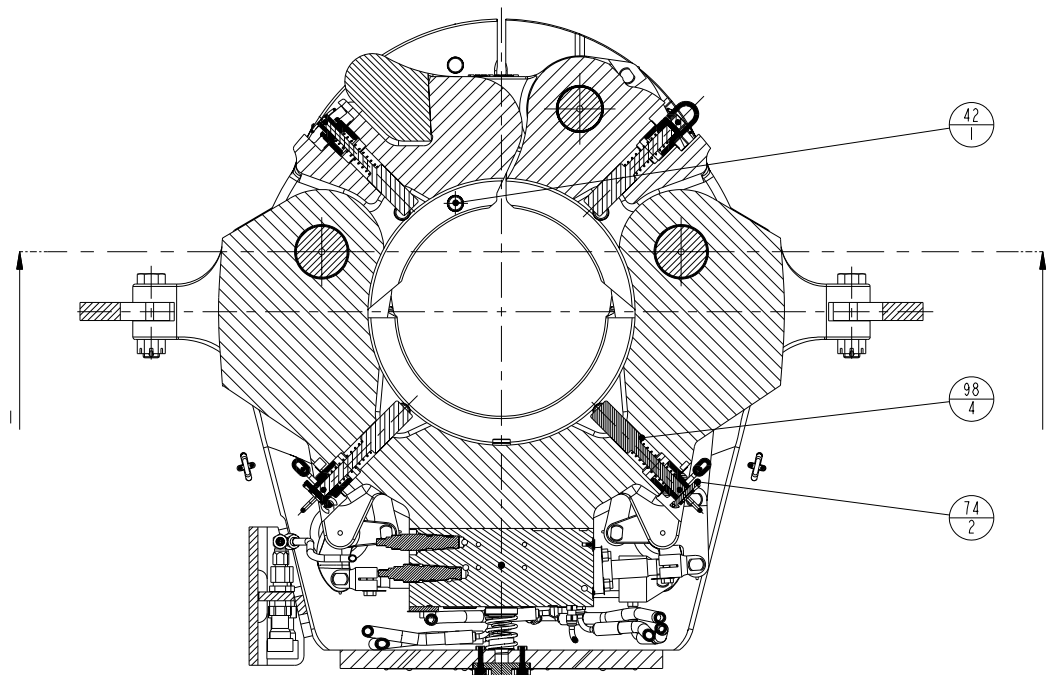


RATING ELEVATOR BX5				
TUBING	N.A.	TONS	N.A.	MTONNES
DC PLAIN	150	TONS	136	MTONNES
DC WITH ZIP LIFT	150	TONS	136	MTONNES
18" DRILLPIPE	750	TONS	681	MTONNES
CASING	750	TONS	681	MTONNES
SPECIAL	1000	TONS	908	MTONNES

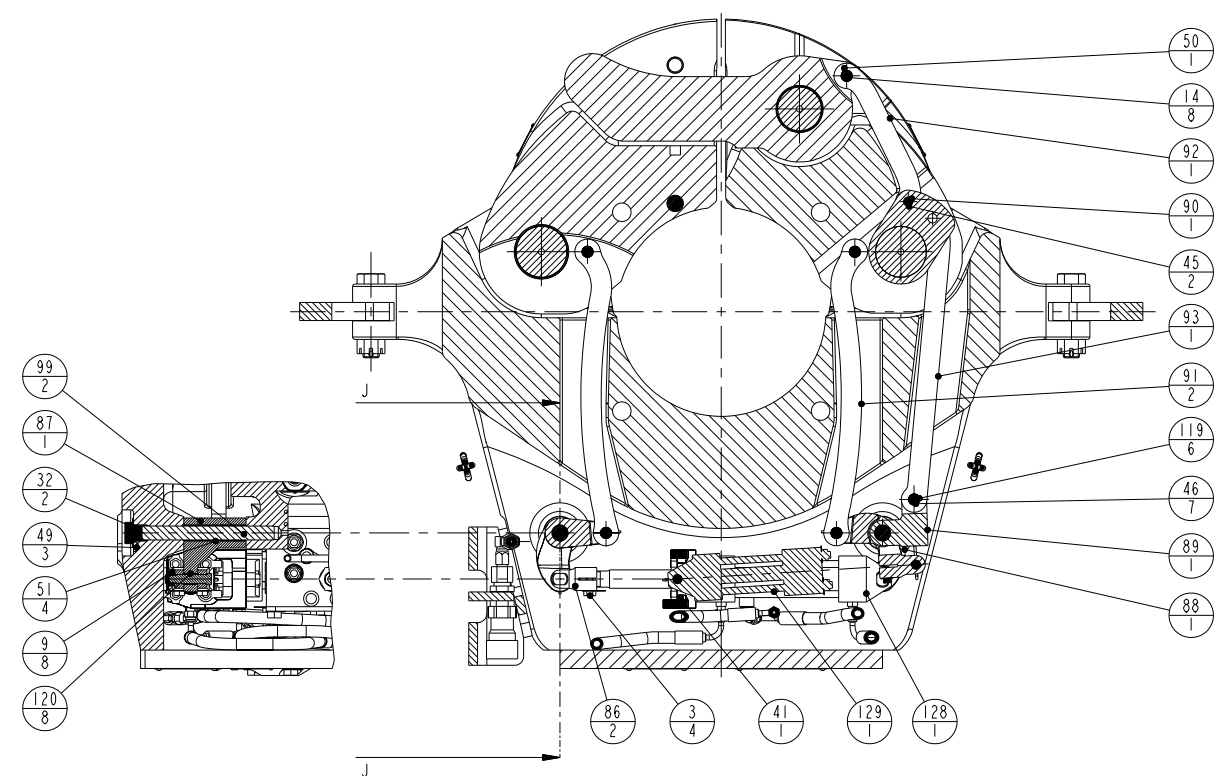
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SURF. FINISH / PAINTSPEC.		-		BREAK SHARP CORNERS .010 ± .005		
COLOR		-		MACHINED SURFACES 250		
WEIGHT		4647.4 lbs		2108.0 kg		TORCHCUT SURFACES 1000
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT		SCALE 1:5
NAME J. W.		NAME M. S.		REV. A		UNITS INCH (mm)
DATE 19-Aug-04		DATE Aug-19-04				
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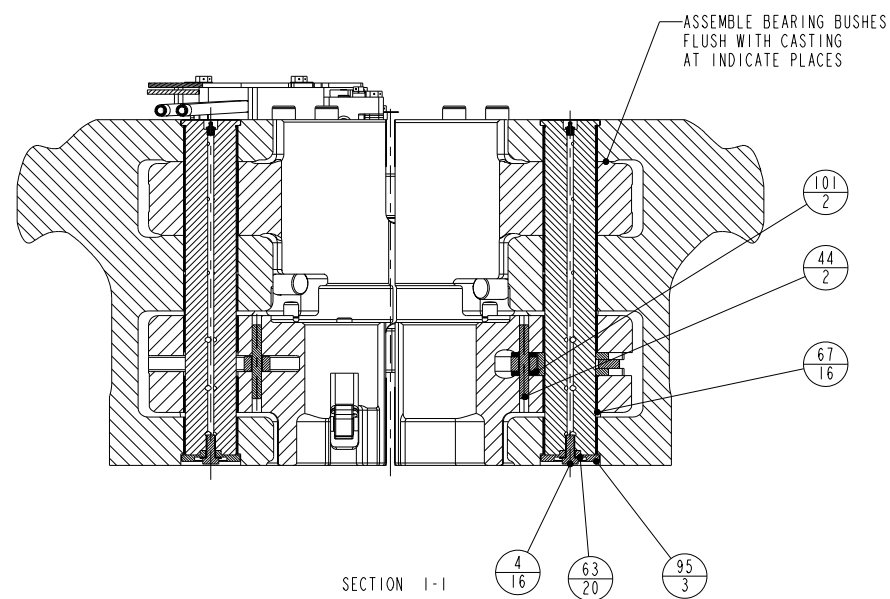


SECTION E-E




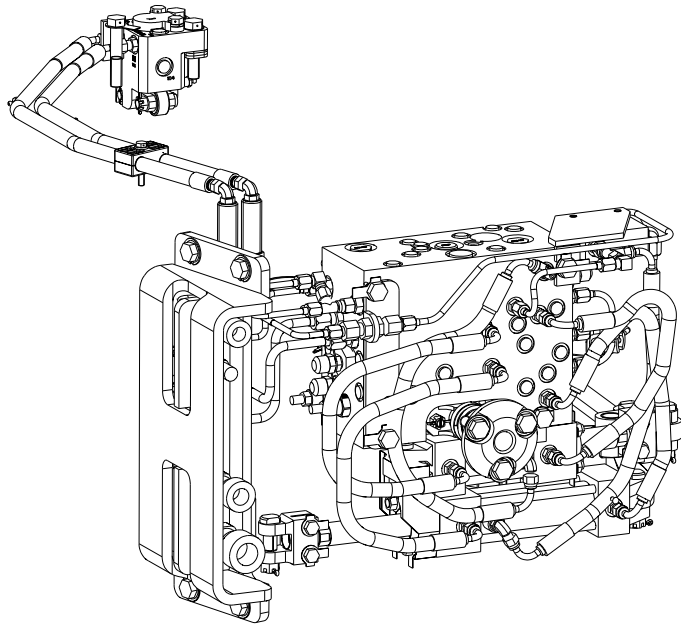
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SECTION G-G

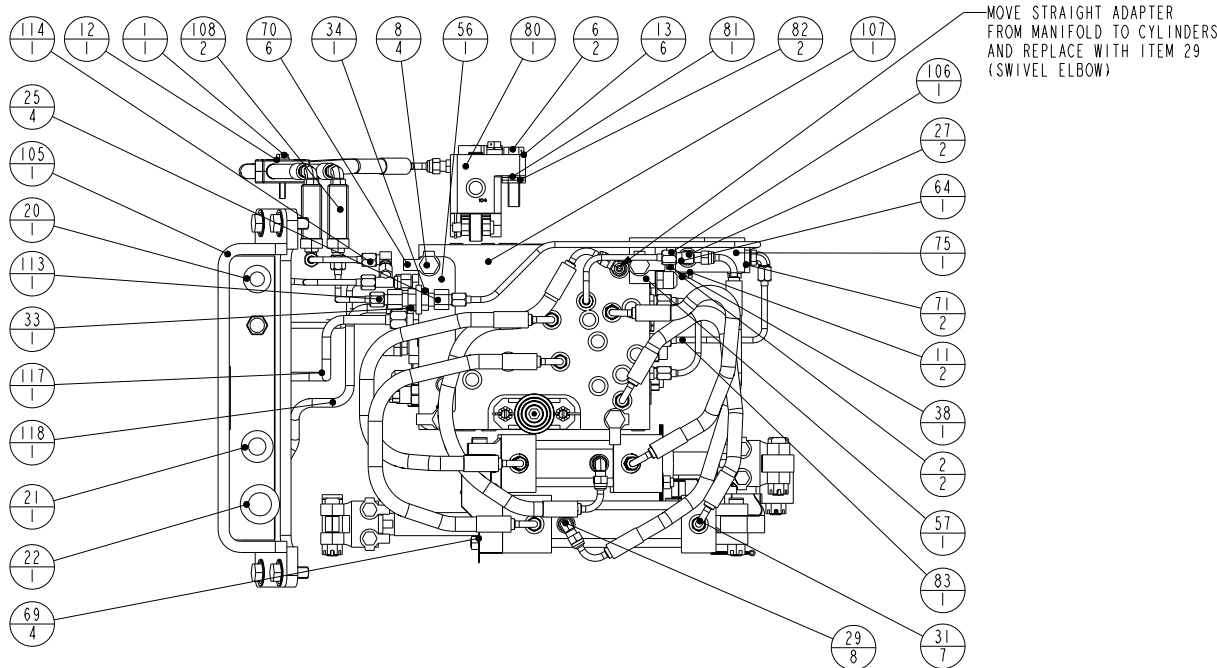
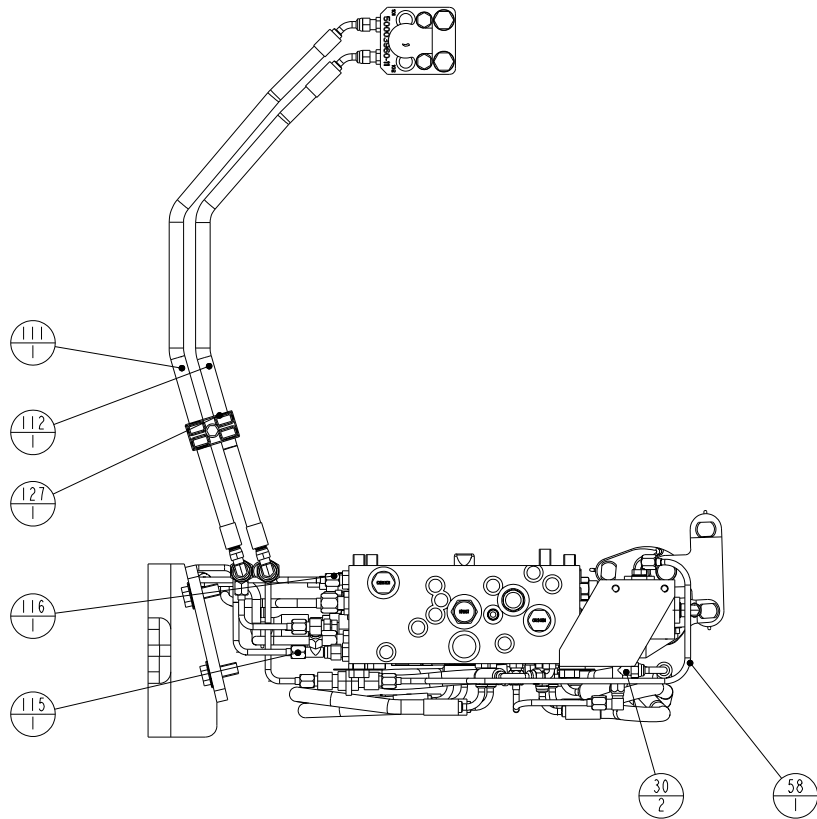
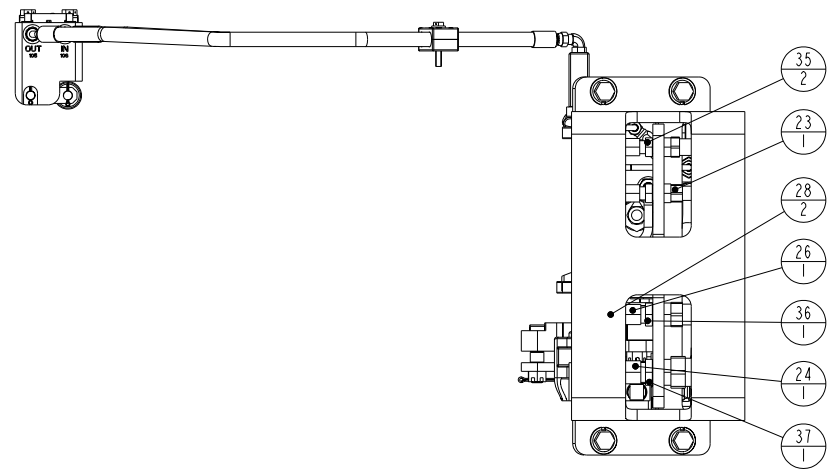


SECTION I-I


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SURF. FINISH / PAINTSPEC.	-		BREAK SHARP CORNERS .010 ± .005		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	
COLOR	-		MACHINED SURFACES 250 ✓			
WEIGHT	4647.4 lbs 2108.0 kg		TORCHCUT SURFACES 1000 ✓			
ORIGINAL DOCUMENT	LATEST REVISION		DO NOT SCALE DOCUMENT		SCALE 1:5	PROJ.
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		E.C.W.	601428			
TITLE				SIZE	DRAWING NO.	SHEET
BX ELEVATOR FRAME 5				D	50004000-30	2 of 4

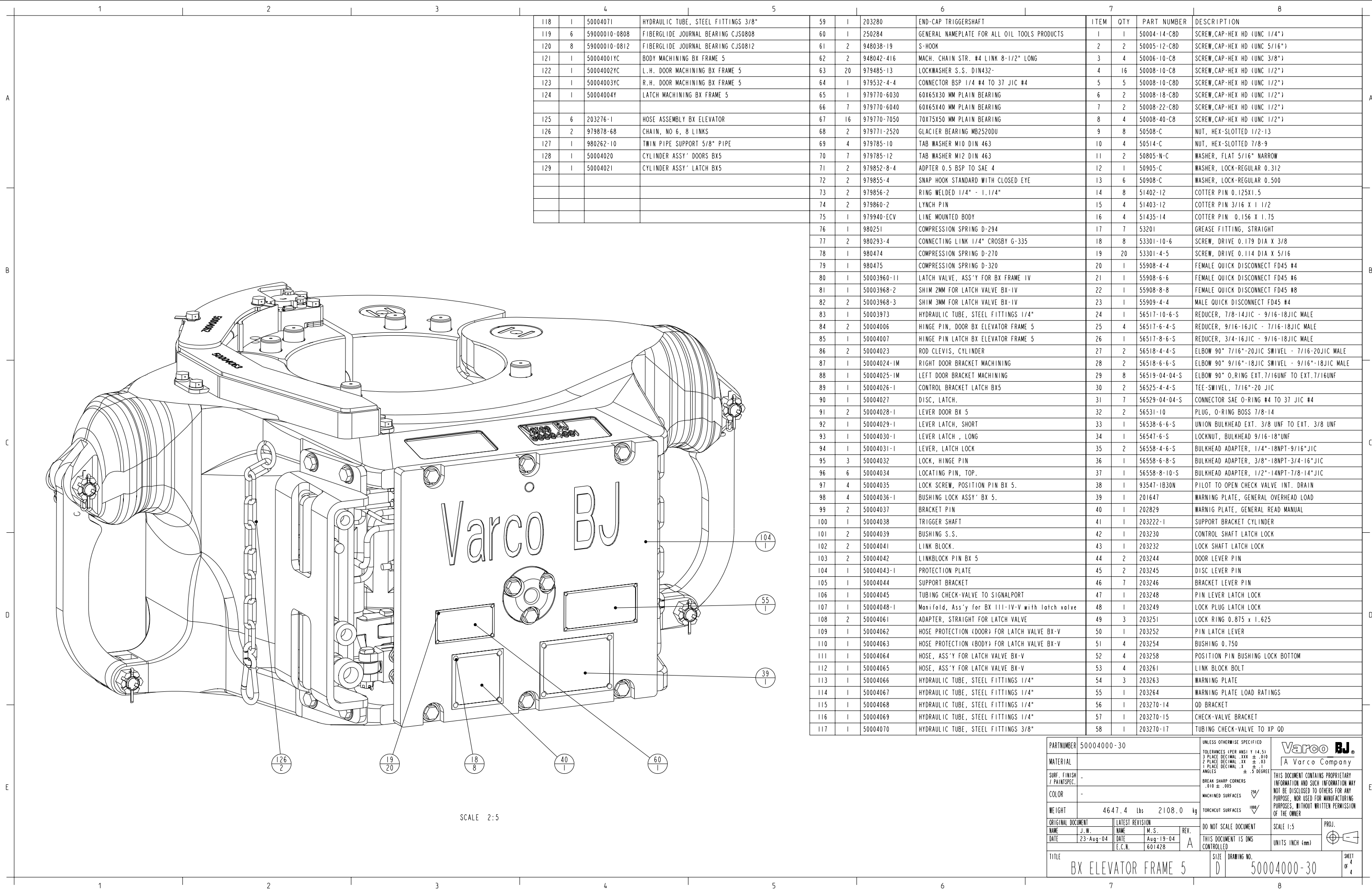


SCALE 1:4



SCALE 1:4

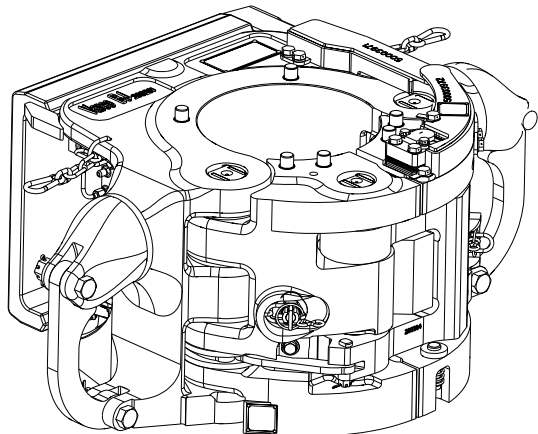
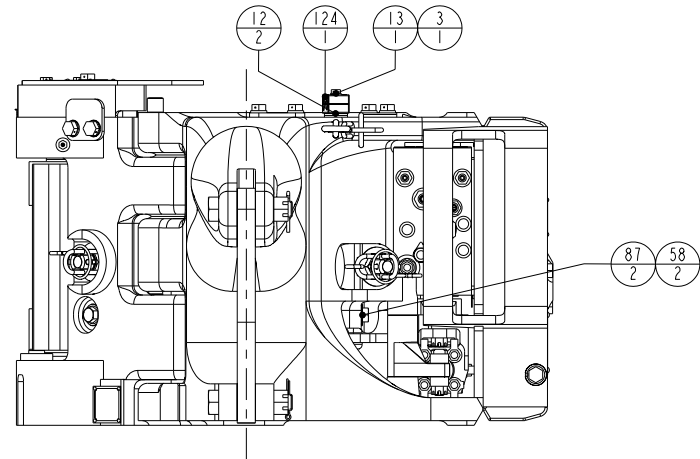
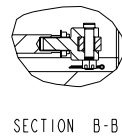
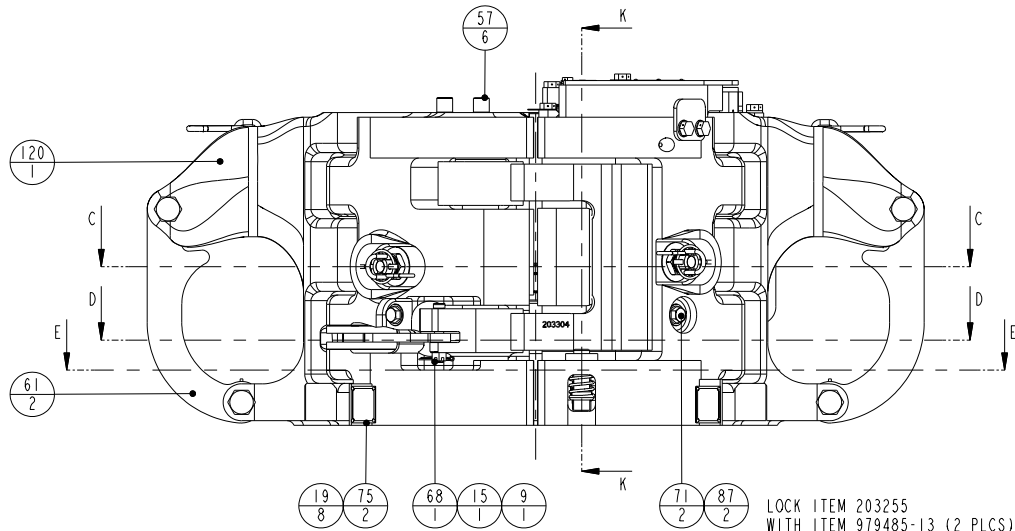
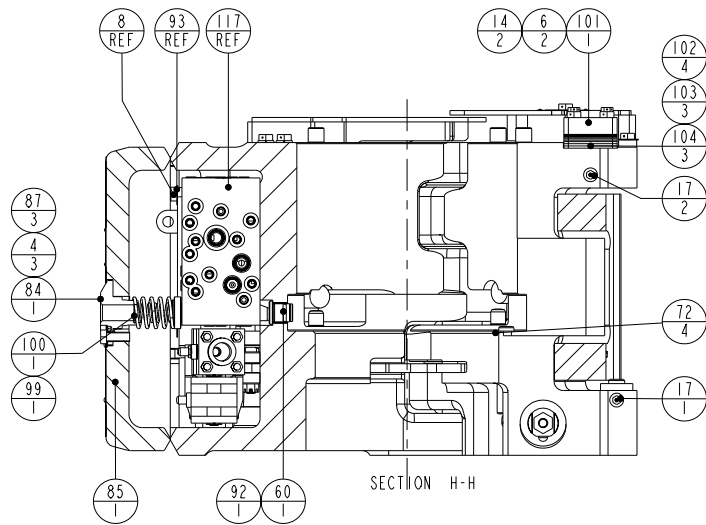
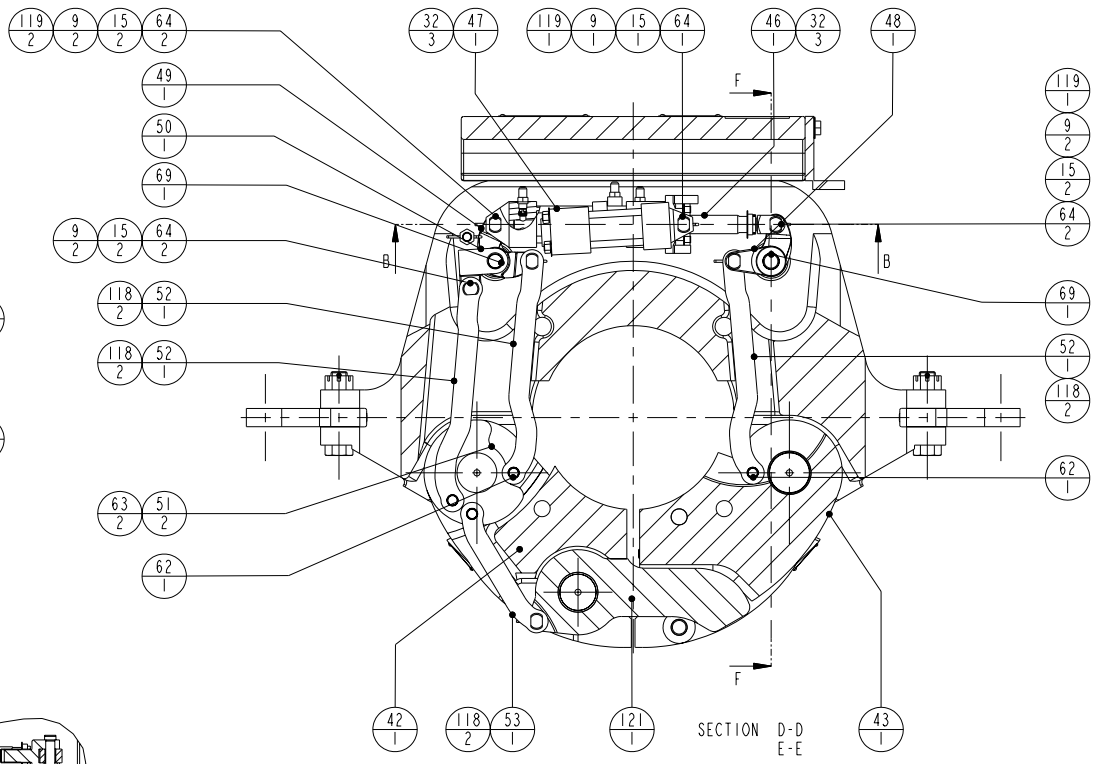
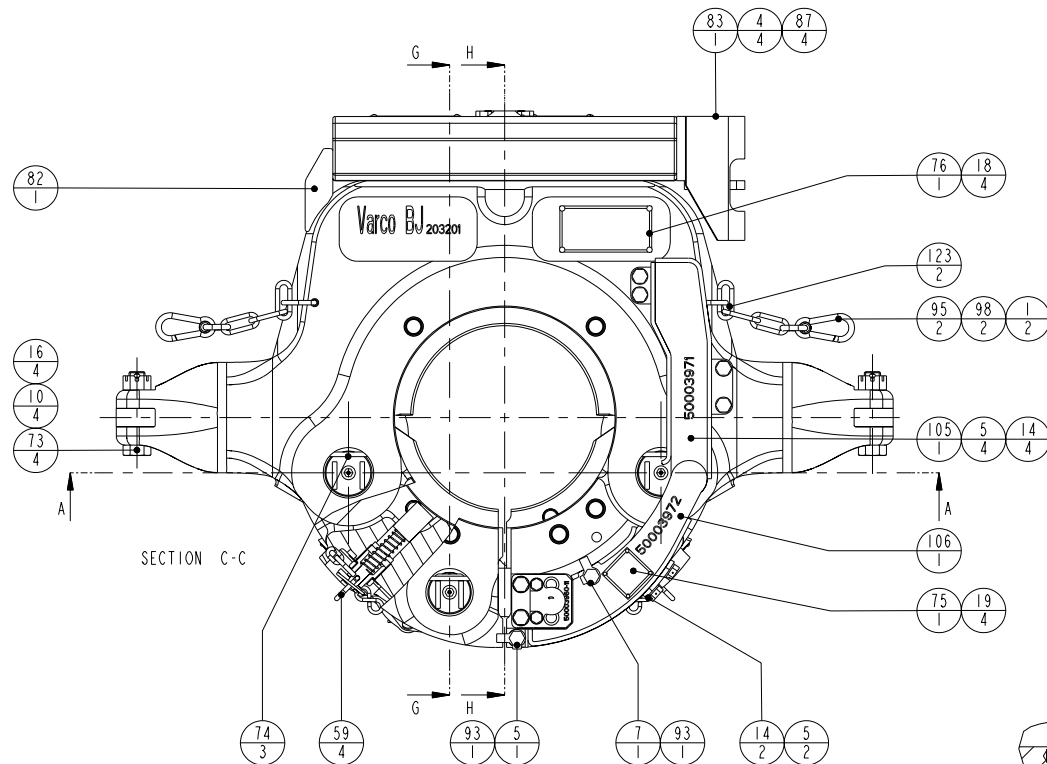
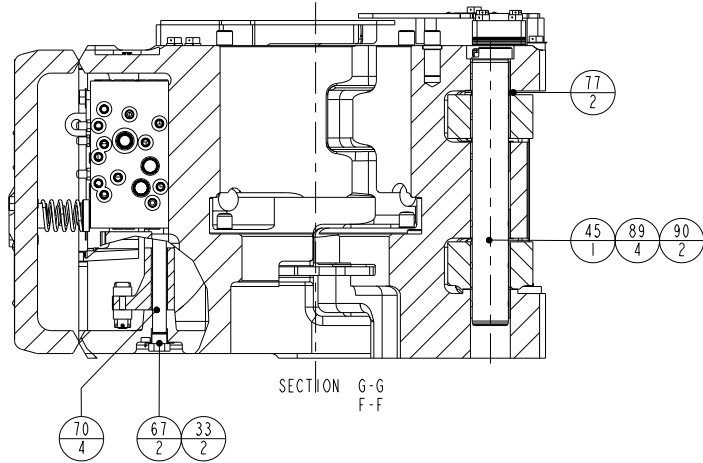
PARTNUMBER 50004000-30		UNLESS OTHERWISE SPECIFIED		<div>Varco <b>B.J.</b></div> <div>A Varco Company</div>	
MATERIAL		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .xxx ± .010 2 PLACE DECIMAL .xx ± .03 1 PLACE DECIMAL .x ± .1 ANGLES ± .5 DEGREE			
SURF. FINISH / PAINTSPEC.		BREAK SHARP CORNERS .010 ± .005			
COLOR -		MACHINED SURFACES $\frac{250}{\sqrt{\phantom{x}}}$			
WEIGHT 4647.4 lbs 2108.0 kg		TORNCUT SURFACES $\frac{1000}{\sqrt{\phantom{x}}}$		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	
ORIGINAL DOCUMENT		LATEST REVISION			
NAME J. W.	NAME M. S.	REV. A	DO NOT SCALE DOCUMENT		
DATE 23-Aug-04	DATE Aug-19-04	E.C.N. 601428	THIS DOCUMENT IS DMS CONTROLLED		
TITLE BX ELEVATOR FRAME 5			SIZE D	DRAWING NO. 50004000-30	PROJ. 
				UNITS INCH (mm)	SHEET 3 of 4



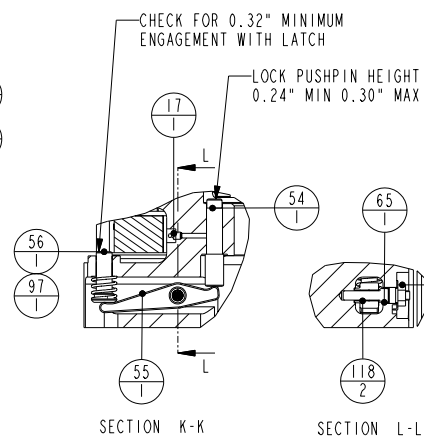
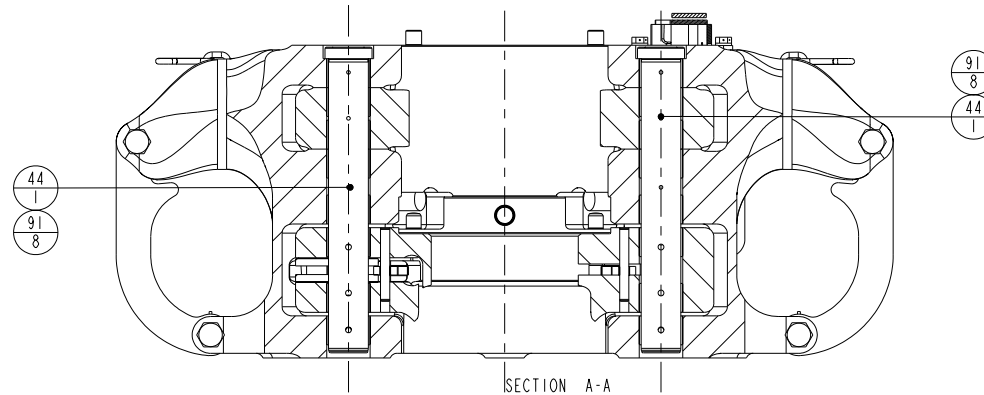
SCALE 2:5

118	1	50004071	HYDRAULIC TUBE, STEEL FITTINGS 3/8"	59	1	203280	END-CAP TRIGGERSHAFT	ITEM	QTY	PART NUMBER	DESCRIPTION
119	6	59000010-0808	FIBERGLIDE JOURNAL BEARING CJS0808	60	1	250284	GENERAL NAMEPLATE FOR ALL OIL TOOLS PRODUCTS	1	1	50004-14-C8D	SCREW,CAP-HEX HD (UNC 1/4")
120	8	59000010-0812	FIBERGLIDE JOURNAL BEARING CJS0812	61	2	948038-19	S-HOOK	2	2	50005-12-C8D	SCREW,CAP-HEX HD (UNC 5/16")
121	1	50004001YC	BODY MACHINING BX FRAME 5	62	2	948042-416	MACH. CHAIN STR. #4 LINK 8-1/2" LONG	3	4	50006-10-C8	SCREW,CAP-HEX HD (UNC 3/8")
122	1	50004002YC	L.H. DOOR MACHINING BX FRAME 5	63	20	979485-13	LOCKWASHER S.S. DIN432-	4	16	50008-10-C8	SCREW,CAP-HEX HD (UNC 1/2")
123	1	50004003YC	R.H. DOOR MACHINING BX FRAME 5	64	1	979532-4-4	CONNECTOR BSP 1/4 #4 TO 37 JIC #4	5	5	50008-10-C8D	SCREW,CAP-HEX HD (UNC 1/2")
124	1	50004004Y	LATCH MACHINING BX FRAME 5	65	1	979770-6030	60X65X30 MM PLAIN BEARING	6	2	50008-18-C8D	SCREW,CAP-HEX HD (UNC 1/2")
				66	7	979770-6040	60X65X40 MM PLAIN BEARING	7	2	50008-22-C8D	SCREW,CAP-HEX HD (UNC 1/2")
125	6	203276-1	HOSE ASSEMBLY BX ELEVATOR	67	16	979770-7050	70X75X50 MM PLAIN BEARING	8	4	50008-40-C8	SCREW,CAP-HEX HD (UNC 1/2")
126	2	979878-68	CHAIN, NO 6, 8 LINKS	68	2	979771-2520	GLACIER BEARING MB2520DU	9	8	50508-C	NUT, HEX-SLOTTED 1/2-13
127	1	980262-10	TWIN PIPE SUPPORT 5/8" PIPE	69	4	979785-10	TAB WASHER M10 DIN 463	10	4	50514-C	NUT, HEX-SLOTTED 7/8-9
128	1	50004020	CYLINDER ASSY' DOORS BX5	70	7	979785-12	TAB WASHER M12 DIN 463	11	2	50805-N-C	WASHER, FLAT 5/16" NARROW
129	1	50004021	CYLINDER ASSY' LATCH BX5	71	2	979852-8-4	ADPTER 0.5 BSP TO SAE 4	12	1	50905-C	WASHER, LOCK-REGULAR 0.312
				72	2	979855-4	SNAP HOOK STANDARD WITH CLOSED EYE	13	6	50908-C	WASHER, LOCK-REGULAR 0.500
				73	2	979856-2	RING WELDED 1/4" - 1.1/4"	14	8	51402-12	COTTER PIN 0.125X1.5
				74	2	979860-2	LYNCH PIN	15	4	51403-12	COTTER PIN 3/16 X 1 1/2
				75	1	979940-ECV	LINE MOUNTED BODY	16	4	51435-14	COTTER PIN 0.156 X 1.75
				76	1	980251	COMPRESSION SPRING D-294	17	7	53201	GREASE FITTING, STRAIGHT
				77	2	980293-4	CONNECTING LINK 1/4" CROSBY G-335	18	8	53301-10-6	SCREW, DRIVE 0.179 DIA X 3/8
				78	1	980474	COMPRESSION SPRING D-270	19	20	53301-4-5	SCREW, DRIVE 0.114 DIA X 5/16
				79	1	980475	COMPRESSION SPRING D-320	20	1	55908-4-4	FEMALE QUICK DISCONNECT FD45 #4
				80	1	50003960-11	LATCH VALVE, ASS'Y FOR BX FRAME 1V	21	1	55908-6-6	FEMALE QUICK DISCONNECT FD45 #6
				81	1	50003968-2	SHIM 2MM FOR LATCH VALVE BX-1V	22	1	55908-8-8	FEMALE QUICK DISCONNECT FD45 #8
				82	2	50003968-3	SHIM 3MM FOR LATCH VALVE BX-1V	23	1	55909-4-4	MALE QUICK DISCONNECT FD45 #4
				83	1	50003973	HYDRAULIC TUBE, STEEL FITTINGS 1/4"	24	1	56517-10-6-S	REDUCER, 7/8-14JIC - 9/16-18JIC MALE
				84	2	50004006	HINGE PIN, DOOR BX ELEVATOR FRAME 5	25	4	56517-6-4-S	REDUCER, 9/16-16JIC - 7/16-18JIC MALE
				85	1	50004007	HINGE PIN LATCH BX ELEVATOR FRAME 5	26	1	56517-8-6-S	REDUCER, 3/4-16JIC - 9/16-18JIC MALE
				86	2	50004023	ROD CLEVIS, CYLINDER	27	2	56518-4-4-S	ELBOW 90° 7/16"-20JIC SWIVEL - 7/16-20JIC MALE
				87	1	50004024-1M	RIGHT DOOR BRACKET MACHINING	28	2	56518-6-6-S	ELBOW 90° 9/16"-18JIC SWIVEL - 9/16"-18JIC MALE
				88	1	50004025-1M	LEFT DOOR BRACKET MACHINING	29	8	56519-04-04-S	ELBOW 90° O-RING EXT.7/16UNF TO EXT.7/16UNF
				89	1	50004026-1	CONTROL BRACKET LATCH BX5	30	2	56525-4-4-S	TEE-SWIVEL, 7/16"-20 JIC
				90	1	50004027	DISC, LATCH.	31	7	56529-04-04-S	CONNECTOR SAE O-RING #4 TO 37 JIC #4
				91	2	50004028-1	LEVER DOOR BX 5	32	2	56531-10	PLUG, O-RING BOSS 7/8-14
				92	1	50004029-1	LEVER LATCH, SHORT	33	1	56538-6-6-S	UNION BULKHEAD EXT. 3/8 UNF TO EXT. 3/8 UNF
				93	1	50004030-1	LEVER LATCH , LONG	34	1	56547-6-S	LOCKNUT, BULKHEAD 9/16-18"UNF
				94	1	50004031-1	LEVER, LATCH LOCK	35	2	56558-4-6-S	BULKHEAD ADAPTER, 1/4"-18NPT-9/16"JIC
				95	3	50004032	LOCK, HINGE PIN	36	1	56558-6-8-S	BULKHEAD ADAPTER, 3/8"-18NPT-3/4-16"JIC
				96	6	50004034	LOCATING PIN, TOP.	37	1	56558-8-10-S	BULKHEAD ADAPTER, 1/2"-14NPT-7/8-14"JIC
				97	4	50004035	LOCK SCREW, POSITION PIN BX 5.	38	1	93547-1B30N	PILOT TO OPEN CHECK VALVE INT. DRAIN
				98	4	50004036-1	BUSHING LOCK ASSY' BX 5.	39	1	201647	WARNING PLATE, GENERAL OVERHEAD LOAD
				99	2	50004037	BRACKET PIN	40	1	202829	WARNIG PLATE, GENERAL READ MANUAL
				100	1	50004038	TRIGGER SHAFT	41	1	203222-1	SUPPORT BRACKET CYLINDER
				101	2	50004039	BUSHING S.S.	42	1	203230	CONTROL SHAFT LATCH LOCK
				102	2	50004041	LINK BLOCK.	43	1	203232	LOCK SHAFT LATCH LOCK
				103	2	50004042	LINKBLOCK PIN BX 5	44	2	203244	DOOR LEVER PIN
				104	1	50004043-1	PROTECTION PLATE	45	2	203245	DISC LEVER PIN
				105	1	50004044	SUPPORT BRACKET	46	7	203246	BRACKET LEVER PIN
				106	1	50004045	TUBING CHECK-VALVE TO SIGNALPORT	47	1	203248	PIN LEVER LATCH LOCK
				107	1	50004048-1	Manifold, Ass'y for BX 111-1V-V with latch valve	48	1	203249	LOCK PLUG LATCH LOCK
				108	2	50004061	ADAPTER, STRAIGHT FOR LATCH VALVE	49	3	203251	LOCK RING 0.875 x 1.625
				109	1	50004062	HOSE PROTECTION (DOOR) FOR LATCH VALVE BX-V	50	1	203252	PIN LATCH LEVER
				110	1	50004063	HOSE PROTECTION (BODY) FOR LATCH VALVE BX-V	51	4	203254	BUSHING 0.750
				111	1	50004064	HOSE, ASS'Y FOR LATCH VALVE BX-V	52	4	203258	POSITION PIN BUSHING LOCK BOTTOM
				112	1	50004065	HOSE, ASS'Y FOR LATCH VALVE BX-V	53	4	203261	LINK BLOCK BOLT
				113	1	50004066	HYDRAULIC TUBE, STEEL FITTINGS 1/4"	54	3	203263	WARNING PLATE
				114	1	50004067	HYDRAULIC TUBE, STEEL FITTINGS 1/4"	55	1	203264	WARNING PLATE LOAD RATINGS
				115	1	50004068	HYDRAULIC TUBE, STEEL FITTINGS 1/4"	56	1	203270-14	QD BRACKET
				116	1	50004069	HYDRAULIC TUBE, STEEL FITTINGS 1/4"	57	1	203270-15	CHECK-VALVE BRACKET
				117	1	50004070	HYDRAULIC TUBE, STEEL FITTINGS 3/8"	58	1	203270-17	TUBING CHECK-VALVE TO XP QD

PARTNUMBER	50004000-30	UNLESS OTHERWISE SPECIFIED	<b>Varco BJ.</b> [A Varco Company]	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
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/ TORNCUT SURFACES 1000/		
WEIGHT	4647.4 lbs 2108.0 kg			
ORIGINAL DOCUMENT		LATEST REVISION	DO NOT SCALE DOCUMENT	SCALE 1:5
NAME J.W.	NAME M.S.	REV. A	THIS DOCUMENT IS DMS CONTROLLED	PROJ.
DATE 23-Aug-04	DATE Aug-19-04	E.C.N. 601428		UNITS 1/8" (mm)
TITLE	SIZE	DRAWING NO.	SHEET	
BX ELEVATOR FRAME 5	D	50004000-30	4	



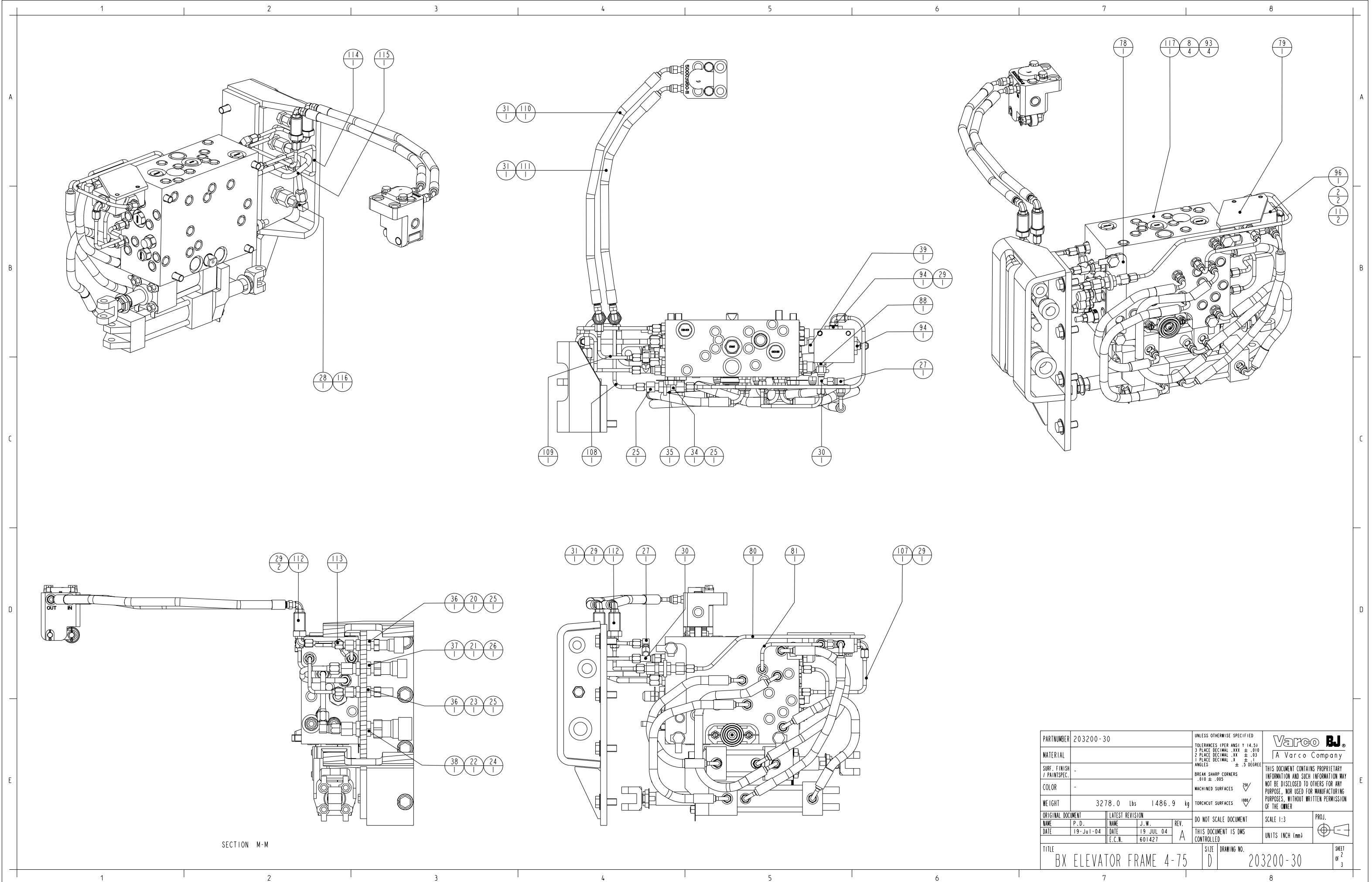
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


TEST ACCORDING  
TO TSEL-0140

RATING ELEVATOR BX 4-75				
TUBING	500	Tons	454	Mtonnes
DC PLAIN	150	Tons	136	Mtonnes
DC WITH ZIP LIFT	150	Tons	136	Mtonnes
18" DRILLPIPE	500	Tons	454	Mtonnes
CASING	500	Tons	454	Mtonnes
SO.SH.RISER HANDLING	750	Tons	681	Mtonnes
READ MANUAL FOR DETAILED INSTRUCTIONS				

PARTNUMBER		203200-30		UNLESS OTHERWISE SPECIFIED		Varco <b>BJ.</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		[A Varco Company]	
SURF. FINISH / PAINTSPEC.		-		BREAK SHARP CORNERS .010 ± .005		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.	
COLOR		-		MACHINED SURFACES ✓ 250			
WEIGHT		3278.0 Lbs 1486.9 kg		TORNCUT SURFACES ✓ 1000			
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT		SCALE 1:5	
NAME P.D.		NAME J.W.		REV.		PROJ.	
DATE 09-JUL-04		DATE 19 JUL 04		A		THIS DOCUMENT IS DMS CONTROLLED	
E.C.N. 601427						UNITS INCH (mm)	
TITLE		SIZE		DRAWING NO.		SHEET 1 of 3	
BX ELEVATOR FRAME 4-75		D		203200-30			



PARTNUMBER		203200-30		UNLESS OTHERWISE SPECIFIED		<b>Varco BJ.</b> A Varco Company	
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 INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER	
COLOR		-		MACHINED SURFACES $\sqrt{32}$			
WEIGHT		3278.0 lbs 1486.9 kg		TORNCUT SURFACES $\sqrt{100}$			
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT		SCALE 1:3	
NAME P.D.		NAME J.W.		THIS DOCUMENT IS DMS CONTROLLED		PROJ.	
DATE 19-Jul-04		DATE 19 JUL 04		A		UNITS INCH (mm)	
		E.C.N. 601427					
TITLE		BX ELEVATOR FRAME 4-75		SIZE D		DRAWING NO. 203200-30	
						SHEET 2 OF 3	





$$\begin{array}{r} 86 \\ 19 \\ \hline 1 \end{array}$$

**Varco BJ.**  
A Varco Company

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OF THE OWNER

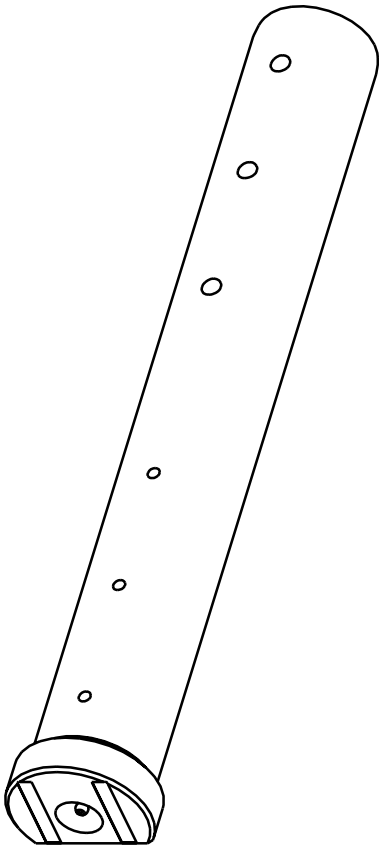
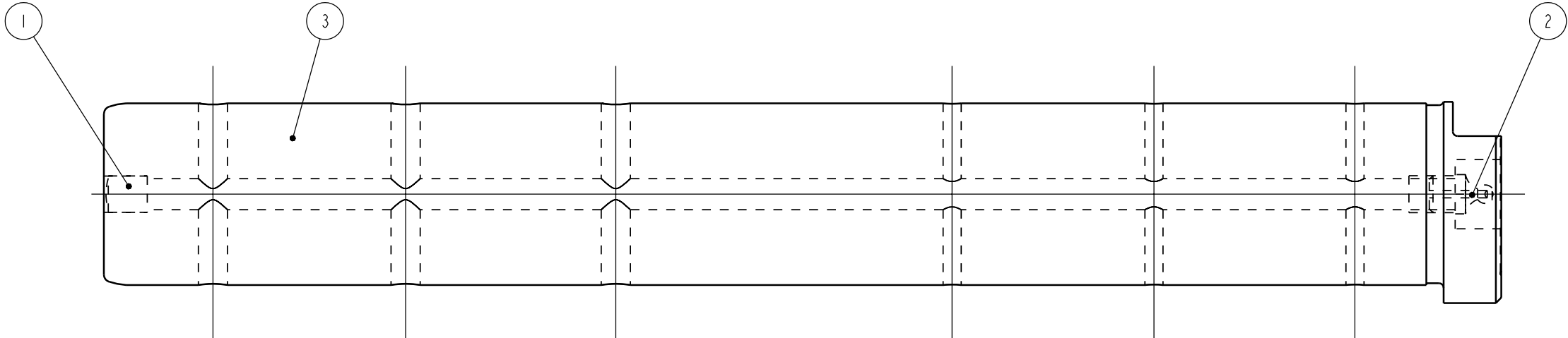
SCALE 1:3	PROJ.
UNITS INCH (mm)	

3200-30  
SHEET  
OF  
3

203207-1

PART NUMBER

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



3D VIEW  
SCALE 1:2

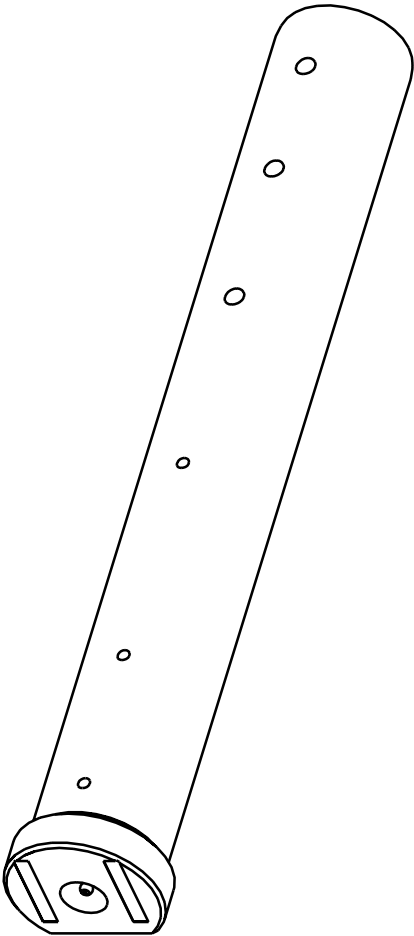
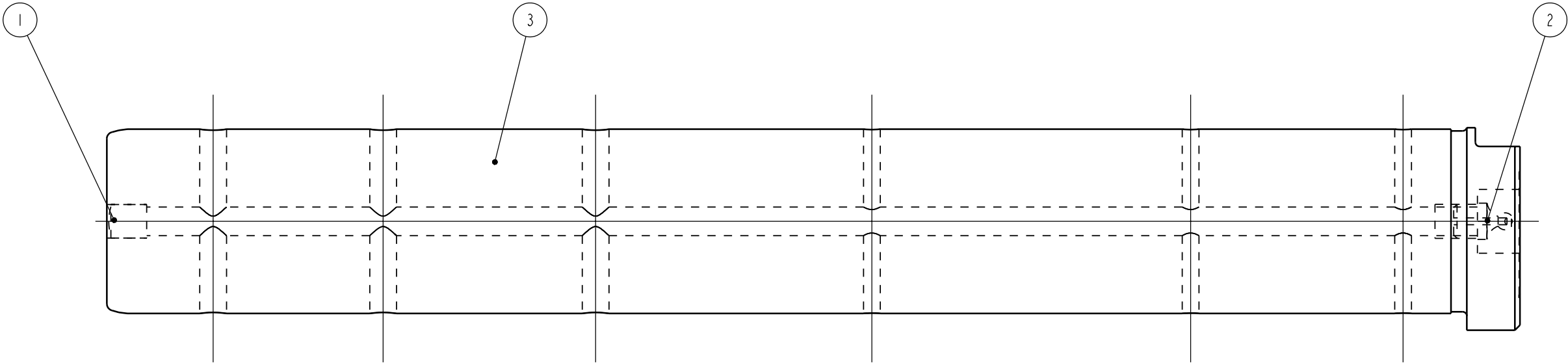
VIEWS UPDATED (ADDITIONAL GREASE HOLES.)

203207-1	1	203200	203200	K					
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.	J					
 ETTEN-LEUR, THE NETHERLANDS			UNLESS OTHERWISE SPECIFIED		I				
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			TOLERANCES (PER ANSI Y 14.5)		H				
			3 PLACE DECIMAL .XXX ± .010		G				
			2 PLACE DECIMAL .XX ± .03		F				
			1 PLACE DECIMAL .X ± .1		E				
			ANGLES ± .5 DEGREE		D				
			BREAK SHARP CORNERS .010 ± .005		C				
			MACHINED SURFACES						
APPROVED	NAME J. Tiebout	DATE 18-Dec-97	PROJ.	MATERIAL	B	600574	P.D.	08-Nov-01	A.N.
CHECKED	AJ	18-Dec-97	SCALE 1:1		A	545001	SBc	18-Dec-97	AJ
PREPARED	SBc	18-Dec-97	UNITS (INCH (MM))	WEIGHT	REV.	E.C.N	NAME	DATE	CHECKED
				LBS/	KG	PROJ/ FILE NO.: 203207-1			
TITLE HINGE PIN ASSEMBLY LATCH BX ELEVATOR FRAME 4				SIZE C	DRAWING NO. 203207-1				SHEET 1 OF 1
REDRAWN / REPLACED BY:				REPLACES:					

203206-1

PART NUMBER

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

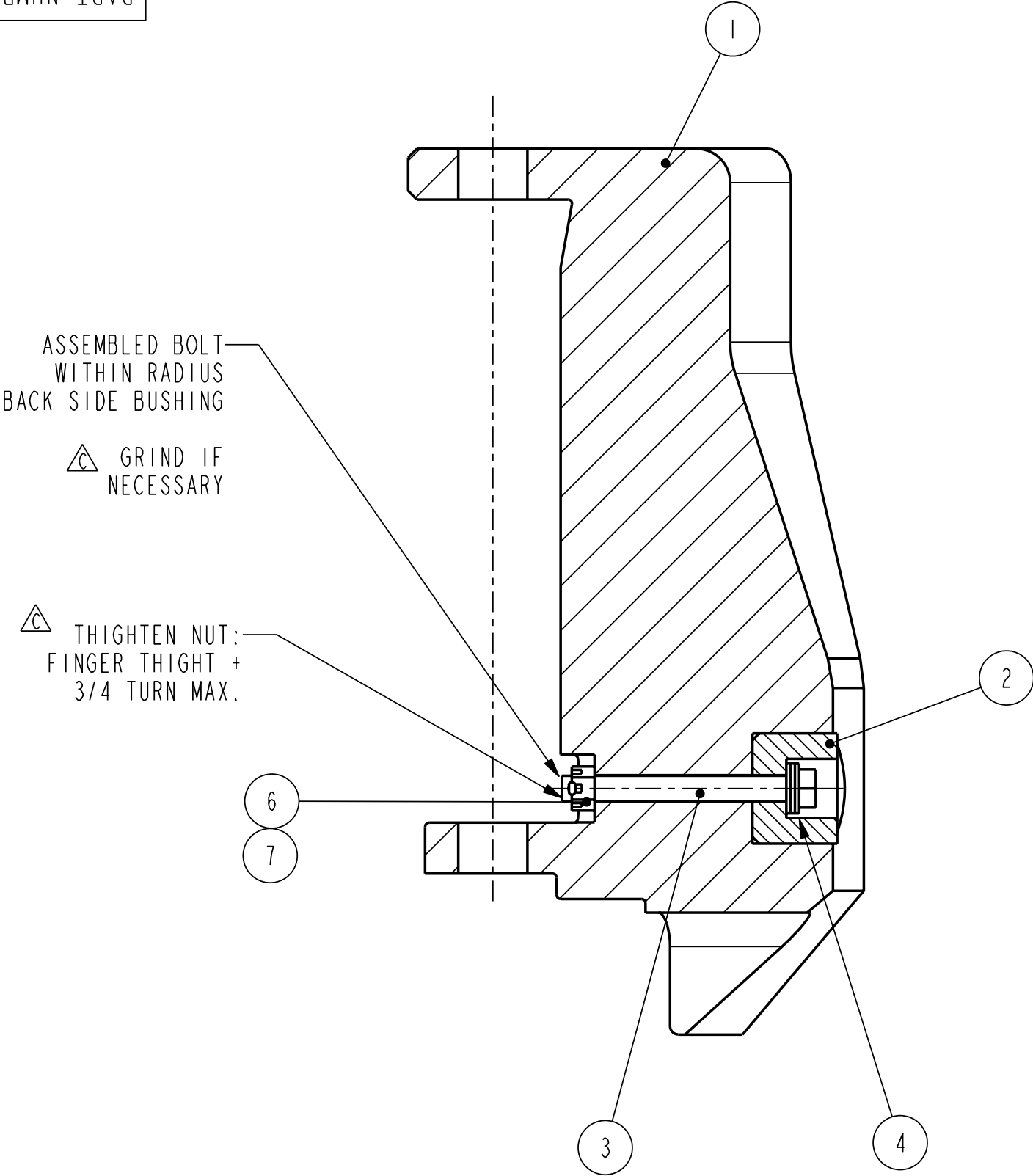


3D VIEW  
SCALE 1:2

△ VIEWS UPDATED (ADDITIONAL GREASEHOLES.)

203206-1	2	203200	203200	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>				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/					
				MATERIAL					
APPROVED	J. Tiebout	18-Dec-97	PROJ.		B	600574	P.D.	08-Nov-01	A.N.
CHECKED	AJ	18-Dec-97	SCALE 1:1		A	545001	SBc	18-Dec-97	AJ
PREPARED	SBc	18-Dec-97	UNITS (INCH (MM))		REV.	E.C.N	NAME	DATE	CHECKED
TITLE				SIZE	DRAWING NO.				SHEET
HINGE PIN ASSEMBLY DOOR BX ELEVATOR FRAME 4				C	203206-1				1 OF 1
REDRAWN / REPLACED BY:				REPLACES:					

203212
PART NUMBER

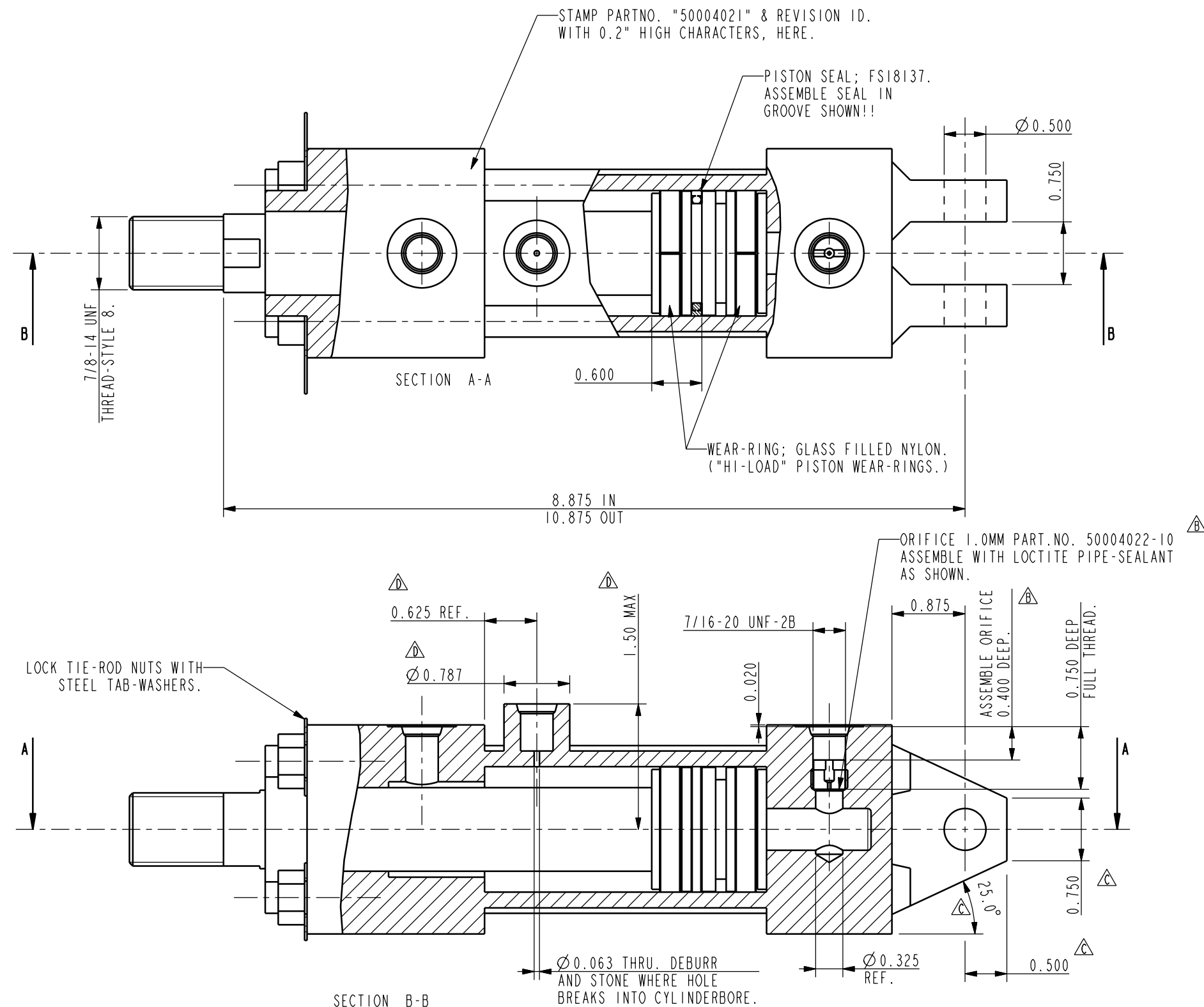





SECTION A-A


ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	SEE TABLE	DRILL PIPE BUSHING SEGMENT
2	1	203216	WEAR BUSH
3	1	SEE TABLE	SCREW CAP-HEX HEAD DRILLED SHANK
4	SEE TABLE	50806-N-C	WASHER, FLAT
6	1	50506	NUT, HEX-SLOTTED 3/8-16
7	1	51433-8	COTTER PIN 0.094 X 1

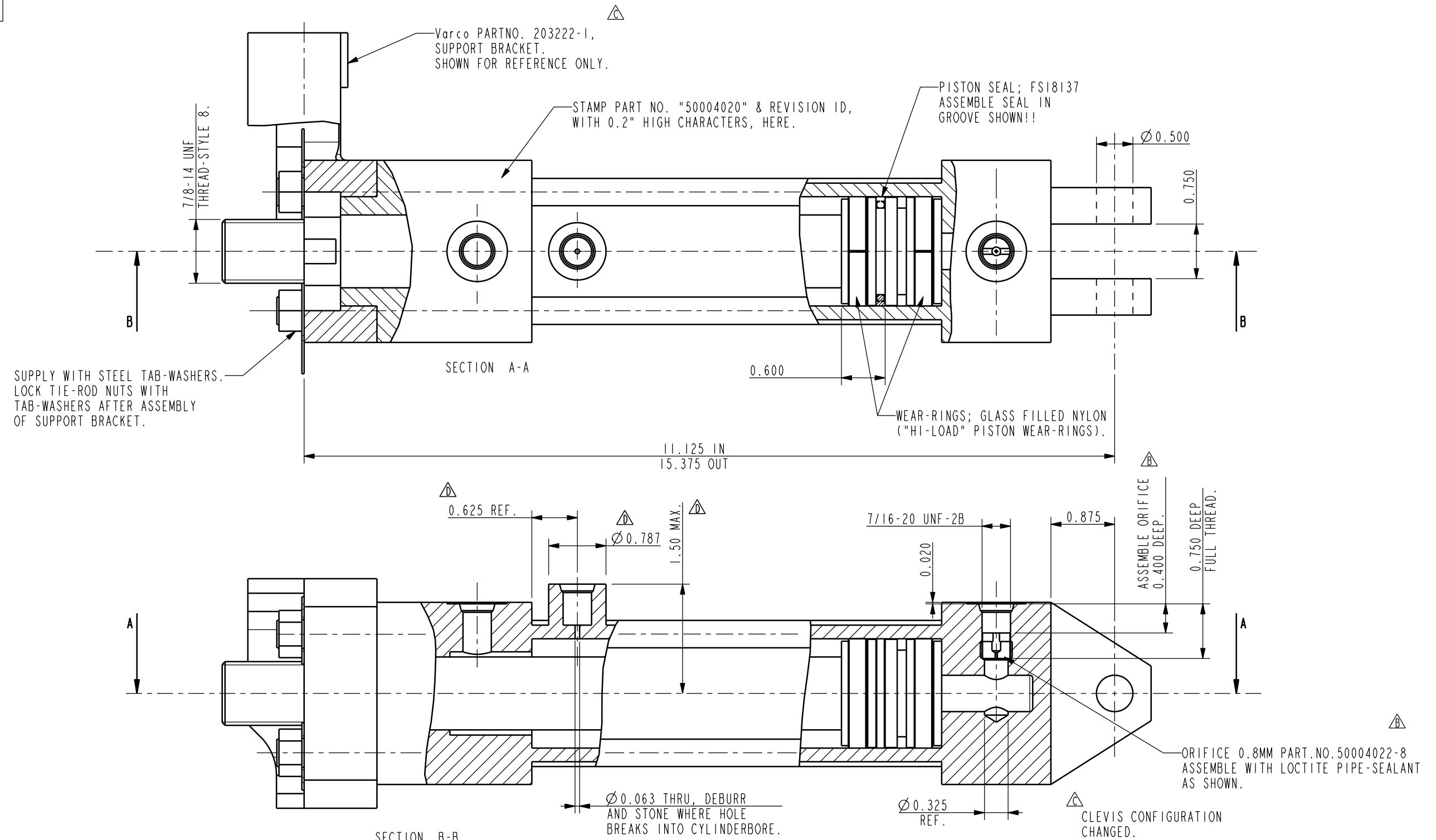
	PART NUMBER ITEM 1	PART NUMBER ITEM 3	QUANTITY ITEM 4
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△	203212Y118	980257-30	2
△	203212Y776	980257-28	3
△	203212Y798	980257-26	2
△	203212Y777	980257-26	2
△	203212Y778	980257-24	2
△	203212Y779	980257-22	2
△	203212Y780	980257-20	2
△	203212Y789	980257-18	1
△	203212Y781	980257-18	2
△	203212Y782	980257-14	1

203212								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>						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						MATERIAL				G				
										F				
										E				
										D	600885	P.D.	09-Sept-02	A.K.
										C	600212	E.F.	08-Mar-01	P.D.
										B	592201	P.D.	03-July-00	A.K.
										A	545001	A.J.	25-Feb-98	P.D.
										REV.	E.C.N	NAME	DATE	CHECKED
APPROVED	J. Tiebout	25-Feb-98	PROJ.					PRO/E FILE NO.: 203212						
CHECKED	P.D.	25-Feb-98	SCALE 1:2					TITLE WEAR BUSH ASSEMBLY						
PREPARED	A.J.	25-Feb-98	UNITS INCH (MM)	WEIGHT 0.000		LBS/	KG	SIZE B		DRAWING NO. 203212		SHEET 1 OF 1		
REDRAWN / REPLACED BY:								REPLACES:						



- NOTES:
- PARKER SERIES 2H CYLINDER.
  - BORE; 1.50"
  - STROKE; 2.00"
  - ROD S.S. 17-4 PH, CHROME PLATED.
  - ROD NO.; 2.
  - ROD-END THREAD-STYLE; 8 (7/8-14 UNF)
-  -CAP MOUNTING STYLE; BB SPECIAL; 0.875"LENGTH.
- PORT SIZE 7/16-20 UNF-"SAE-4 'O'-RING"
  - "Hi-Load" PISTON WITH:
  - PISTON SEAL RINGS; FS18137 (GLASS-FILLED PTFE)
  - PISTON WEAR RING; GLASS FILLED NYLON
- TEST ACCORDING TSEL-0091. 
- SENSE-PORT POSITION 0.120" BEFORE END-OF-STROKE- OUT. 
  - CAP ALL PORTS PRIOR TO PAINTING.
  - STAMP Varco PART NO. & REVISION ID. AT INDICATED LOCATION.

50004021															
PART NO.		QTY.		NEXT ASSY.		FINAL ASSY.		J							
<b>Varco. BJ</b> <b>OIL TOOLS</b> ETTEN-LEUR, THE NETHERLANDS				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 $\frac{250}{\sqrt{\quad}}$				I							
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								H							
								G							
								F							
								E							
								D		600788		P. D.		23-May-02 A. K.	
								C		600613		P. D.		04-Dec-01 A. K.	
								B		583602		P. D.		25-Apr-2K A. K.	
								A		583601		P. D.		11-Feb-00 A. K.	
								REV.		E. C. N		NAME		DATE	
														CHECKED	
APPROVED		NAME		DATE		PROJ.				MATERIAL					
A. K.		11-Feb-00													
CHECKED		A. K.		11-Feb-00		SCALE 1:1									
PREPARED		P. D.		11-Feb-00		UNITS INCH (MM)		WEIGHT		9.687		LBS/		KG	
												PROJ/ FILE NO.:		50004021	
TITLE								SIZE		DRAWING NO.				SHEET	
CYLINDER ASSY' LATCH BX5								C				50004021		OF	
REDRAWN / REPLACED BY:								REPLACES:						I	



NOTES:  
-PARKER SERIES 2H CYLINDER.  
-BORE; 1.5"  
-STROKE; 4.25"  
-ROD S.S. 17-4 PH, CHROME PLATED.  
-ROD NO.; 2.  
-ROD-END THREAD-STYLE; 8 (7/8-14 UNF)

- HEAD MOUNTING STYLE; TB
- CAP MOUNTING STYLE; BB SPECIAL; 0.875"LENGTH.
- PORT SIZE 7/16-20 UNF-"SAE-4 'O'-RING"
- "Hi-Load" PISTON WITH:
  - PISTON SEAL RING; FS-18137 (GLASS-FILLED PTFE)
  - PISTON WEAR RING; GLASS FILLED NYLON
- TEST CYLINDER ACCORDING TSEL-0091.
- SENSE PORT POSITION 0.120" BEFORE END-OF-STROKE OUT.
- CAP ALL PORTS PRIOR TO PAINTING.
- STAMP Varco PART NO. +REVISION ID.. AT INDICATED LOCATION.

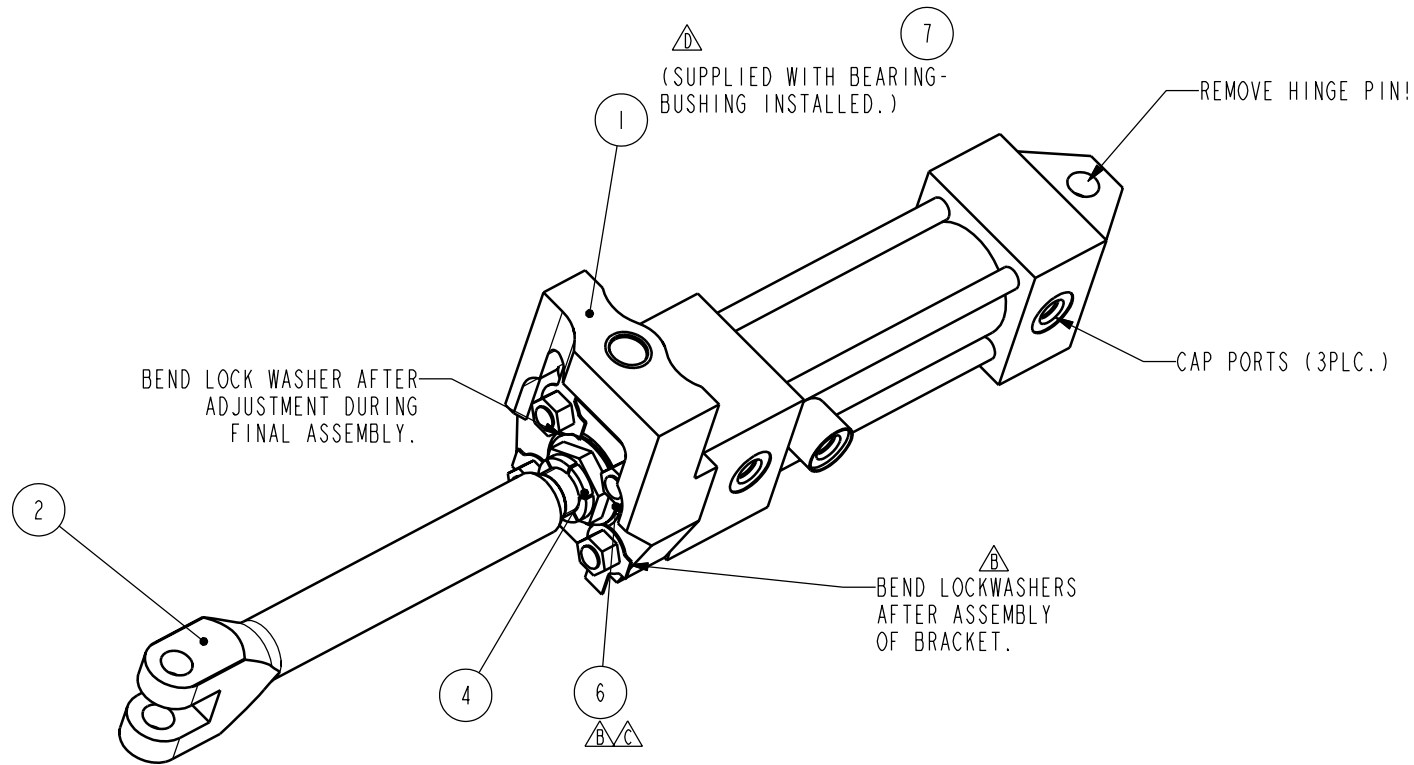
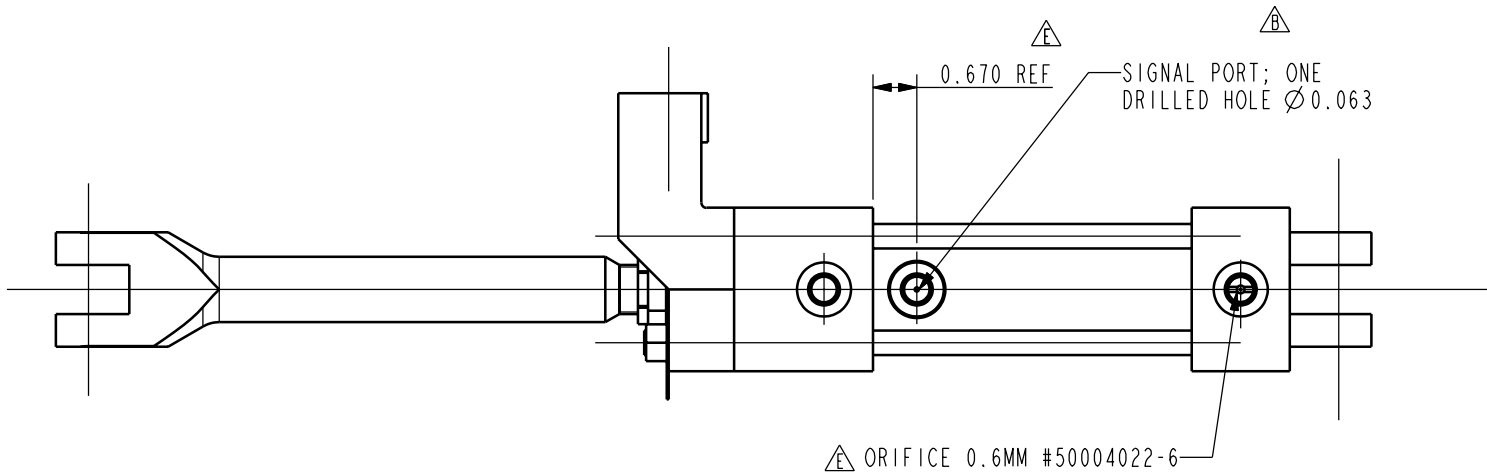
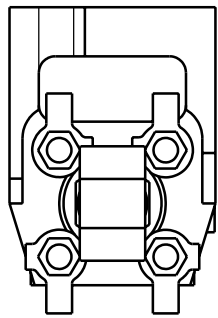
50004020																	
PART NO.		QTY.		NEXT ASSY.		FINAL ASSY.		J									
<div>Varco. <b>BJ</b> <small>TM</small></div> <div>OIL TOOLS</div> <div>ETTEN-LEUR, THE NETHERLANDS</div>				UNLESS OTHERWISE SPECIFIED				I									
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER				TOLERANCES (PER ANSI Y 14.5)				H									
				3 PLACE DECIMAL .XXX ± .010				G									
				2 PLACE DECIMAL .XX ± .03				F									
				1 PLACE DECIMAL .X ± .1				E									
				ANGLES ± .5 DEGREE				D		600788		P. D.		23-May-02		A. K.	
				BREAK SHARP CORNERS .010 ± .005				C		600613		P. D.		04-Dec-01 A. K.			
				MACHINED SURFACES <div>250/✓</div>				B		583602		P. D.		24-Apr-2K A. K.			
NAME		DATE		PROJ.		MATERIAL		A		583601		P. D.		11-Feb-00 A. K.			
APPROVED A. K.		11-Feb-00		SCALE 1:1				REV.		E.C.N		NAME		DATE		CHECKED	
CHECKED A. K.		11-Feb-00															
PREPARED P. D.		11-Feb-00		UNITS INCH (MM)				WEIGHT 11.169		LBS/		KG		PROJ/ FILE NO.:		50004020	
TITLE						SIZE		DRAWING NO.						SHEET			
CYLINDER ASSY' DOORS BX5						C		50004020						1 OF 1			
REDRAWN / REPLACED BY:						REPLACES:											

203318-1  
PART NUMBER

REV. E;  
- ITEM 7 CHANGED TO #203318 (CYLINDER  
WITH REVISED PISTON 1& SIGNALPORT CONFIGURATION.  
- ITEM 5 REMOVED IS NOW SUPPLIED WITH ITEM 7.

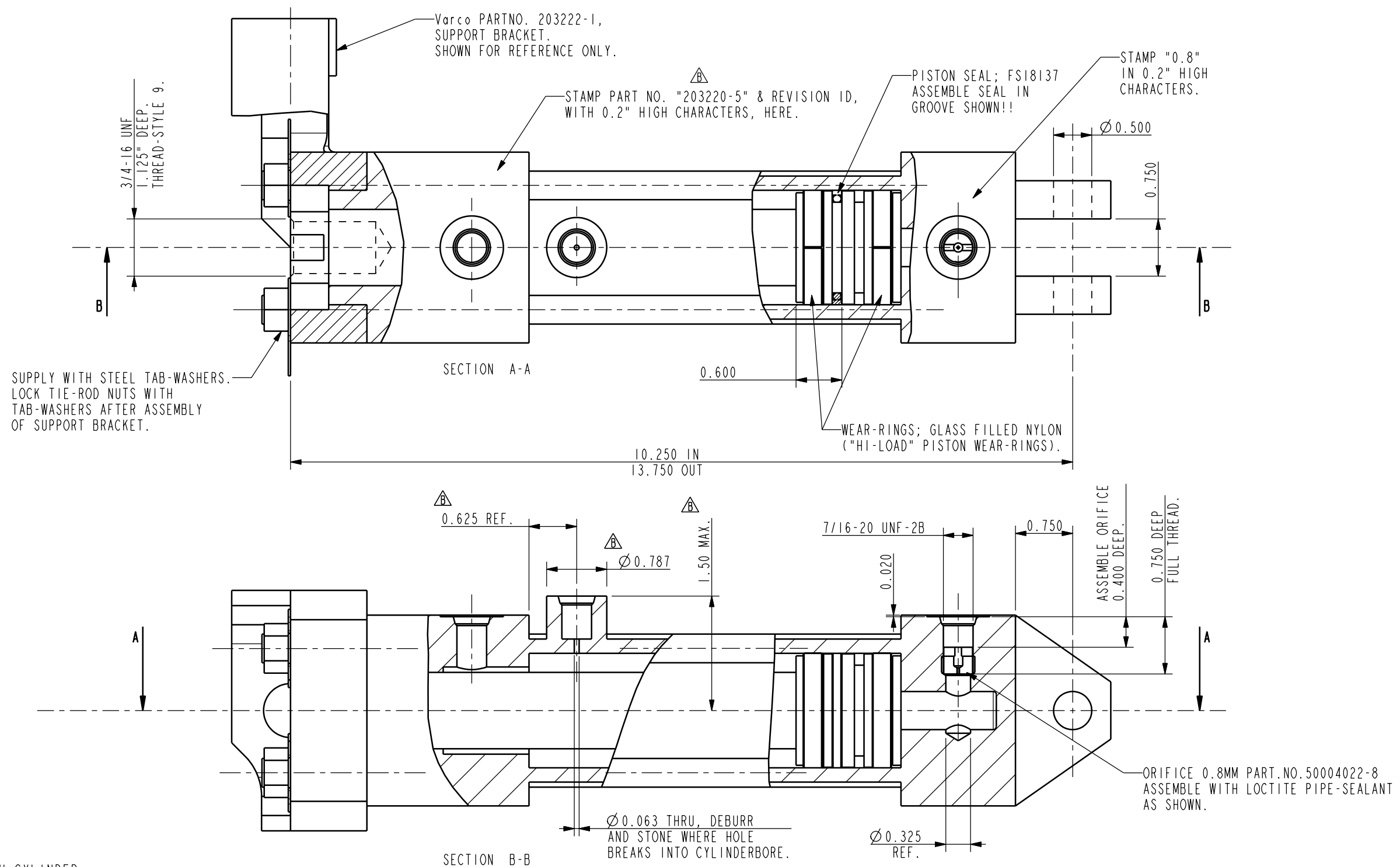
(ITEM 3  
REMOVED)  
(ITEM 5  
REMOVED.)

ITEM	QTY	DWG SIZE	PART NUMBER	DESCRIPTION
1	1		203222-1	SUPPORT BRACKET CYLINDER
2	1		203316	CLEVIS HEAD CYLINDER
4	1		944422-12	FLEXLOC NUT, 3/4"-16 UNF
6	1		203268	LOCK RING 0.75 X 1.50
7	1		203318	CYLINDER DOORS BX 3



3D VIEW  
SCALE 1:2

203318-1	-	-	-	K					
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.	J					
<b>Varco</b> <small>OIL TOOLS</small> ETTEN-LEUR, THE NETHERLANDS				I					
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				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					
APPROVED J.Tiebout 29-Sep-98				F					
CHECKED A.J. 29-Sep-98				E	600623	P.D.	29-Nov-01	A.K.	
PREPARED P.D. 29-Sep-98				D	600121	P.D.	08-Feb-01	A.K.	
UNITS (INCH (MM))				C	587201	P.D.	20-Mar-00	A.K.	
WEIGHT				B	550502	SDe	17-Feb-99	PD	
LBS/				A	550501	P.D.	29-Sep-98	A.J.	
KG				REV.	E.C.N	NAME	DATE	CHECKED	
TITLE				PROJ. FILE NO.: 203318-1					
DOOR CYLINDER ASSY' BX 111				DRAWING NO. 203318-1					
REPLACES:				SHEET 1 OF 1					



NOTES:  
-PARKER SERIES 2H CYLINDER.  
-BORE; 1.5"  
-STROKE; 3.50"  
-ROD S.S. 17-4 PH, CHROME PLATED.  
-ROD NO.; 2.  
-ROD-END THREAD-STYLE; 9 (3/4-16 UNF)

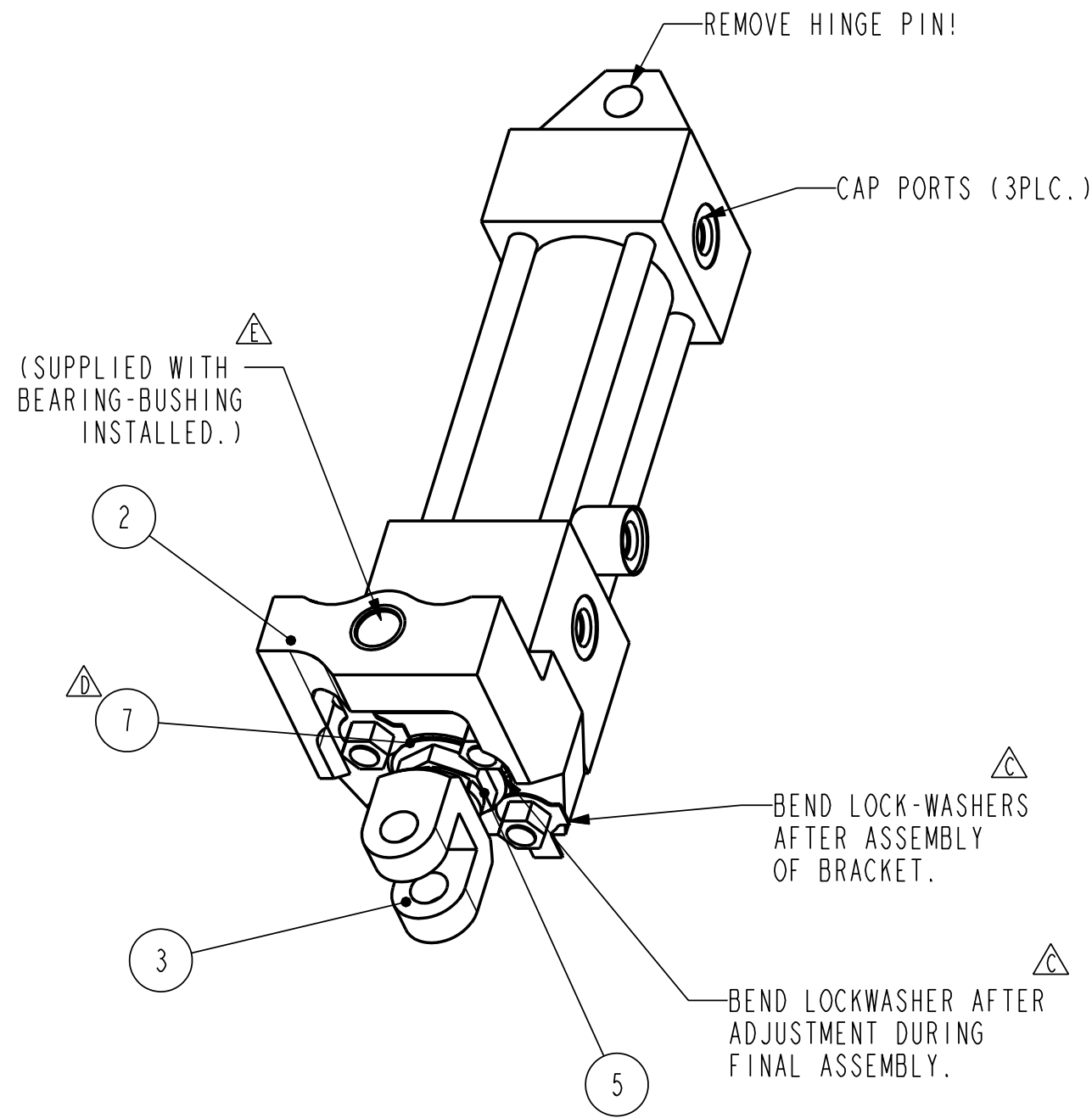
- HEAD MOUNTING STYLE; TB
- CAP MOUNTING STYLE; BB 0.750"LENGTH.
- PORT SIZE 7/16-20 UNF-"SAE-4 'O'-RING"
- "Hi-Load" PISTON WITH:
- PISTON SEAL RING; FS-18137 (GLASS-FILLED PTFE)
- PISTON WEAR RING; GLASS FILLED NYLON
- TEST CYLINDER ACCORDING TSEL-0091
- SENSE PORT POSITION 0.120" BEFORE END-OF-STROKE OUT.
- CAP ALL PORTS PRIOR TO PAINTING.
- STAMP Varco PART NO. +REVISION ID. AT INDICATED LOCATION.

203220-5						K	-	-	-	-
PART NO.		QTY.	NEXT ASSY.		FINAL ASSY.	J	-	-	-	-
<div>Varco. <b>BJ</b>™ OIL TOOLS ETTEN-LEUR, THE NETHERLANDS</div>			<div>UNLESS OTHERWISE SPECIFIED</div> <div>TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .xxx ± .010 2 PLACE DECIMAL .xx ± .03 1 PLACE DECIMAL .x ± .1 ANGLES ± .5 DEGREE</div> <div>BREAK SHARP CORNERS .010 ± .005</div> <div>MACHINED SURFACES <math>\sqrt{\phantom{x}}</math></div>			I	-	-	-	-
<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>						H	-	-	-	-
						G	-	-	-	-
						F	-	-	-	-
						E	-	-	-	-
			D	-	-	-	-			
			C	-	-	-	-			
			B	600699	P. D.	23-Nov-02	A. K.			
			A	600614	P. D.	29-Nov-01	A. K.			
NAME		DATE	PROJ.		MATERIAL	REV.	E. C. N	NAME	DATE	CHECKED
APPROVED	A. K.	29-Nov-01								
CHECKED	A. K.	29-Nov-01	SCALE 1:1							
PREPARED	P. D.	29-Nov-01	UNITS INCH (MM)							
WEIGHT				11.169	LBS/	KG				
TITLE					SIZE	DRAWING NO.				SHEET
CYLINDER DOORS BX 4					C	203220-5				I
REDRAWN / REPLACED BY:					REPLACES 203220					OF
										I

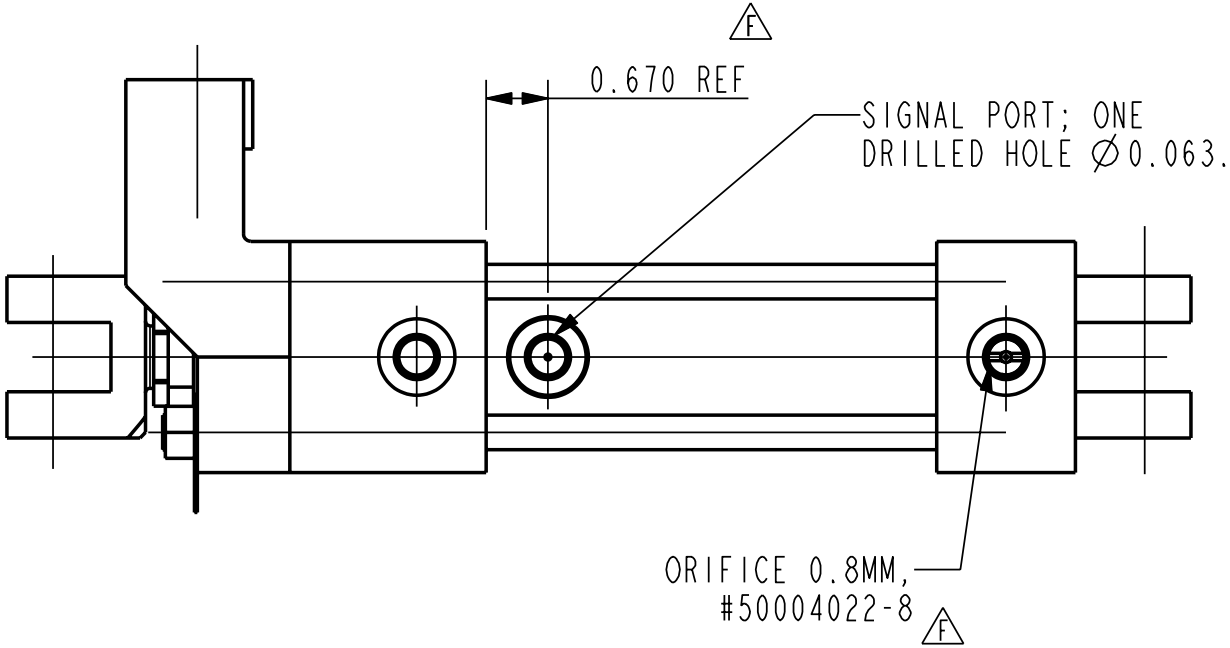


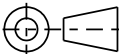
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PART NUMBER

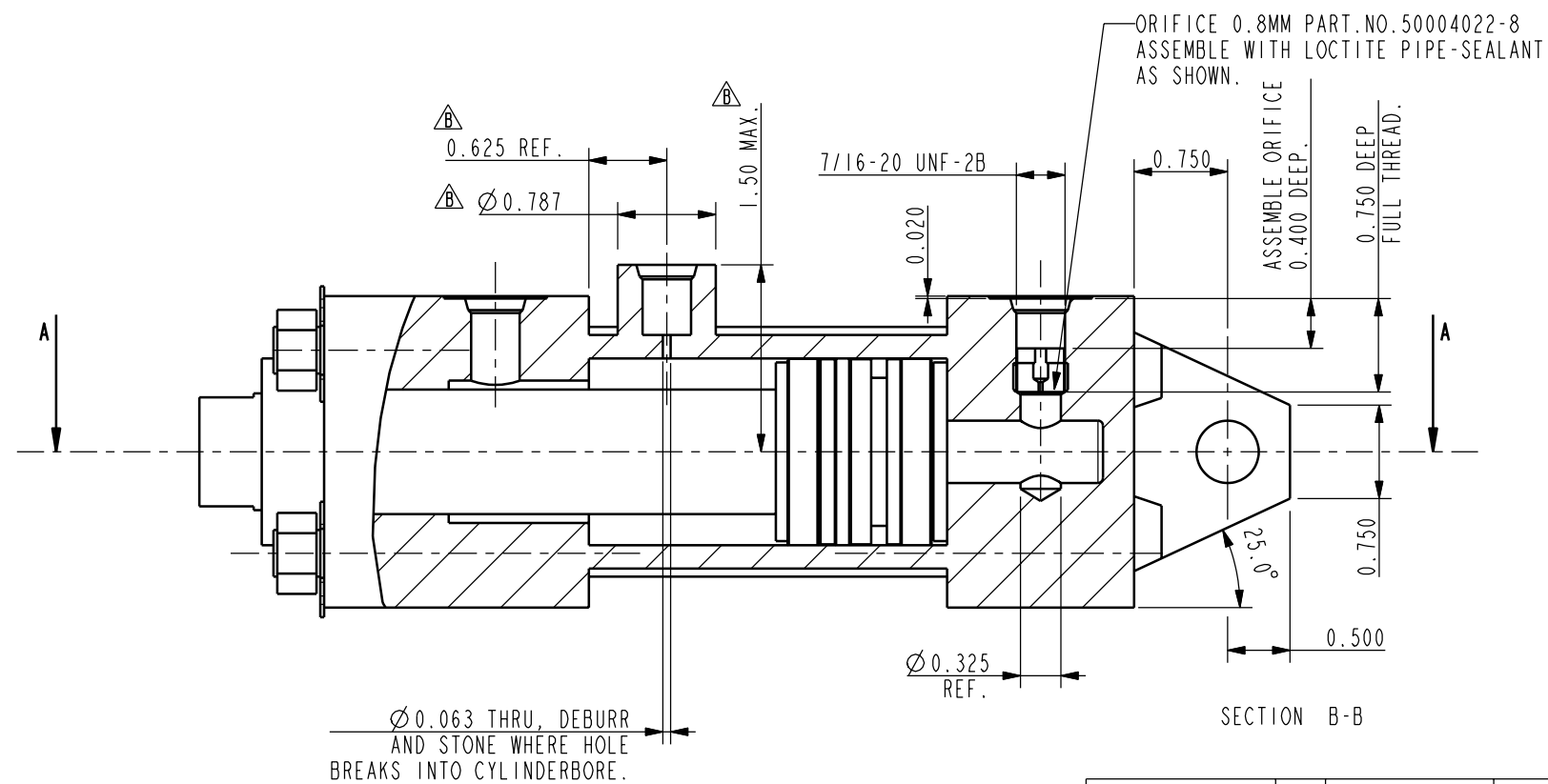
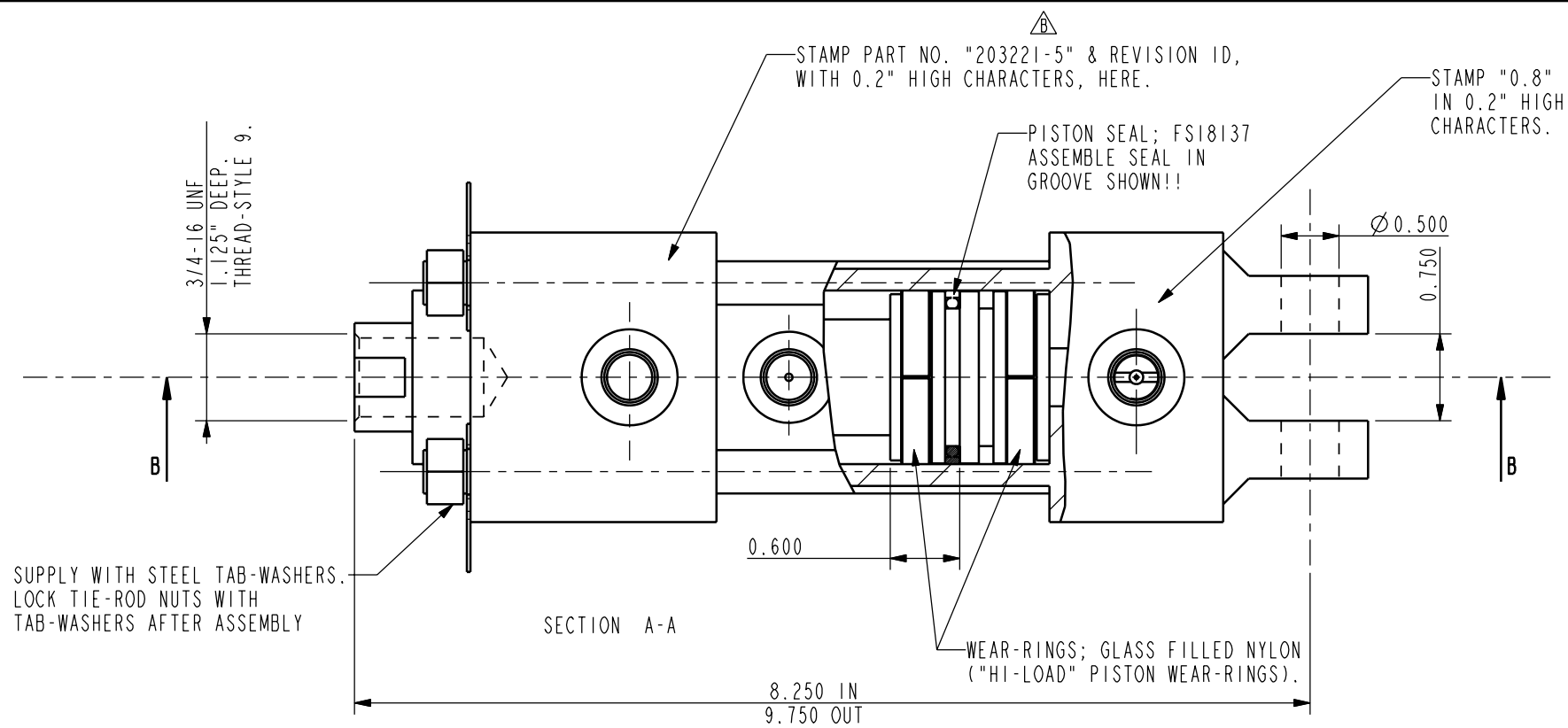
REF F:  
- ITEM 1 CHANGED TO #203220-5 (CYLINDER WITH REVISED PISTON & BARRE PORT CONFIGURATION)  
- ITEM 6 REMOVED. IS NOW SUPPLIED WITH ITEM 1.



	ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
△	1	1		203220-5	CYLINDER DOORS BX 4
△	2	1		203222-1	SUPPORT BRACKET CYLINDER
△ (ITEM 4 REMOVED)	3	1		203223	CLEVIS HEAD CYLINDER
△ (ITEM 6 REMOVED)	5	1		944422-12	FLEXLOC NUT, 3/4"-16 UNF
△ △	7	1		203268	LOCK RING 0.75 X 1.50



203220-1					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>				UNLESS OTHERWISE SPECIFIED		I				
				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		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				BREAK SHARP CORNERS .010 ± .005		G				
				MACHINED SURFACES 250✓		F	600613	P.D.	04-Dec-01	A.K.
						E	600120	P.D.	09-Febr-01	A.K.
						D	587201	P.D.	20-Mar-00	A.K.
						C	545003	SBe	12-Jan-99	PD
<div>NAME</div> <div>DATE</div> <div>PROJ. </div>				MATERIAL		B	545002	SBe	23-Oct-98	AJ
						A	545001	SBe	11-May-98	AJ
						REV.	E.C.N	NAME	DATE	CHECKED
APPROVED	J. Tiebout	11-May-98	SCALE 1:2			PRO/E FILE NO.: 203220-1				
CHECKED	AJ	11-May-98	UNITS INCH (MM)	WEIGHT	LBS/	KG				
PREPARED	SBe	11-May-98								
TITLE				SIZE	DRAWING NO.				SHEET	
DOOR CILINDER ASSY' BX FRAME IV				B	203220-1				1	
REDRAWN / REPLACED BY:				REPLACES:						



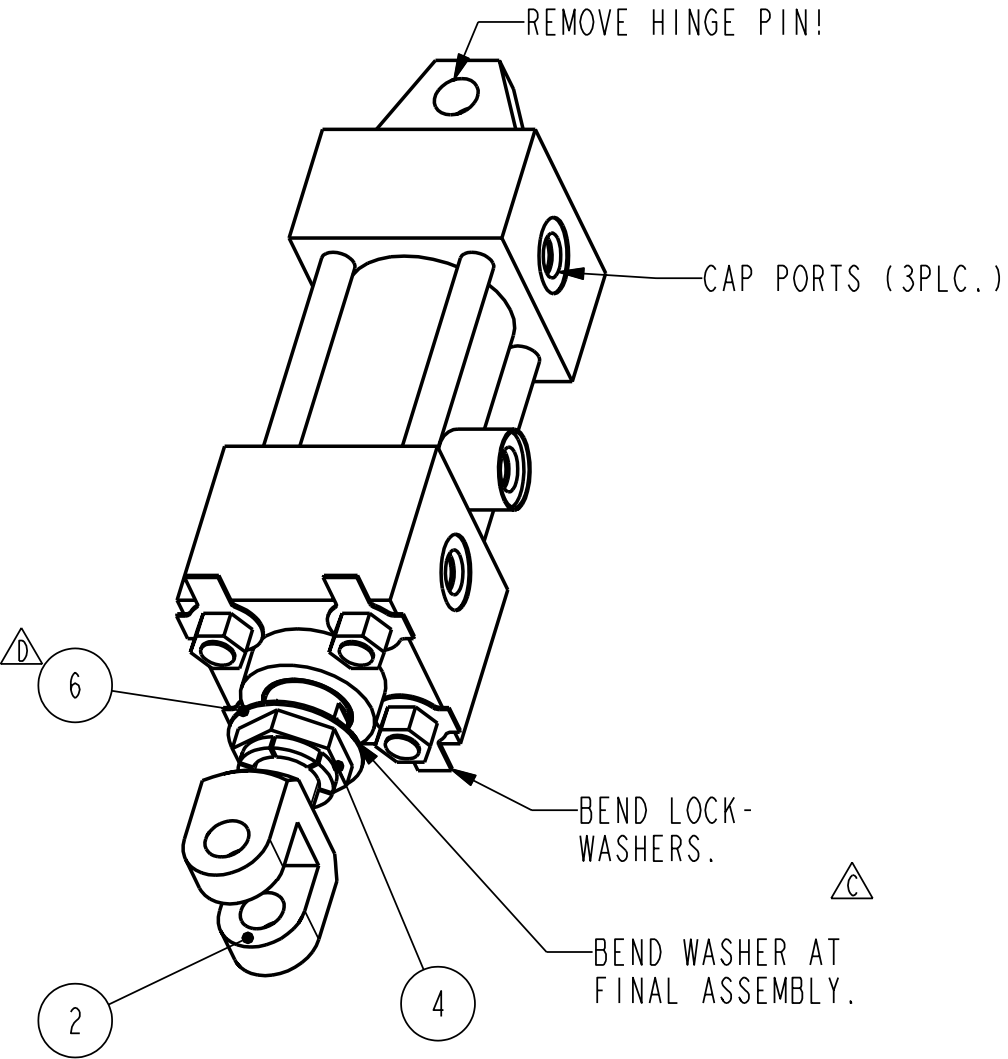
- NOTES:
- PARKER SERIES 2H CYLINDER.
  - BORE; 1.5"
  - STROKE; 1.50"
  - ROD S.S.17-4 PH, CHROME PLATED.
  - ROD NO.; 2.
  - ROD-END THREAD-STYLE; 9 (3/4-16 UNF)

- △
- △
- CAP MOUNTING STYLE; BB 0.750"LENGTH.
  - PORT SIZE 7/16-20 UNF-"SAE-4 'O'-RING"
  - "Hi-Load" PISTON WITH:
  - PISTON SEAL RING; FS-18137 (GLASS-FILLED PTFE)
  - PISTON WEAR RING; GLASS FILLED NYLON
  - TEST CYLINDER ACCORDING TSEL-0091
  - SENSE PORT POSITION 0.120" BEFORE END-OF-STROKE OUT.
  - CAP ALL PORTS PRIOR TO PAINTING.
  - STAMP Varco PART NO. +REVISION ID. AT INDICATED LOCATION.

203221-5											K							
PART NO.			QTY.		NEXT ASSY.		FINAL ASSY.				J							
<div>Varco. <b>BJ</b>™</div> <div>OIL TOOLS</div> <div>ETTEN-LEUR, THE NETHERLANDS</div>					UNLESS OTHERWISE SPECIFIED							I						
<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>					TOLERANCES (PER ANSI Y 14.5)							H						
					3 PLACE DECIMAL .xxx ± .010							G						
					2 PLACE DECIMAL .xx ± .03							F						
					1 PLACE DECIMAL .x ± .1							E						
					ANGLES ± .5 DEGREE							D						
					BREAK SHARP CORNERS .010 ± .005							C						
					MACHINED SURFACES													
					<div>250/</div>													
	NAME	DATE	PROJ.			MATERIAL						B	600699	P.D.	23-May-02	A.K.		
APPROVED	A. K.	29-Nov-01										A	600614	P.D.	29-Nov-01	A.K.		
CHECKED	A. K.	29-Nov-01	SCALE 1:1									REV.	E.C.N	NAME	DATE	CHECKED		
PREPARED	P. D.	29-Nov-01	UNITS INCH (MM)			WEIGHT	11.169	LBS/	KG									
TITLE						SIZE		DRAWING NO.							SHEET			
CYLINDER LATCH BX 3 & 4						C		203221-5							OF 1			
REDRAWN / REPLACED BY:						REPLACES 203221												

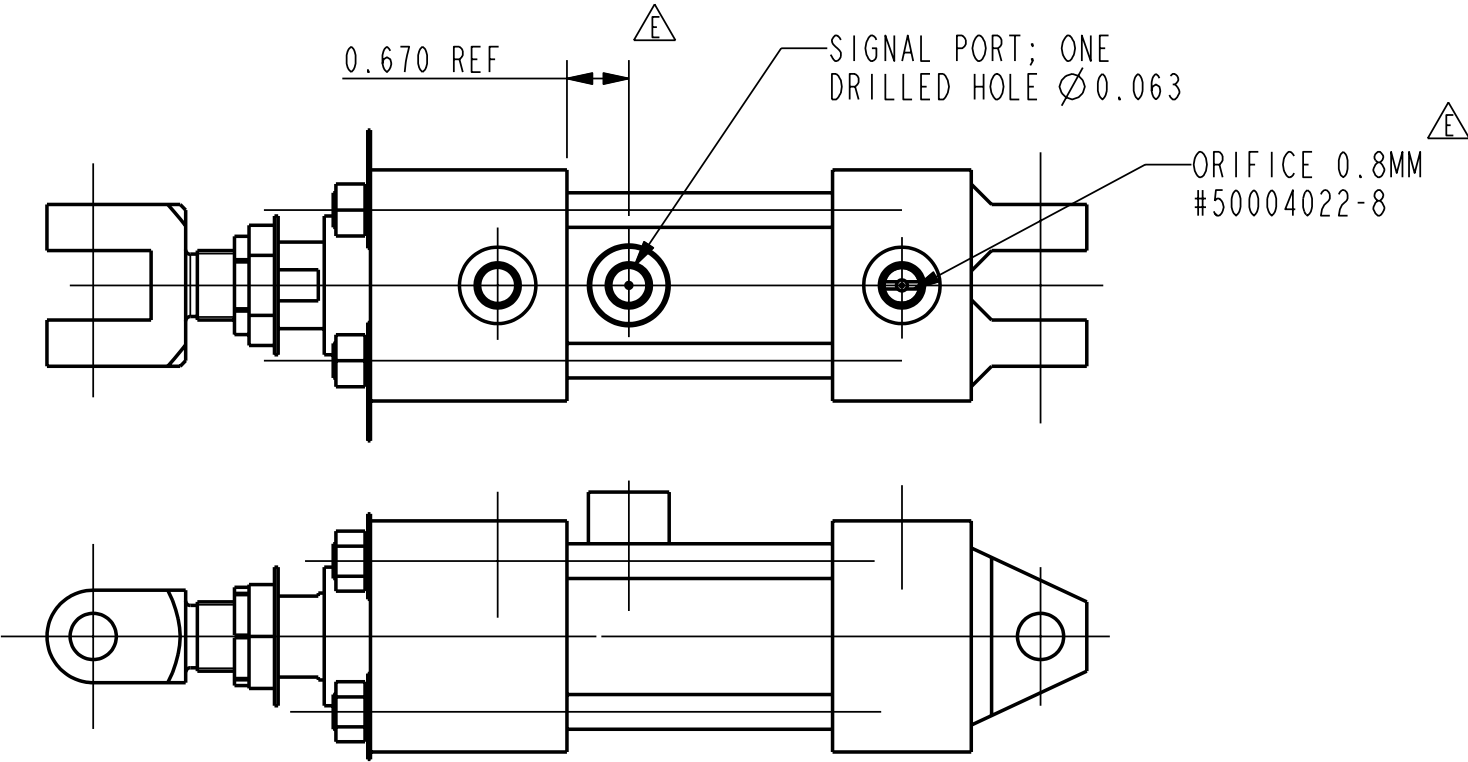
203221-1
PART NUMBER

REV E:  
- ITEM 1 CHANGED TO #203221-5 (CYLINDER  
WITH REVISED PISTON & BARRELPORT CONFIGURATION.)  
- ITEM 5 REMOVED, IS NOW SUPPLIED WITH ITEM 1.



△ (ITEM 3  
REMOVED)  
△ (ITEM 5  
REMOVED)  
△ △

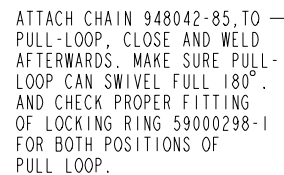
ITEM	QTY	DWG SIZE	PART NUMBER	DESCRIPTION
1	1		203221-5	CYLINDER LATCH BX 3 & 4
2	1		203223	CLEVIS HEAD CYLINDER
4	1		944422-12	FLEXLOC NUT, 3/4"-16 UNF
6	1		203268	LOCK RING 0.75 X 1.50




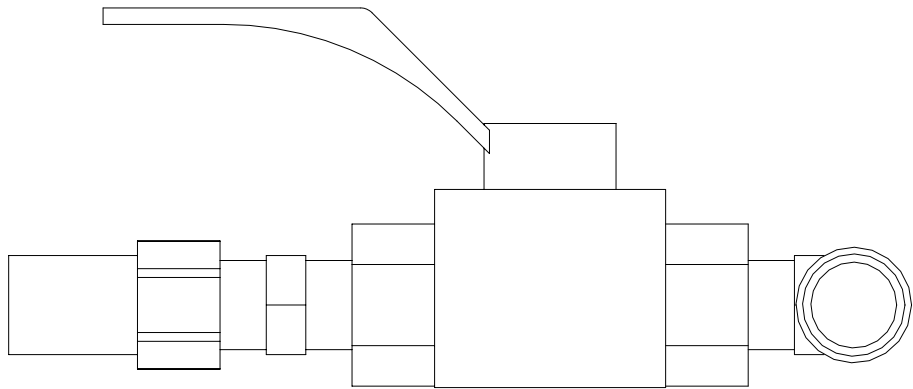
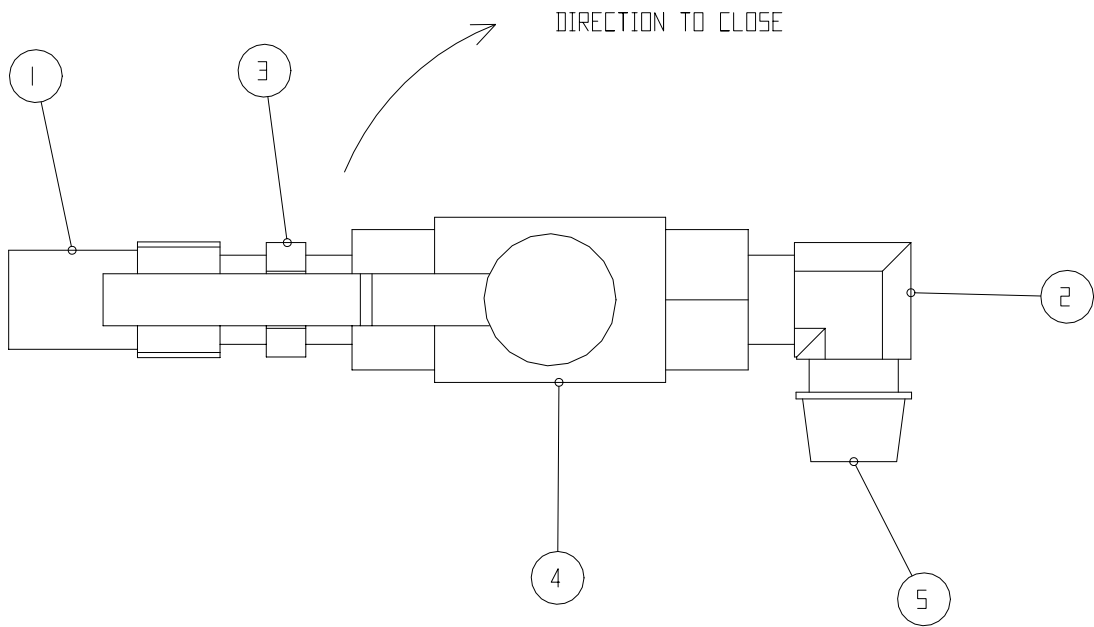
203221-1										K													
PART NO.				QTY.		NEXT ASSY.		FINAL ASSY.		J													
<div>Varco. BJ™ OIL TOOLS</div> <div>ETTEN-LEUR, THE NETHERLANDS</div>						UNLESS OTHERWISE SPECIFIED  TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE  BREAK SHARP CORNERS .010 ± .005  MACHINED SURFACES 250✓						I											
												H											
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												F											
												E		600613		P.D.		04-Dec-01		A.K.			
												D		587201		P.D.		20-Mar-00		A.K.			
												C		545003		SBe		12-Jan-99		PD			
		NAME		DATE		PROJ.		MATERIAL						B		545002		SBe		23-Oct-98		AJ	
APPROVED		J.Tiebout		11-May-98										A		545001		SBe		11-May-98		AJ	
CHECKED		AJ.		11-May-98		SCALE 1:2								REV.		E.C.N		NAME		DATE		CHECKED	
PREPARED		P.D.		11-May-98		UNITS INCH (MM)								WEIGHT		LBS/		KG					
TITLE						SIZE						DRAWING NO.						SHEET					
LATCH CILINDER ASSY' BX III & IV						B						203221-1						OF 1					
REDRAWN / REPLACED BY:						REPLACES:																	

PART NUMBER 50004036-1

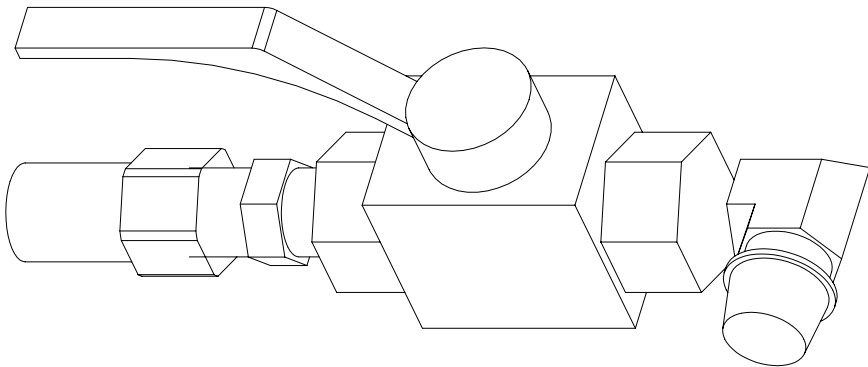
ITEM	QTY	DWG SIZE	PART NUMBER	DESCRIPTION
1	1		203237	END CAP BUSHING LOCK
2	1		203239	PULL LOOP
3	1		203240	LOCK RING
4	1		980250	COMPRESSION SPRING D-210
5	1		50004036	LOCK SHAFT BUSHING LOCK
6	1		59000298-1	LOCKING RING, D=30mm, d= 3mm
7	1		948042-85	MACH. CHAIN STR. #3 LINK 5 LINKS LONG
8	1		948051-2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



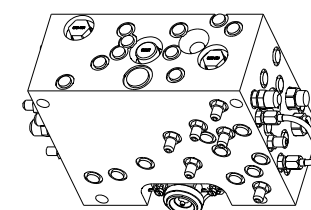
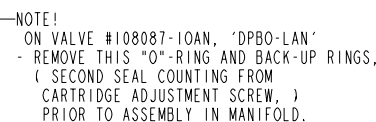
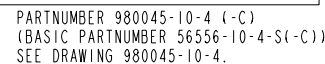
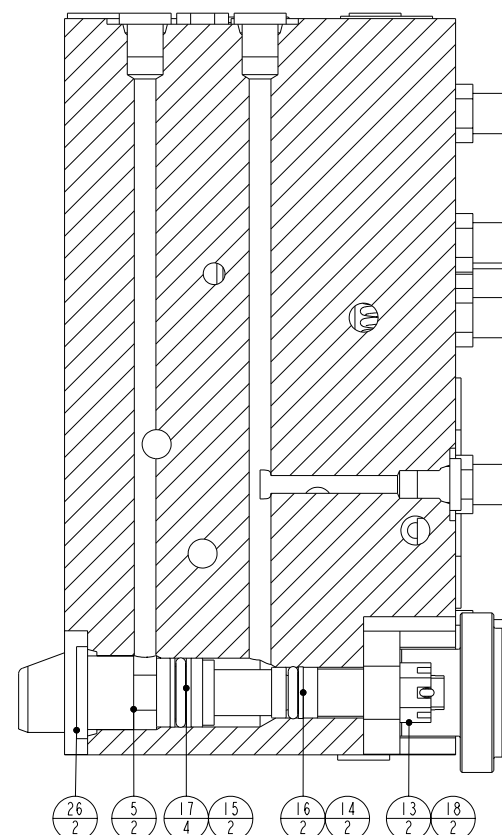
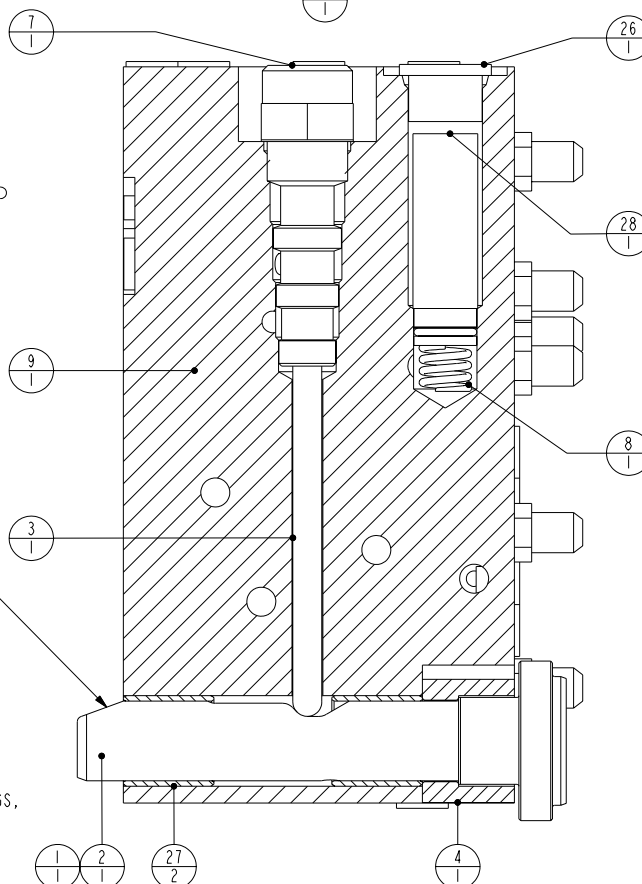
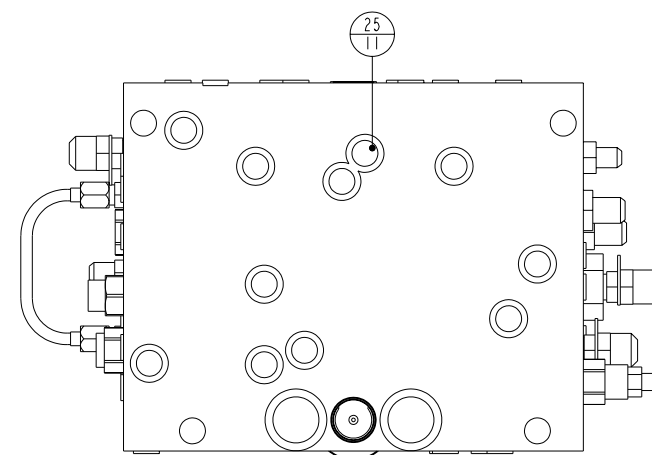
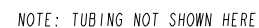
50004036-I											
PART NO.		QTY.		NEXT ASSY.		FINAL ASSY.		J		I	
<b>Vareo. BJ.</b> <small>CIL TOOLS</small> ETTEN-LEUR, THE NETHERLANDS				UNLESS OTHERWISE SPECIFIED  TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX $\pm$ .010 2 PLACE DECIMAL .XX $\pm$ .03 1 PLACE DECIMAL .X $\pm$ .5 DEGREE ANGLES  BREAK SHARP CORNERS .010 $\pm$ .005 MACHINED SURFACES $\sqrt{32}$							
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											
NAME		DATE		PROJ.				MATERIAL		B	
APPROVED		A. K.		25-Jan-00						700143 L. S.	
CHECKED		A. K.		25-Jan-00		SCALE 1:1				A 536801 P. D.	
PREPARED		P. D.		25-Jan-00		UNITS (INCH OR MM)		WEIGHT		29 JUN 05 P. D.	
								LBS/		A. K.	
								KG		CHECKED	
TITLE								SIZE		DRAWING NO.	
										50004036-I	
REDRAWN / REPLACED BY:								REPLACES:		SHEET 1 OF 1	



ITEM	QTY	DWG SIZE	PART NUMBER	DESCRIPTION
1	1		55909-6-6	MALE QUICK DISCONNECT FD45 #6
2	1		56702-6-6-5	KNEE 3/8" NPT
3	1		56703-6-6-5	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><div><div>Vareco</div><div>OVER 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				I			
				TOLERANCES (PER ANSI Y 14.5)				H			
				3 PLACE DECIMAL .XXX ± .010				G			
				2 PLACE DECIMAL .XX ± .05				F			
				1 PLACE DECIMAL .X ± .1				E			
				ANGLES ± 5 DEGREE				D			
				BREAK SHARP CORNERS .010 ± .005				C			
				MACHINED SURFACES 250 ✓				B	545002	A.J.	18-Nov-98 P.D.
				MATERIAL				A	545001	A.J.	28-Oct-98 P.D.
	NAME	DATE	PROJ.								
APPROVED	J.Tiebout	28-Oct-98									
CHECKED	P.D.	28-Oct-98	SCALE 1:1								
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:				



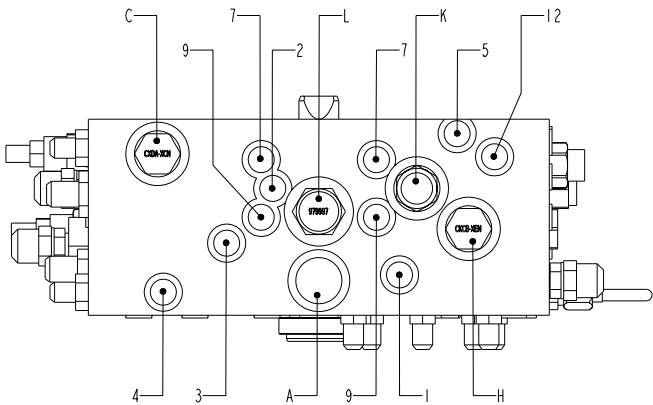
NOTE:  
TORQUE VALUES FOR CARTRIDGES:  
-SUN SERIES I 45-50 Nm - 33-37 ft/lbs  
-HYDRAFORCE 10 SIZE 34 Nm - 25 ft/lbs

3D VIEW  
SCALE 1:4

## TEST ACC. TSEL 0139

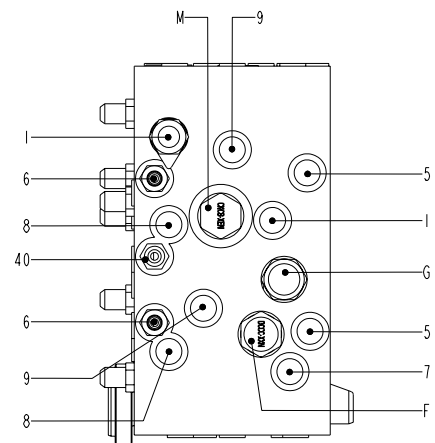
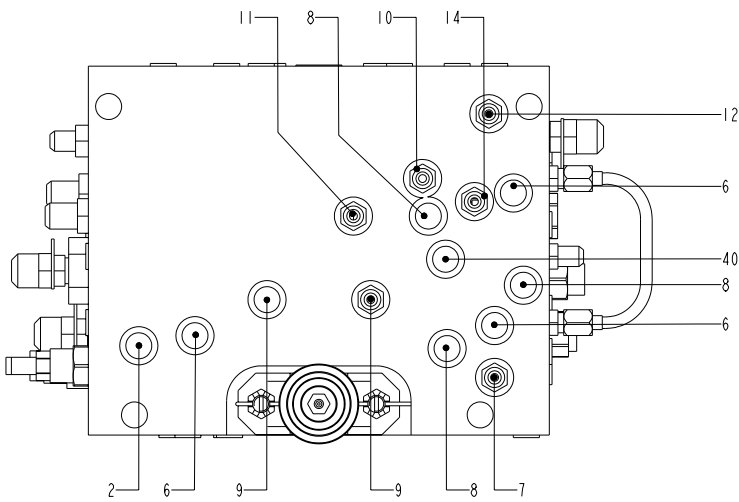
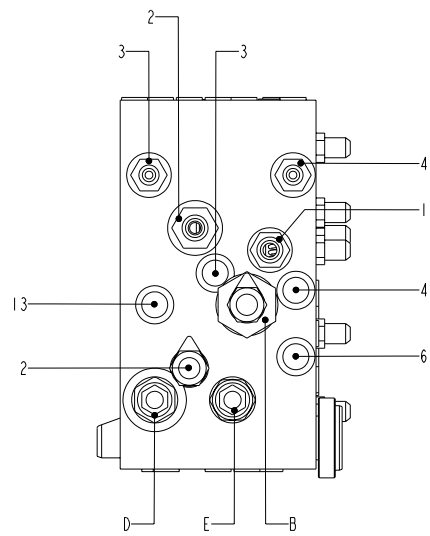
MANIFOLD ASSEMBLY FOR USE ON BX FRAMES 3, 4-50, 4-75 AND 5 FITTED WITH  
"CHECK-VALVE" RETRO-FIT KIT #203270-13.  
MANIFOLD NOT TO BE FITTED WITHOUT THIS.  
SEE VARCO BJ BULLETIN #73

PARTNUMBER	50004048-1			UNLESS OTHERWISE SPECIFIED		 [A Varco Company]	
MATERIAL	-			TOLERANCES (PER ANSI Y 14.5) 2 PLACE DECIMAL .xxx ± .010 3 PLACE DECIMAL .xx ± .003 1 PLACE DECIMAL .x ± .1 ANGLES ± .5 DEGREE		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	
SURF. FINISH / PAINTSPEC.	-			BREAK SHARP CORNERS .010 ± .005			
COLOR	-			MACHINED SURFACES $\frac{250}{\sqrt{\text{in}}}$			
WEIGHT	86.8 Lbs	39.4 kg			TORCHCUT SURFACES $\frac{1000}{\sqrt{\text{in}}}$		
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT		SCALE 1:2	PROJ.
NAME	J.W.	NAME	N.D.K.	REV.	A	THIS DOCUMENT IS DMS CONTROLLED	
DATE	12-Jul-04	DATE	04-Aug-04			UNITS INCH (mm)	
		E.C.N.	601452				
TITLE				SIZE	DRAWING NO.	SHEET 1 OF 1	
Manifold, Ass'y for BX III-IV-V with latch valve				D	50004048-1		

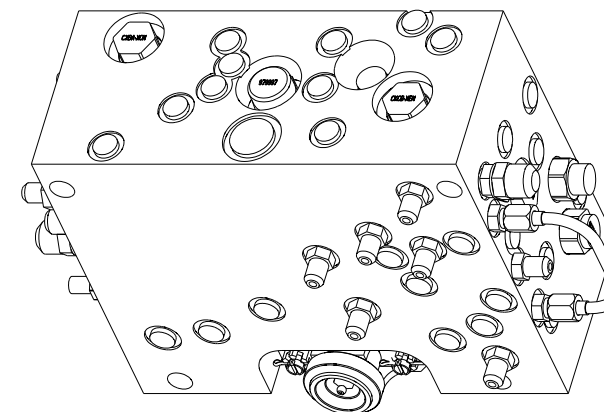
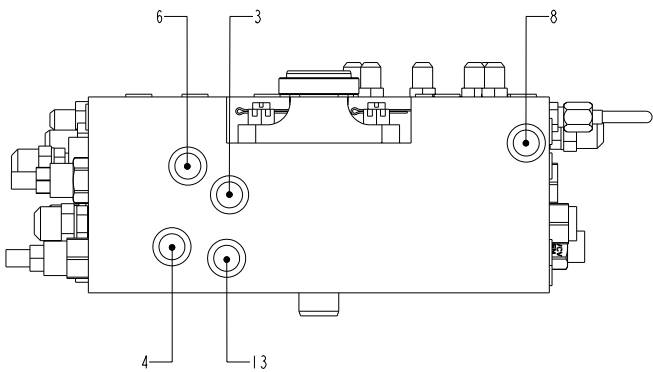
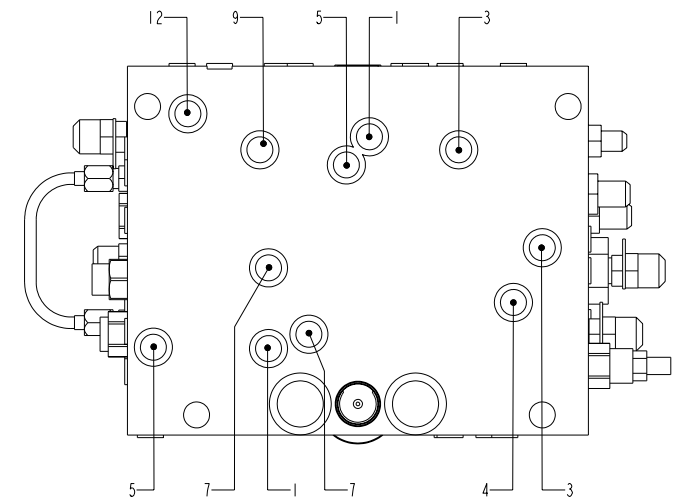


1= P	A= FILTERELEMENT,	ART.NR. 979796-25
2= T	B= FILTERELEMENT,	ART.NR. 979796-25
3= XP	C= CXDA-XCN CARTRIDGE	ART.NR. 94536-130N
4= FLOAT	D= PRDB-LBN CARTRIDGE	ART.NR. 109858-1BN
7= DOOR OUT (OPEN)	E= DPBO-LAN CARTRIDGE	ART.NR. 108087-10AN
9= DOOR IN (CLOSE)	F= DCCC-XN CARTRIDGE	ART.NR. 979880-8
10= SIGNAL DOOR	G= CVCV-XEN CARTRIDGE	ART.NR. 107029-175N
11= LATCH OUT (OPEN)	H= CKCB-XEN CARTRIDGE	ART.NR. 93547-1B75N
12= SIGNAL LATCH	K= CVCV-XEN CARTRIDGE	ART.NR. 107029-175N
14= LATCH IN (CLOSE)	L= PD10-40-NS-110 CARTRIDGE (HYDRAFORCE)	ART.NR. 979997
40= TO LATCH VALVE	M= CKCB-XEN CARTRIDGE	ART.NR. 93547-1B75N

FOR NUMBERS AND SYMBOLS SEE ALSO SCHEMATIC 203270-32






NOTE: TUBING NOT SHOWN HERE



3D-VIEW

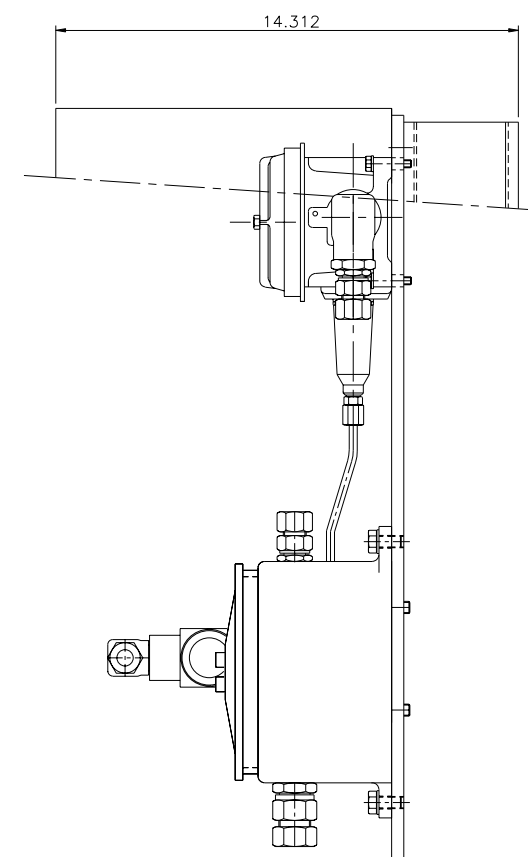
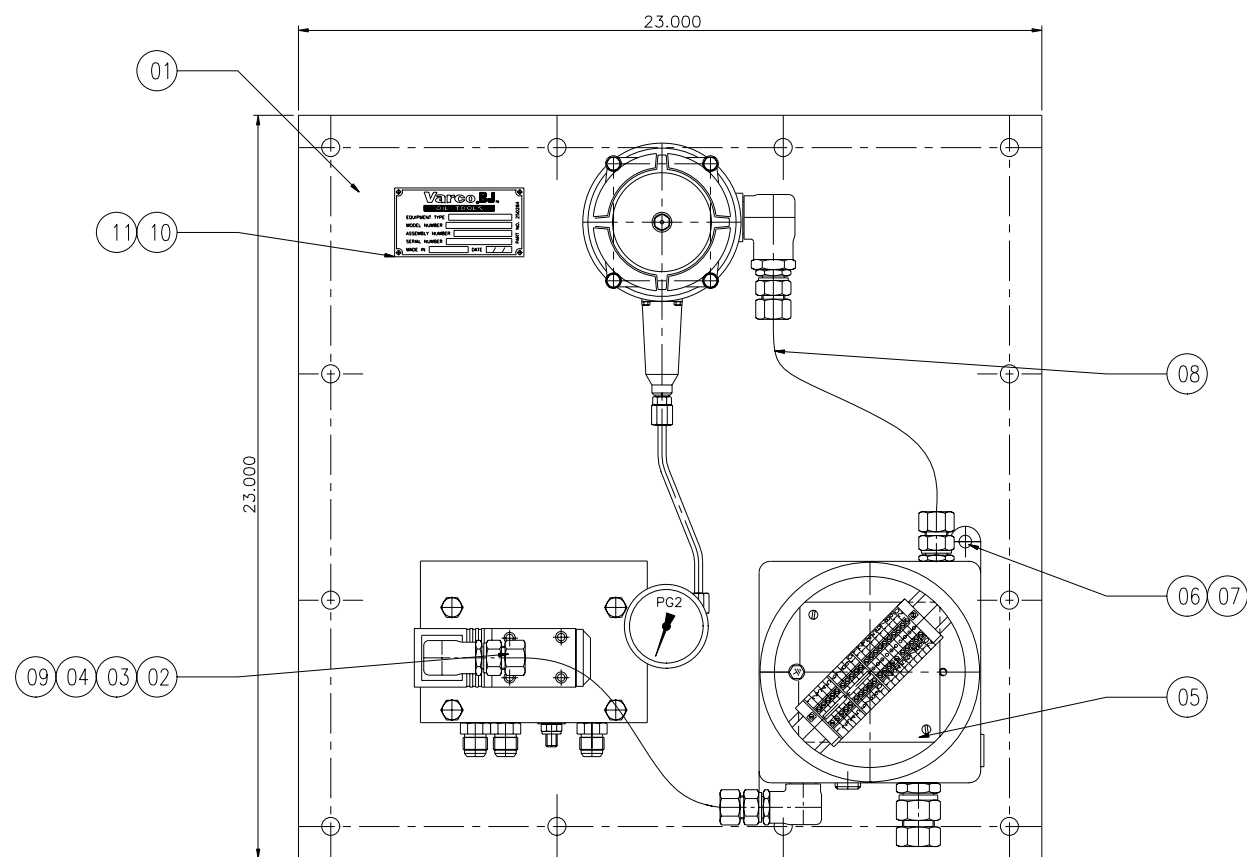
NOTE: IMPRESSION STAMPED LETTERING NOT SHOWN!

PARTNUMBER	50004048-1		UNLESS OTHERWISE SPECIFIED		<b>Varco BJ.</b> A Varco Company	
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 INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER	
COLOR	-		MACHINED SURFACES 			
WEIGHT	86.8	Lbs	39.4	kg	TORNCUT SURFACES 	
ORIGINAL DOCUMENT	LATEST REVISION		DO NOT SCALE DOCUMENT		SCALE 1:2	PROJ.
NAME	J.W.	NAME	N. d. K.	REV.	THIS DOCUMENT IS DWS CONTROLLED	
DATE	13-Jul-04	DATE	04-Aug-04	A		
		E.C.N.	601452		UNITS INCH (mm)	
TITLE				SIZE	DRAWING NO.	
Manifold, Ass'y for BX III-IV-V with latch valve				D	50004048-1	
					SHEET OF 2	






13			14		15	16
ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION		
01	1	—	204650	MOUNTING PLATE ASSY BX EEXD		
02	1	—	112554-D2	ATOS 4/2 SINGLE SOLENOID VALVE EEXD 24V/DC		
03	4	—	50167-50-P04	SCREW-CAP SOCKET HEAD M5x50		
04	1	—	83444-01	GLAND EEXD/EEEX, TYPE-501/453/UNIV/0 M20x1.5		
05	1	—	204655-2	JUNCTION BOX EEXD, 2xM20 & 1xM25 GLAND		
06	2	—	50006-6-C8	SCREW, CAP-HEX HEAD 3/8"-1.6 UNC-2A		
07	2	—	50906-C	3/8" WASHER, LOCK-REGULAR		
08	2 m.	—	56625-1.5-03	ELECTRIC CABLE, 3 CONDUCTORS AREA 1.5 mm <sup>2</sup>		
09	1	—	79978-M20-BR	90° ADAPTER EEEX/EEEX M20, MAT. BRASS		
10	1	—	250284	GENERIC NAME PLATE FOR ALL OIL TOOLS PRODUCTS		
11	4	—	53301-4-4	SCREW, DRIVE - TYPE U		

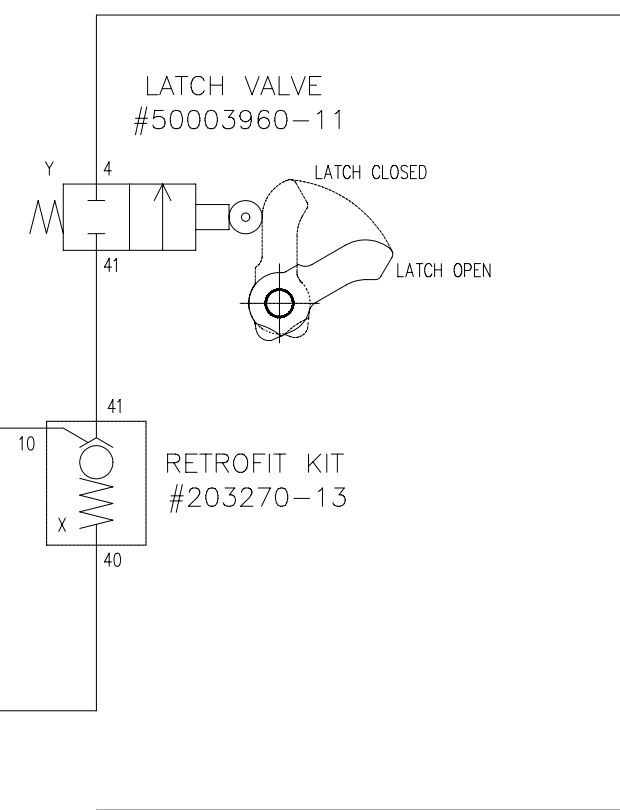
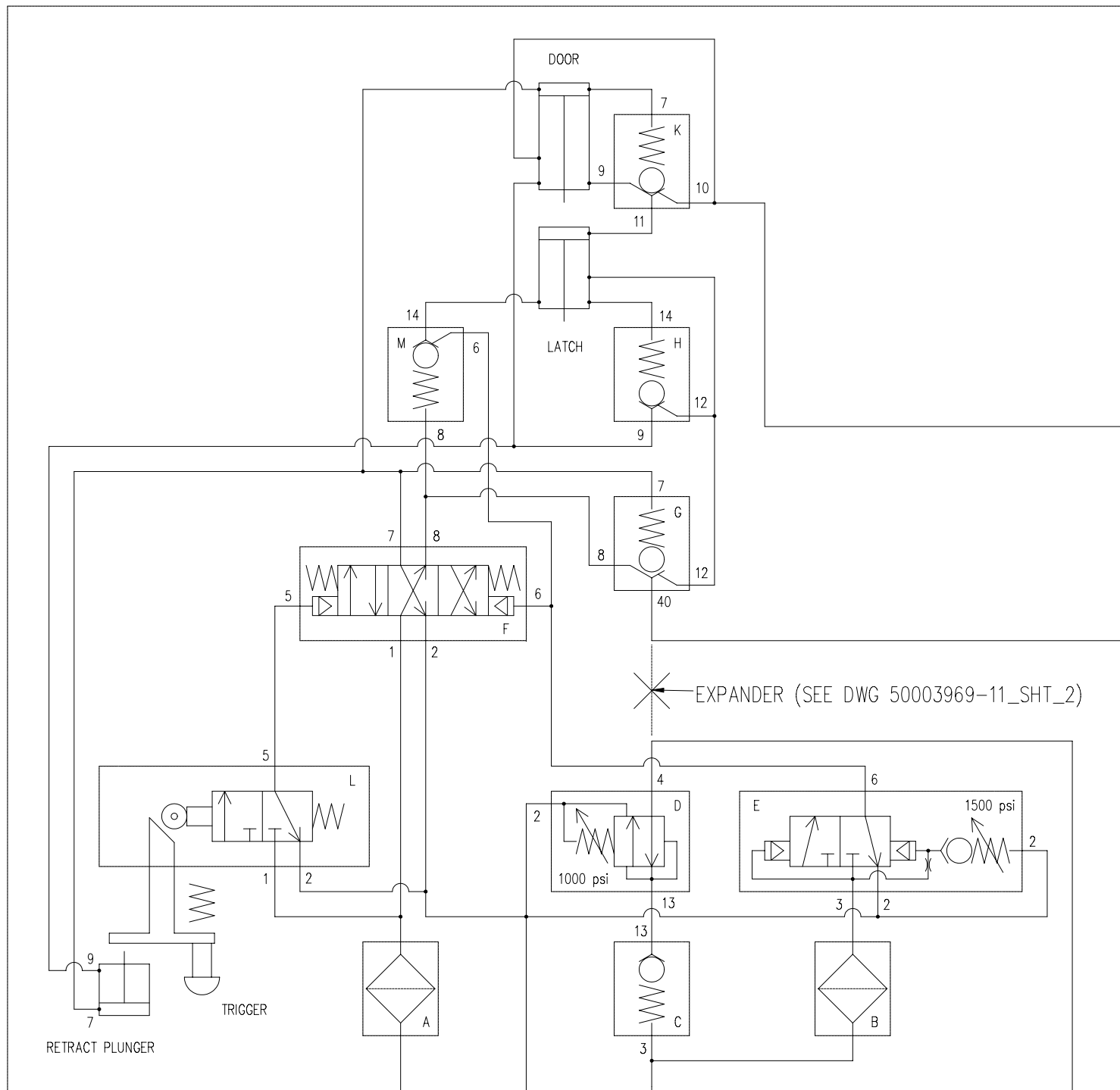


FOR ELECTRICAL  
CONNECTIONS SEE  
DRAWING 203104

NOTE:

FOR WIRING INSIDE  
PRESSURE SWITCH  
SEE DWG: 203062

204472		1	—	—	M					
PART NO.		QTY.	NEXT ASSY	FINAL ASSY	L					
<b>Varco. B.J.</b> <b>OIL TOOLS</b> ETIH-LEUR, THE NETHERLANDS				UNLESS OTHERWISE SPECIFIED TOLERANCES (OVER AND Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES $\frac{R}{16}$		W K L K J H G F E D C B A				
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSES, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE COMPANY.						MATERIAL				
PREPARED	NAME	DATE	PROL	SCALE	1:25					
CHECKED	H.B.	24 APR 68	SCALE	1:25						
APPROVED	H.L.	24 APR 68	UNITS (INCH / MM)	WEIGHT	LBS /	KG	ADD FILE NO. :			
TITLE MOUNTING PLATE BX EEXD 24V/DC ATOS				SIZE DRAWING NO. 204472		NO.				
REORIGIN / REPLACED BY:				REPLACES:		SHEET OF 1				
13		14		15		16				



EXPANDER (SEE DWG 50003969-11\_SHT\_2)

RETRACT PLUNGER

TRIGGER

1000 psi

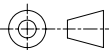
1500 psi

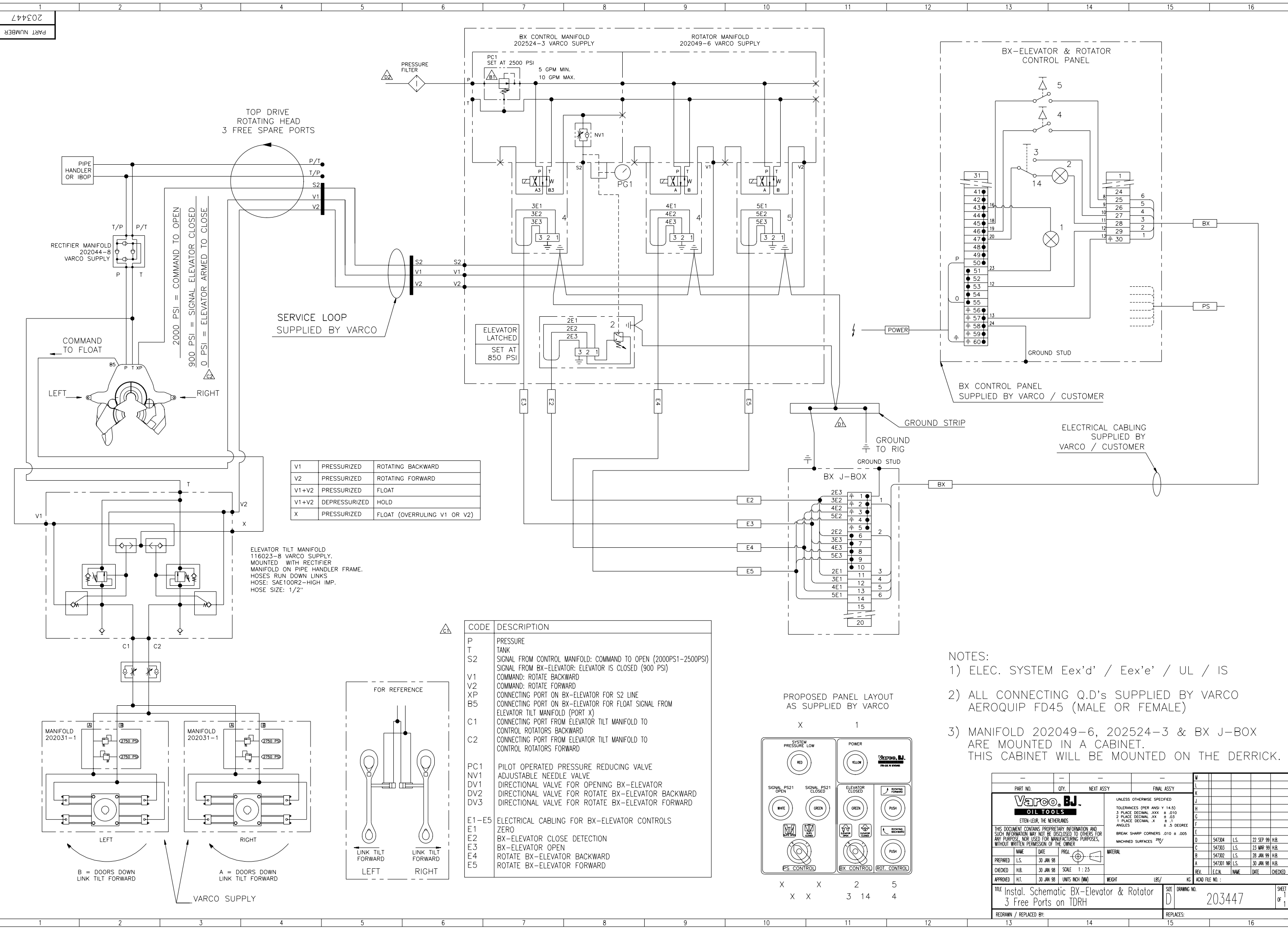
P

T

XP

FLOAT

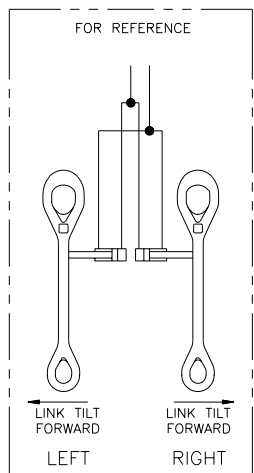
—		—		203200-30		M									
PART NO.		QTY.		NEXT ASS'Y		FINAL ASS'Y		L							
<div><div>Varco® BJ™</div><div>OIL TOOLS</div><div>ETTEN-LEUR, THE NETHERLANDS</div><div>THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER</div></div>						UNLESS OTHERWISE SPECIFIED						K			
						TOLERANCES (PER ANSI Y 14.5)						H			
						3 PLACE DECIMAL .XXX ± .010						G			
						2 PLACE DECIMAL .XX ± .03						F			
						1 PLACE DECIMAL .X ± .1						E			
ANGLES ± .5 DEGREE						D									
BREAK SHARP CORNERS .010 ± .005						C									
MACHINED SURFACES $\sqrt{R30}$						B									
NAME		DATE		PROJ.		MATERIAL		A		601184 N.d.K. 13-Aug-03 P.D.					
PREPARED		N.d.K. 13-Aug-03						REV.		E.C.N. NAME DATE CHECKED					
CHECKED		P.D. 13-Aug-03		SCALE 1 : 10				ACAD FILE NO. : 203270-32							
APPROVED		A.K. 13-Aug-03		UNITS INCH (MM)		WEIGHT		LBS/		KG					
TITLE						SIZE		DRAWING NO.		SHEET					
HYDRAULIC SCHEMATIC BX-FRAME 3,4&5						C		203270-32		1					
WITH LATCH VALVE DETECTION										OF 1					
REDRAWN / REPLACED BY:						REPLACES:									



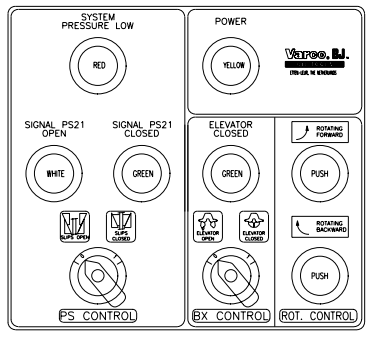
V1	PRESSURIZED	ROTATING BACKWARD
V2	PRESSURIZED	ROTATING FORWARD
V1+V2	PRESSURIZED	FLOAT
V1+V2	DEPRESSURIZED	HOLD
X	PRESSURIZED	FLOAT (OVERRULING V1 OR V2)

ELEVATOR TILT MANIFOLD  
116023-8 VARCO SUPPLY.  
MOUNTED WITH RECTIFIER  
MANIFOLD ON PIPE HANDLER FRAME.  
HOSES RUN DOWN LINKS  
HOSE: SAE100R2-HIGH IMP.  
HOSE SIZE: 1/2"


CODE	DESCRIPTION
P	PRESSURE
T	TANK
S2	SIGNAL FROM CONTROL MANIFOLD: COMMAND TO OPEN (2000PSI-2500PSI) SIGNAL FROM BX-ELEVATOR: ELEVATOR IS CLOSED (900 PSI)
V1	COMMAND: ROTATE BACKWARD
V2	COMMAND: ROTATE FORWARD
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
PC1	PILOT OPERATED PRESSURE REDUCING VALVE
NV1	ADJUSTABLE NEEDLE VALVE
DV1	DIRECTIONAL VALVE FOR OPENING BX-ELEVATOR
DV2	DIRECTIONAL VALVE FOR ROTATE BX-ELEVATOR BACKWARD
DV3	DIRECTIONAL VALVE FOR ROTATE BX-ELEVATOR FORWARD
E1-E5	ELECTRICAL CABLING FOR BX-ELEVATOR CONTROLS
E1	ZERO
E2	BX-ELEVATOR CLOSE DETECTION
E3	BX-ELEVATOR OPEN
E4	ROTATE BX-ELEVATOR BACKWARD
E5	ROTATE BX-ELEVATOR FORWARD

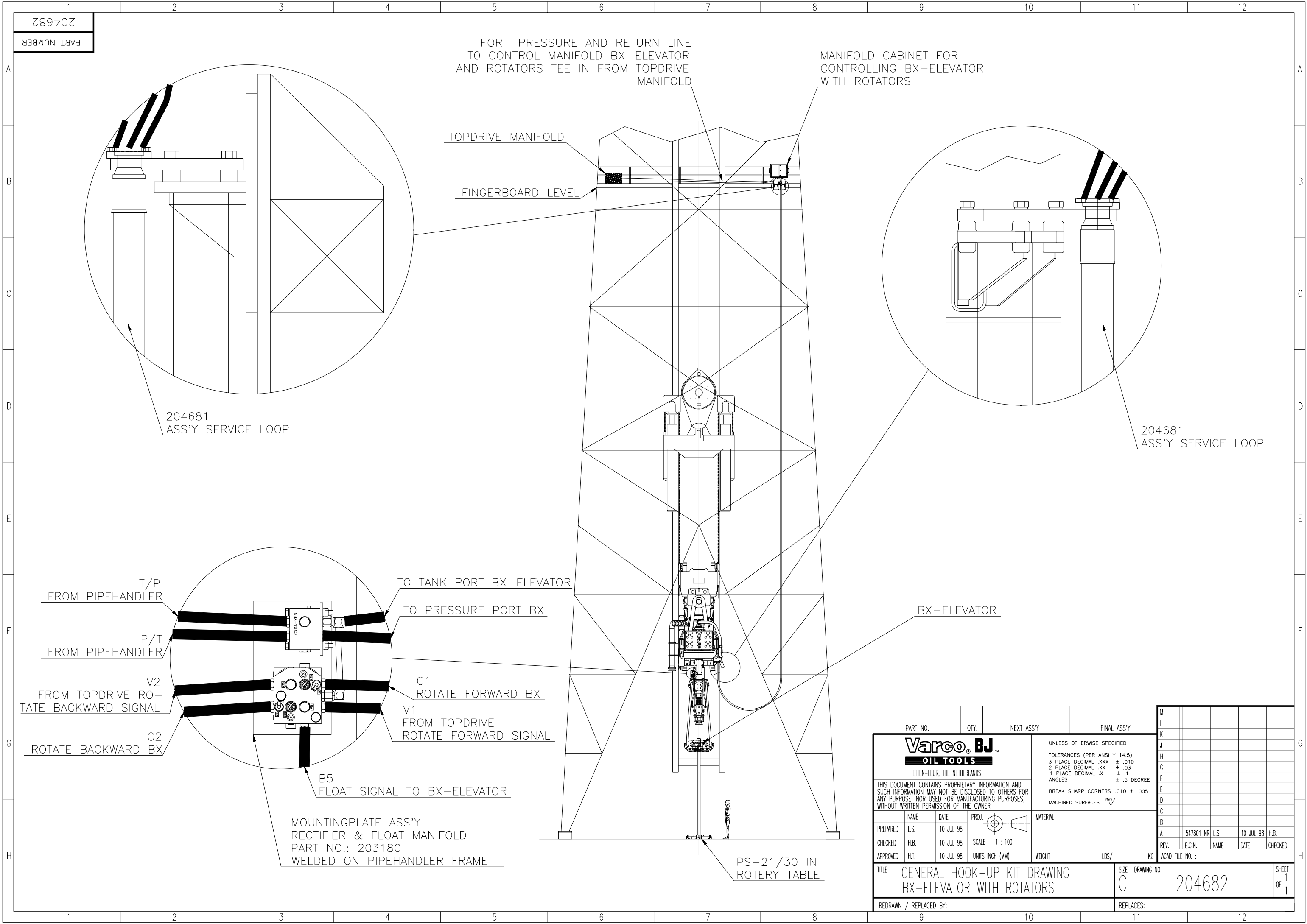


PROPOSED PANEL LAYOUT  
AS SUPPLIED BY VARCO



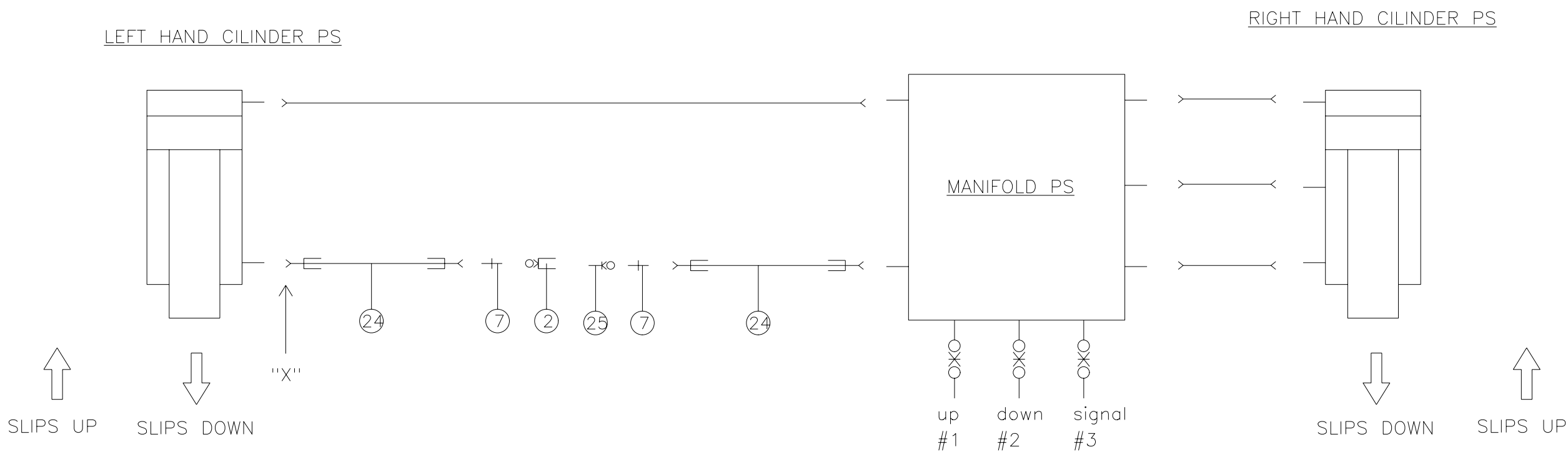
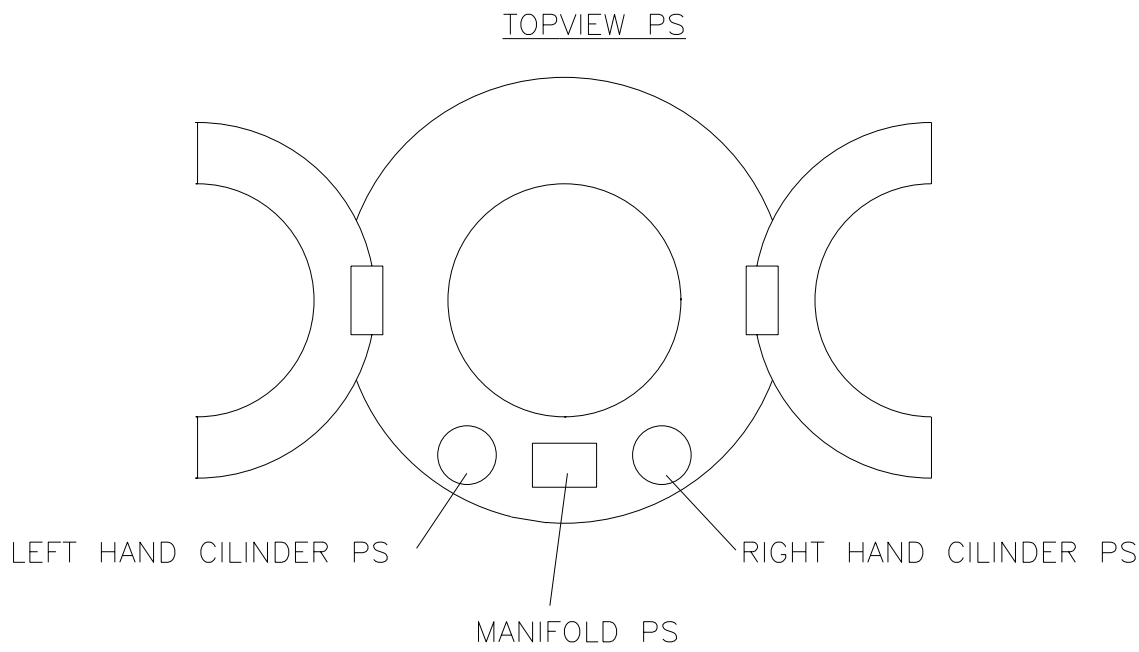
- NOTES:
- 1) ELEC. SYSTEM Eex'd' / Eex'e' / UL / IS
  - 2) ALL CONNECTING Q.D's SUPPLIED BY VARCO AEROQUIP FD45 (MALE OR FEMALE)
  - 3) MANIFOLD 202049-6, 202524-3 & BX J-BOX ARE MOUNTED IN A CABINET. THIS CABINET WILL BE MOUNTED ON THE DERRICK.

—	—	—	—	M	L	K	J	H	G	F	E	D	C	B	A	REV.	E.C.N.	NAME	DATE	CHECKED	
PART NO.				QTY.	NEXT ASSY		FINAL ASSY														
<b>Varco. B.J.</b>																					
<b>OIL TOOLS</b>																					
ETTEN-LEUR, THE NETHERLANDS																					
<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>				UNLESS OTHERWISE SPECIFIED																	
				TOLERANCES (PER ANSI Y 14.5)																	
				3 PLACE DECIMAL .XXX ± .010																	
				2 PLACE DECIMAL .XX ± .05																	
				1 PLACE DECIMAL .X ± .1																	
				ANGLES ± .5 DEGREE																	
				BREAK SHARP CORNERS .010 ± .005																	
				MACHINED SURFACES .R5																	
				MATERIAL																	
NAME	DATE	PROJ.																			
PREPARED	L.S.	30 JUN 98																			
CHECKED	H.B.	30 JUN 98	SCALE 1 : 25																		
APPROVED	H.T.	30 JUN 98	UNITS INCH (MM)	WEIGHT	LBS/	KG	ACAD FILE NO. :														
TITLE				SIZE				DRAWING NO.								SHEET					
Instal. Schematic BX-Elevator & Rotator				D				203447								OF					
3 Free Ports on TDRH																1					
REDRAWN / REPLACED BY:				REPLACES:																	




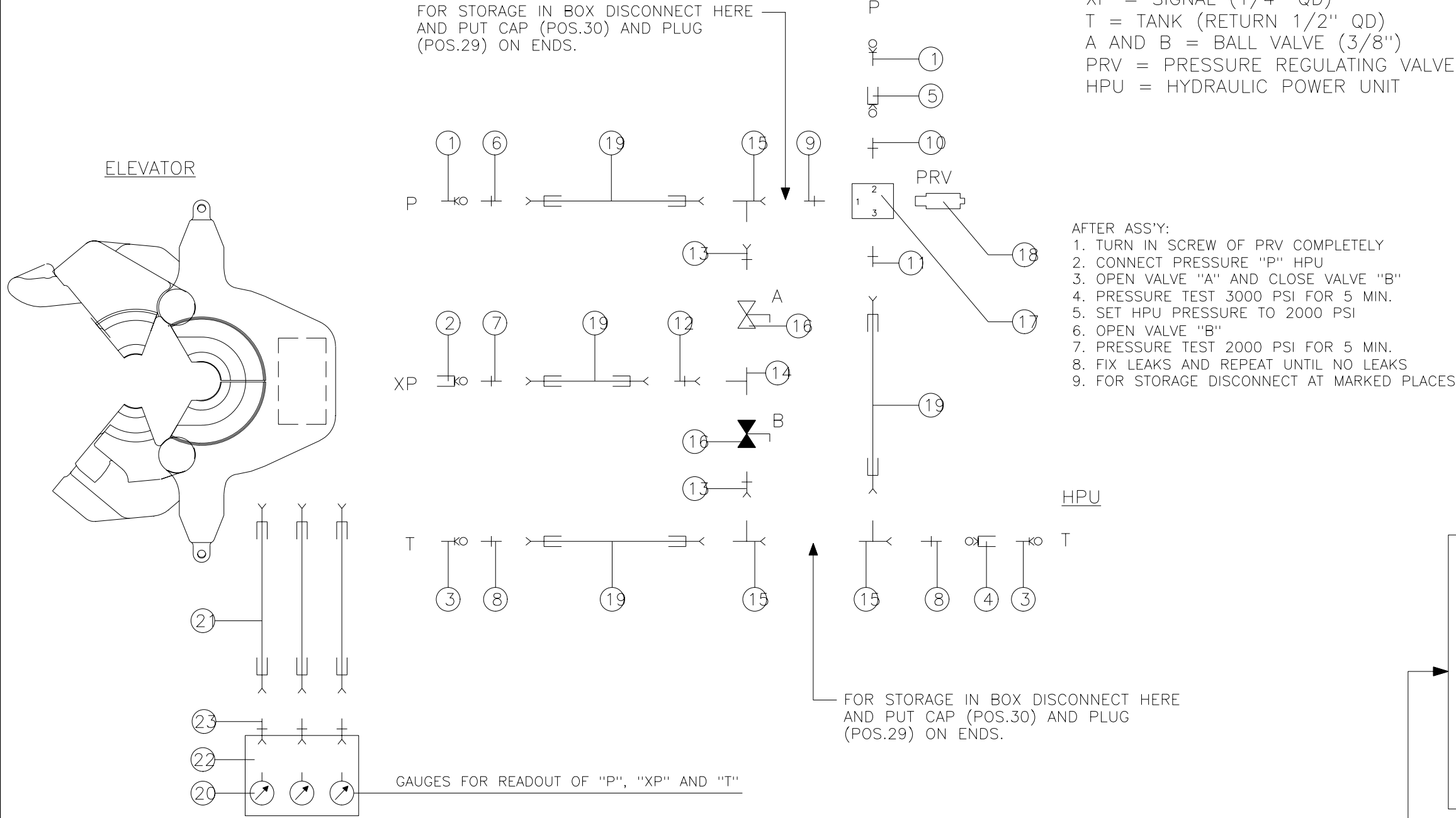
PART NO.		QTY.	NEXT ASS'Y		FINAL ASS'Y		M					
<div>Varco® BJ™ OIL TOOLS</div> <div>ETTEN-LEUR, THE NETHERLANDS</div> <div>THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER</div>						UNLESS OTHERWISE SPECIFIED		L				
						TOLERANCES (PER ANSI Y 14.5)		K				
						3 PLACE DECIMAL .XXX ± .010		J				
						2 PLACE DECIMAL .XX ± .03		H				
						1 PLACE DECIMAL .X ± .1		G				
						ANGLES ± .5 DEGREE		F				
						BREAK SHARP CORNERS .010 ± .005		E				
						MACHINED SURFACES 250/√		D				
								C				
NAME		DATE	PROJ.			MATERIAL		B				
PREPARED	L.S.	10 JUL 98						A	547801 NR	L.S.	10 JUL 98	H.B.
CHECKED	H.B.	10 JUL 98	SCALE	1 : 100				REV.	E.C.N.	NAME	DATE	CHECKED
APPROVED	H.T.	10 JUL 98	UNITS INCH (MM)			WEIGHT	LBS/	KG	ACAD FILE NO. :			
TITLE						SIZE		DRAWING NO.		SHEET		
GENERAL HOOK-UP KIT DRAWING						C		204682		1		
BX-ELEVATOR WITH ROTATORS										OF		
REDRAWN / REPLACED BY:						REPLACES:						

- 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 QD'S TO CILINDER AND MANIFOLD AS OUTLINED IN SKETCH BELOW.
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. DISCONNECT QD'S (POS 2-25) WHILE STILL PRESSURIZED.
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 QD'S 2 AND 25 DISCONNECTED, 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).



NOTE: TROUBLE SHOOTING IS DESCRIBED IN MANUAL

202539		1		—		M	
PART NO.		QTY.		NEXT ASSY		L	
						K	
<b>Varco. B.J.</b> <b>OIL TOOLS</b> ETTEN-LEUR, THE NETHERLANDS		UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .xxx $\pm$ .010 2 PLACE DECIMAL .xx $\pm$ .03 1 PLACE DECIMAL .x $\pm$ .1 ANGLES $\pm$ .5 DEGREE BREAK SHARP CORNERS .010 $\pm$ .005 MACHINED SURFACES $\pm$ .005				J	
						H	
						G	
						F	
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.						E	
						D	
						C	
						B	
NAME		DATE		PROJ.		MATERIAL	
PREPARED	ADE	24 JUN '99					
CHECKED	PDE	24 JUN '99	SCALE		NONE		
APPROVED	LSP	24 JUN '99	UNITS INCH (MM)		WEIGHT		LBS/ KG
TITLE		TEST KIT BX ELEVATOR + PS				ACAD FILE NO. : 202539_2.DWG	
REDRAWN / REPLACED BY:		SIZE D		DRAWING NO. 202539		SHEET	
						OF	
REPLACES:		2					



ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	2	—	55909-6-6	QCK DISC., MALE, 3/8"-18 NPT
2	2	—	55908-4-4	QCK DISC., FEMALE, 1/4"-18 NPT
3	2	—	55909-8-8	QCK DISC., MALE, 1/2"-14 NPT
4	1	—	55908-8-8	QCK DISC., FEMALE, 1/2"-14 NPT
5	1	—	55908-6-6	QCK DISC., FEMALE, 3/8"-18 NPT
6	1	—	56165-6-6-6	EXT.PIPE/JIC, 3/8" NPT - 9/16 UNF
7	3	—	56165-4-6-6	EXT.PIPE/JIC, 1/4" NPT - 9/16 UNF
8	2	—	56165-8-6-6	EXT.PIPE/JIC, 1/2" NPT - 9/16 UNF
9	1	—	979532-8-6	BSP G1/2 MALE/ JIC 9/16 MALE
10	1	—	979861-8-6	BSP+SEAL/NPT, G1/2 TO 3/8" NPT
11	1	—	979532-4-6	BSP+SEAL/JIC, G1/4 TO 9/16 UNF
12	1	—	56521-6-6-6	INT.PIPE/JIC, 3/8" NPT - 9/16 UNF
13	2	—	56566-6-6-6	EXT.PIPE 3/8" NPT TO 9/16 JIC FEMALE
14	1	—	56716-6-S	TEE EXT.PIPE 3/8" NPT
15	3	—	56525-6-6-6	STEE JIC INT/EXT/EXT, 9/16 UNF
16	2	—	979552-1	BALL VALVE 3/8" NPT INT.PIPE
17	1	—	979940-ECV	SUN LINE MOUNT BODY, ECV
18	1	—	94817-1AN	PRESS. REG. CARTRIDGE PBDB-LAN
19	4	—	990065-11	HOSE 3/8" with JIC 9/16 UNF fem.
20	5	—	979849-2	PRESSURE GAUGE 0-3500 PSI
21	5	—	980479	HOSE PRESSURE GAUGE L=2M
22	1	C	202539-1	PLATE FOR 3 GAUGES
23	5	—	980481	M16x2 MALE TO GAUGE CONNECTOR
24	2	—	980482-20	HOSE 1/4" #6 ENDS MAX. 6250 PSI
25	1	—	55909-4-4	QCK DISC., MALE, 1/4"-18 NPT
26	2	—	56525-6-6-6	STEE JIC EXT/INT/INT, 9/16 UNF
27	2	—	56525-4-4-6	STEE JIC EXT/INT/INT, 7/16 UNF
28	1	—	T80600	LOCTITE 542-050 HYDR. SEALANT
29	5	—	56553-6-S	PLUG, MALE-37 SEAT 9/16 UNF
30	5	—	56544-6-S	CAP, FEMALE-37 SEAT 9/16 UNF
31	1	—	980478	STORAGE BOX TEST KIT BX ELEVATOR
32	2	—	980018-6	connector 9/16 unf fem/gauge conn
33	2	—	980018-4	connector 7/16 unf fem/gauge conn
34	1	A	202539-2	LABELS FOR BX
35	4	—	979798-1	GAUGE CONNECTOR MEV20-7/16 UNF
36	2	—	979798-3	GAUGE CONNECTOR MEV20-9/16 UNF
37	4	—	979512-3	PLUG 7/16" UNF + O-RING

PARTS IN KIT THAT ARE NOT SHOWN ON DWG

NOTE: TROUBLE SHOOTING IS DESCRIBED IN MANUAL

202539	1	—	—	M					
PART NO.	QTY.	NEXT ASSY	FINAL ASSY	L					
<b>Varco, B.J.</b> OIL TOOLS ETTEN-LEUR, THE NETHERLANDS				K					
UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .05 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250/				J					
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.				H					
NAME	DATE	PROJ.	MATERIAL	G					
PREPARED	ADE	24 JUN '99		F					
CHECKED	PDE	24 JUN '99	SCALE NONE	E					
APPROVED	LSP	24 JUN '99	UNITS INCH (MM)	D					
TITLE TEST KIT BX ELEVATOR + PS				C					
SIZE D				B					
DRAWING NO. 202539				A	576601	ADE	24 JUN '99	PDE	
REPLACES:				REV.	E.C.N.	NAME	DATE	CHECKED	
REDRAWN / REPLACED BY:				ACAD FILE NO.: 202539_1.DWG					
				KG					
				WEIGHT	LBS/				
				SH					
				OF					
				2					

BEFORE OPERATION WHEN TESTING IS NEEDED:

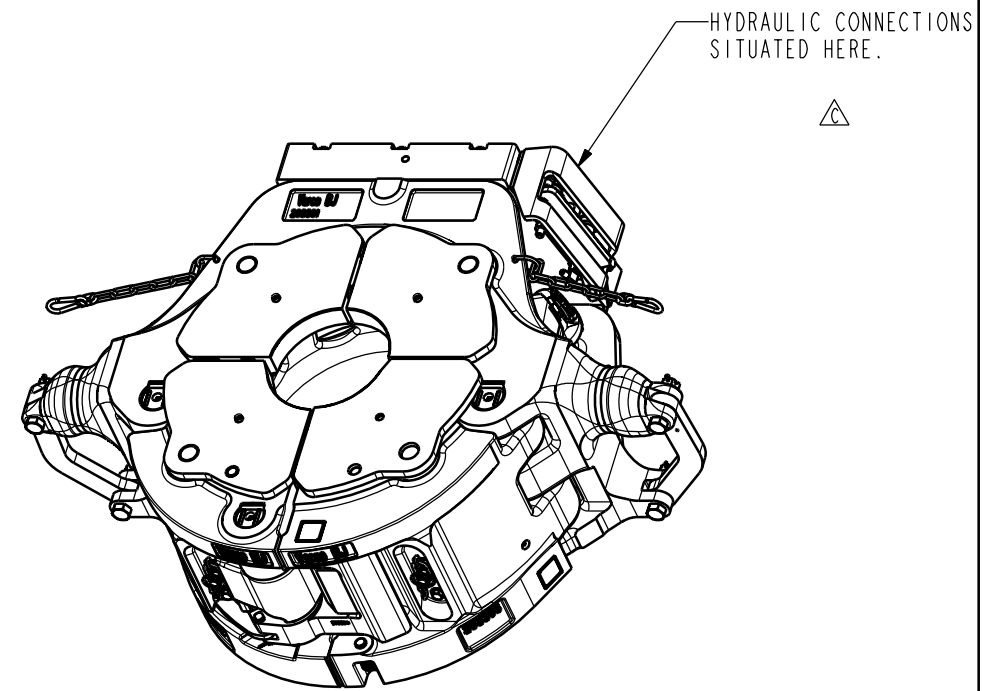
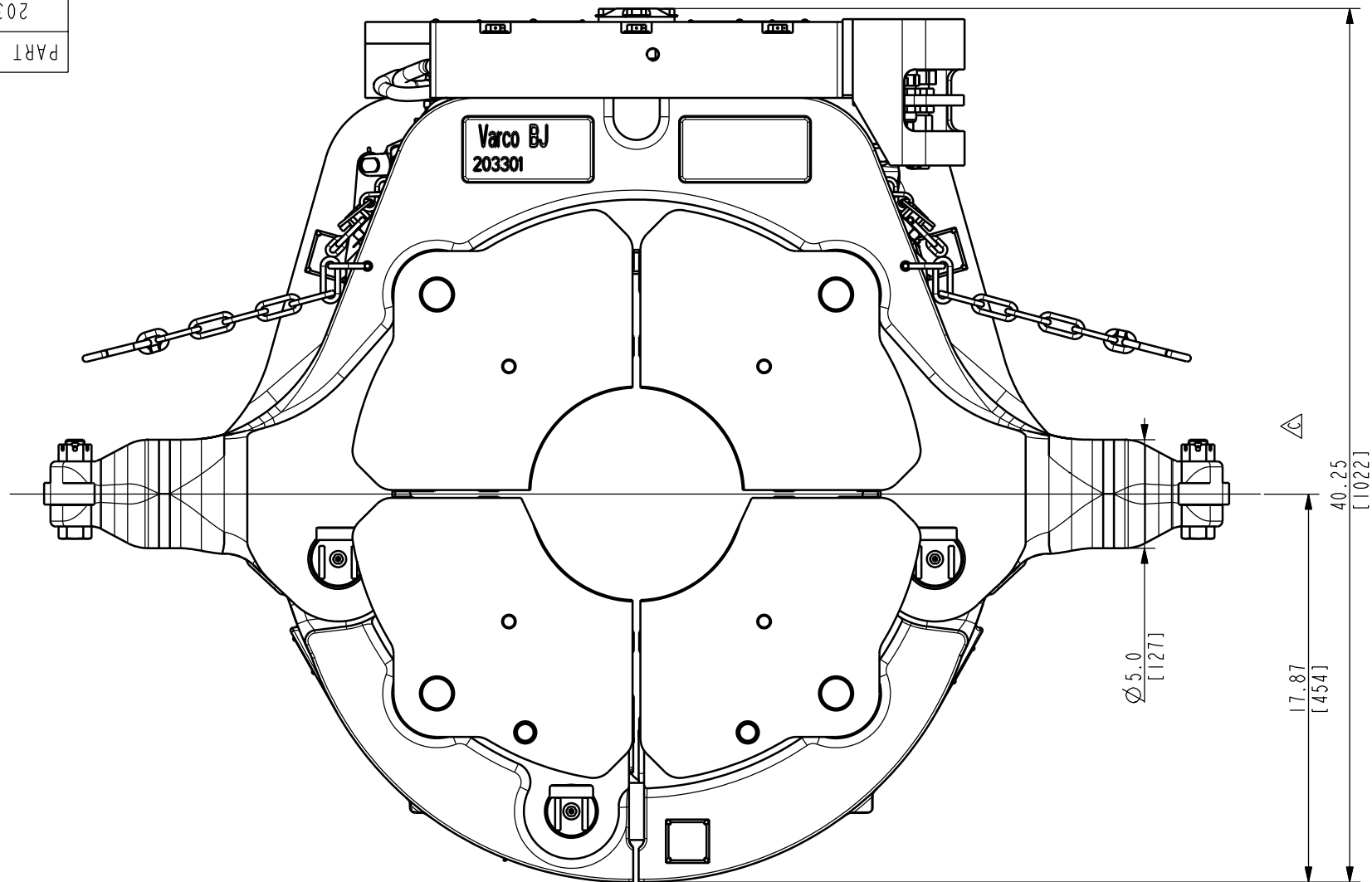
1. SHUT DOWN HYDRAULIC POWER
2. CONNECT HOSES TO HPU AND ELEVATOR
3. CONNECT GAUGES TO MANIFOLD STANDARD CONNECTORS FOR READOUT OF "P", "XP" AND "T"
4. OPEN VALVE "A" AND "B"
5. TURN OUT SETSCREW "PRV" COMPLETELY
6. TURN ON HYDRAULIC POWER
7. CLOSE VALVE "A"
8. TURN IN SETSCREW "PRV" UNTIL "P" READS 2000 PSI

COMMAND TO OPEN IF ELEVATOR IS CLOSED:

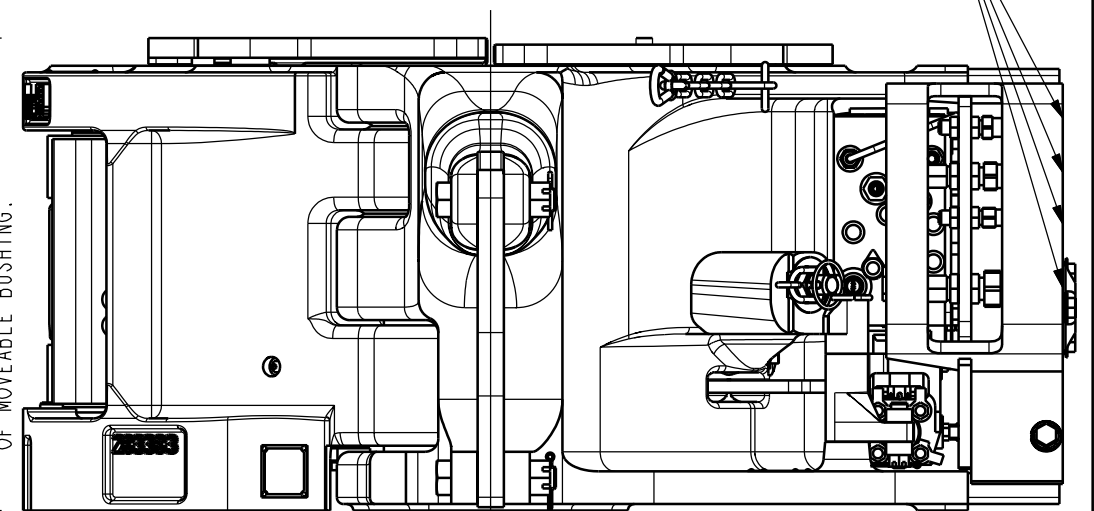
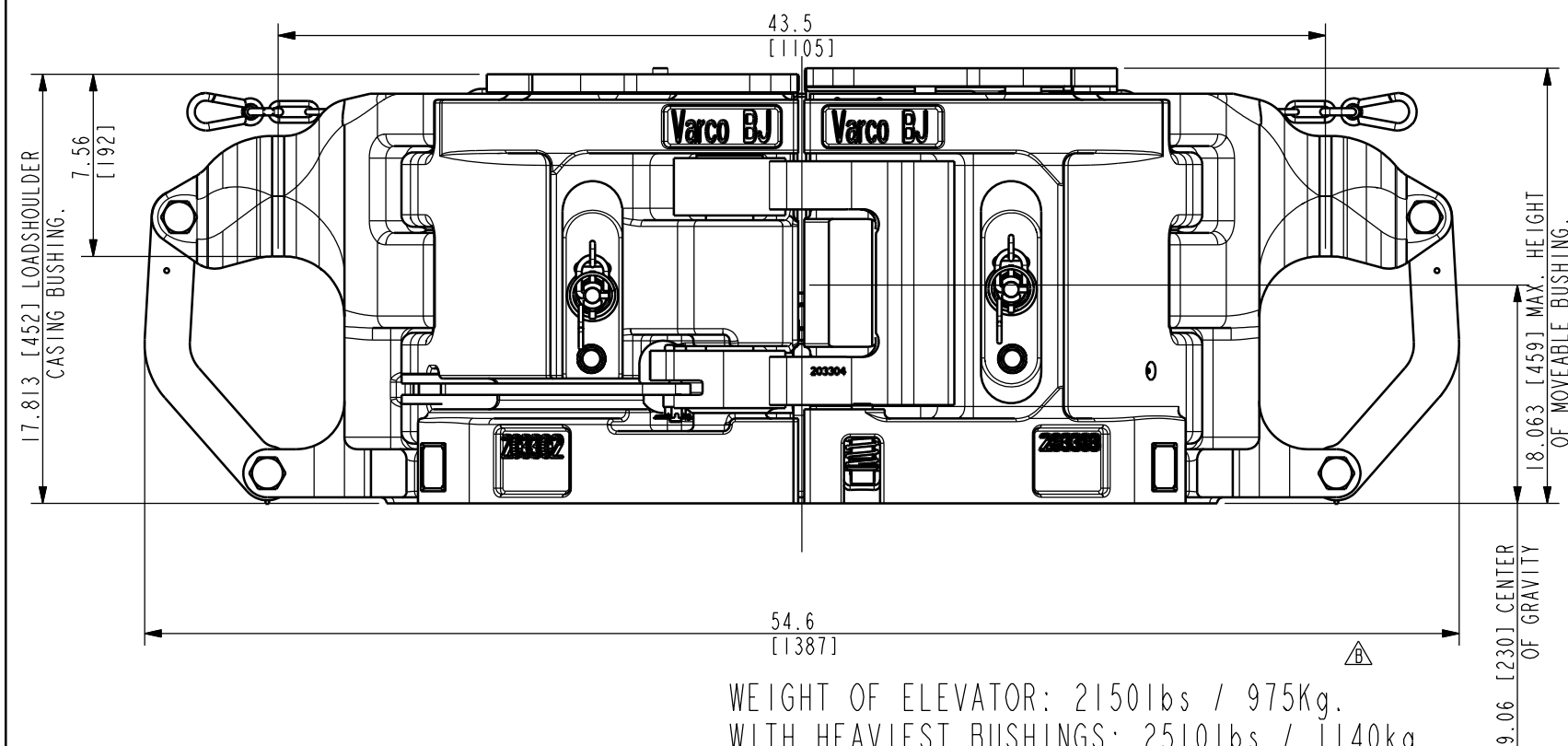
1. CLOSE VALVE "B"
2. OPEN VALVE "A"
3. XP READS 2000 PSI AND ELEVATOR OPENS

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 CLOSES
5. XP READS 1000 PSI WHEN ELEVATOR IS CLOSED

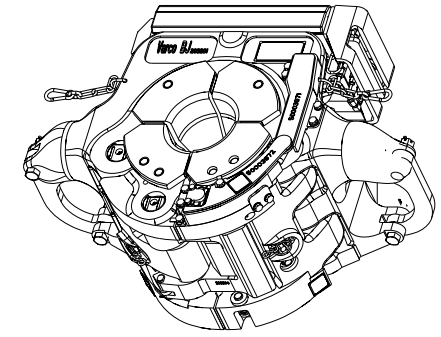
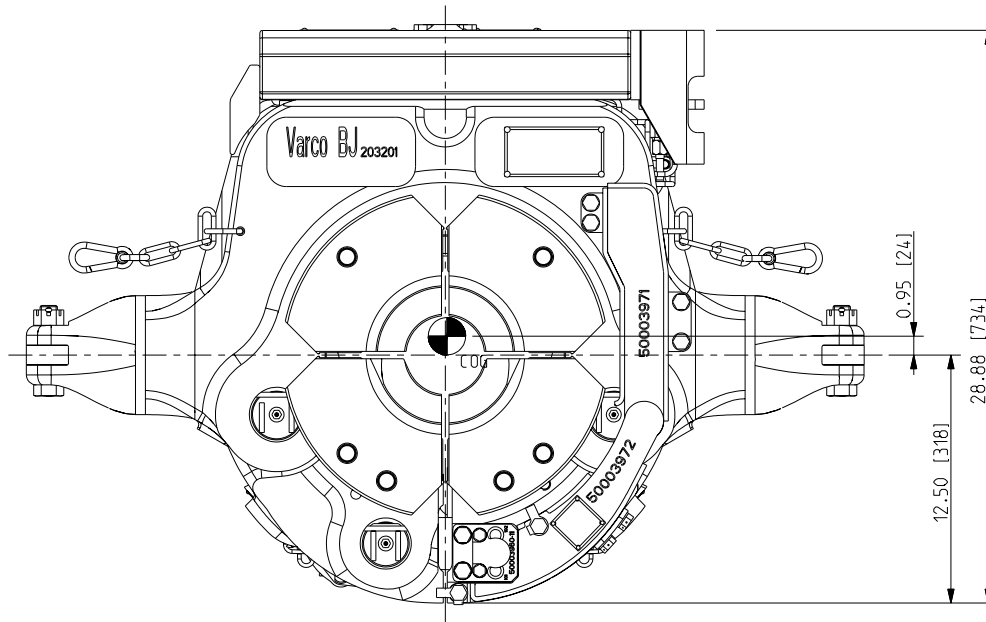


SCALE 1:10

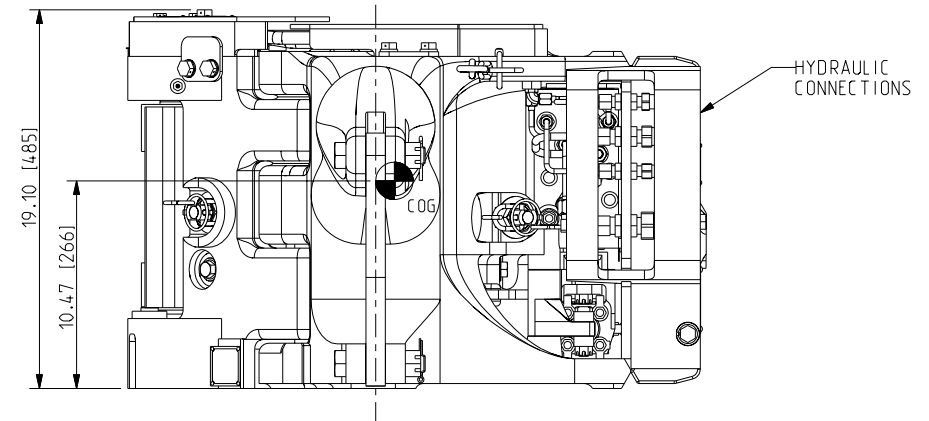
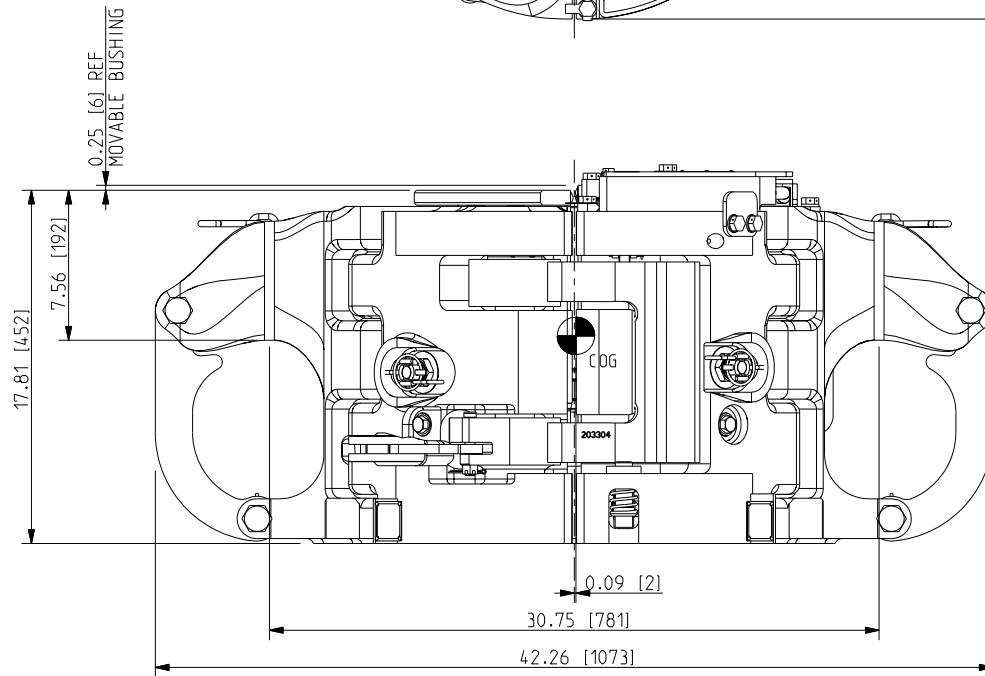


WEIGHT OF ELEVATOR: 2150lbs / 975kg.  
WITH HEAVIEST BUSHINGS: 2510lbs / 1140kg.  
ELEVATOR SHOWN WITH 9 5/8" CASING BUSHING. (20" max.)

203300		-	-	-	K					
PART NO.		QTY.	NEXT ASSY.		J					
<div>Varco. BJ™ OIL TOOLS ETTEN-LEUR, THE NETHERLANDS</div>				UNLESS OTHERWISE SPECIFIED		I				
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				TOLERANCES (PER ANSI Y 14.5)		H				
				3 PLACE DECIMAL .xxx ± .010		G				
				2 PLACE DECIMAL .xx ± .03		F				
				1 PLACE DECIMAL .x ± .1		E				
				ANGLES ± .5 DEGREE		D				
				BREAK SHARP CORNERS .010 ± .005		C	600121	BV	21-Feb-01	P.D.
				MACHINED SURFACES		B	550502	P.D.	01-Jun-99	LS
				250/		A	550501	P.D.	17-Sept-98	A.J
NAME		DATE	PROJ.		MATERIAL	REV.	E.C.N	NAME	DATE	CHECKED
APPROVED	J.Tiebout	17-Sept-98	SCALE 1:5							
CHECKED	A.J.	17-Sept-98	UNITS (INCH (MM))							
PREPARED	SB e	17-Sep-98	WEIGHT			LBS/	KG	PROJE FILE NO.:		DD-203300
TITLE					SIZE	DRAWING NO.		SHEET		
BX ELEVATOR FRAME III					C	DD-203300		OF 1		
REDRAWN / REPLACED BY:					REPLACES:					



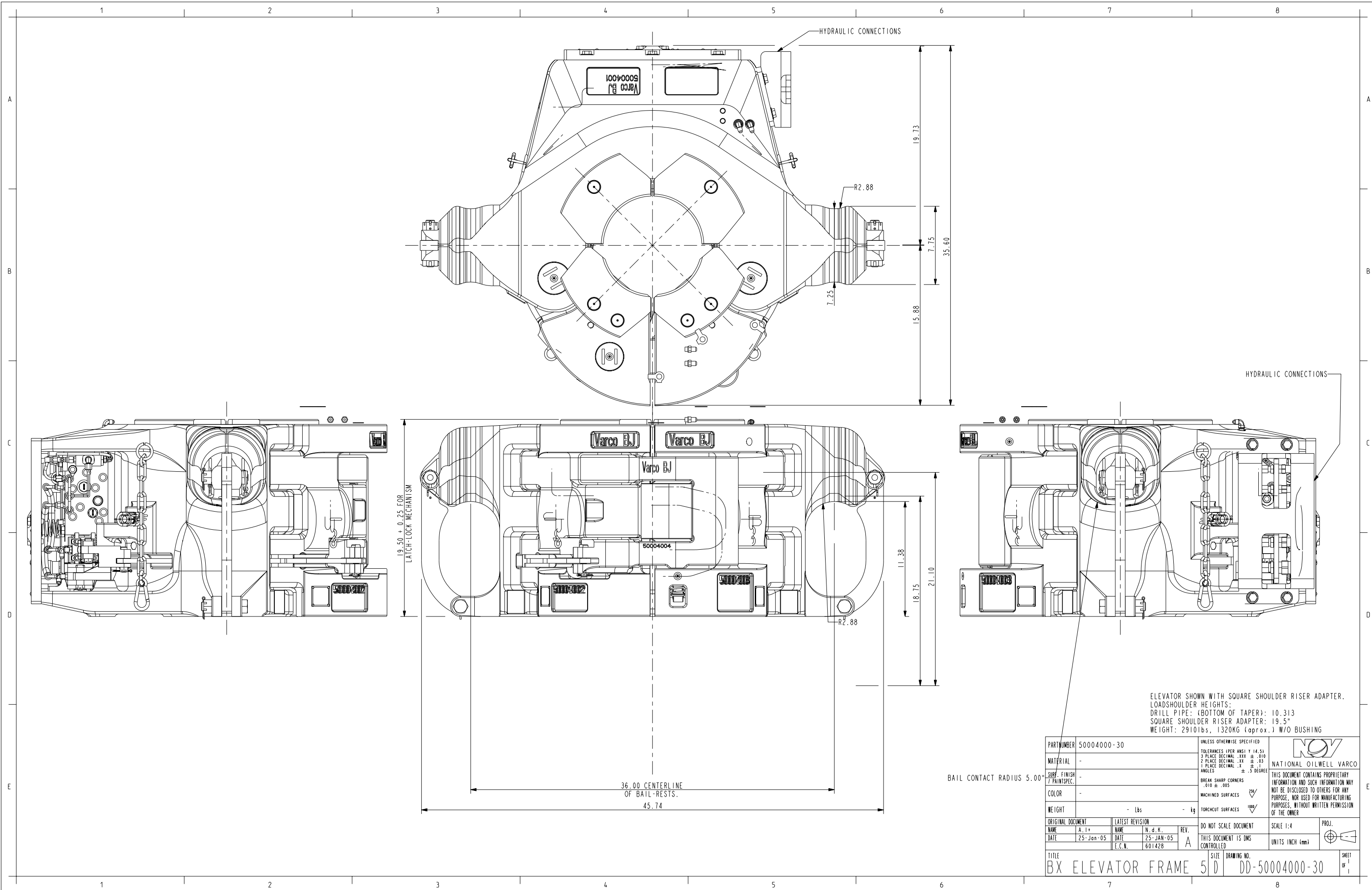
3D-VIEW  
SCALE 1:10



WEIGHT BX ELEVATOR WITHOUT BUSHINGS : 1810 LBS / 821 KG  
WEIGHT BX ELEVATOR WITH BUSHINGS : 2010 LBS / 912 KG

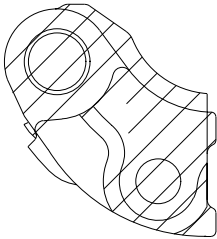
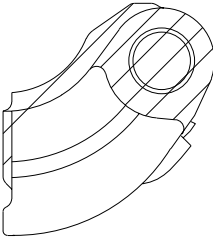
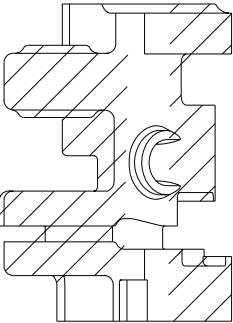
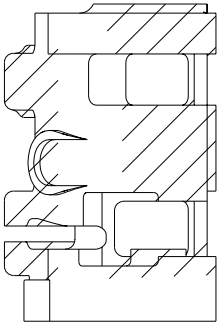
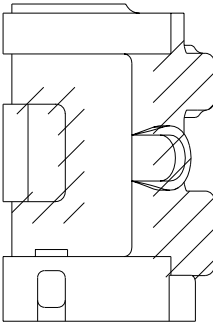
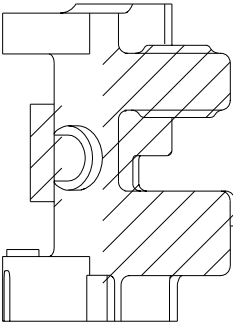
PARTNUMBER 203200		UNLESS OTHERWISE SPECIFIED		Varco BJ. A Varco Company	
MATERIAL -		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER	
SURF. FINISH / PAINTSPEC. -		BREAK SHARP CORNERS .010 ± .005			
COLOR -		MACHINED SURFACES 250✓ TORNCUT SURFACES 1000✓			
WEIGHT - Lbs - kg		DO NOT SCALE DOCUMENT		SCALE 1:5	PROJ.
ORIGINAL DOCUMENT		LATEST REVISION		THIS DOCUMENT IS DMS CONTROLLED	
NAME	P. D.	NAME	N. d. K.	UNITS INCH (mm)	
DATE	04-DEC-03	DATE	04-DEC-03		
		E.C.N.		REV. A	
				601184	
TITLE		SIZE		DRAWING NO.	
BX4-75 ELEVATOR WITH LATCH VALVE		C		DD-203200-30	
				SHEET 1 OF 1	





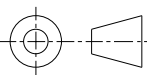
ELEVATOR SHOWN WITH SQUARE SHOULDER RISER ADAPTER.  
LOADSHOULDER HEIGHTS:  
DRILL PIPE: (BOTTOM OF TAPER): 10.313  
SQUARE SHOULDER RISER ADAPTER: 19.5"  
WEIGHT: 2910lbs, 1320KG (approx.) W/O BUSHING

PARTNUMBER 50004000-30		UNLESS OTHERWISE SPECIFIED		TOLERANCES (PER ANSI Y 14.5)	
MATERIAL -		TOLERANCES (PER ANSI Y 14.5)		3 PLACE DECIMAL .xxx ± .010	
SUB. FINISH -		TOLERANCES (PER ANSI Y 14.5)		2 PLACE DECIMAL .xx ± .03	
COLOR -		TOLERANCES (PER ANSI Y 14.5)		1 PLACE DECIMAL .x ± .1	
WEIGHT - lbs - kg		TOLERANCES (PER ANSI Y 14.5)		ANGLES ± .5 DEGREE	
ORIGINAL DOCUMENT		TOLERANCES (PER ANSI Y 14.5)		BREAK SHARP CORNERS .010 ± .005	
NAME A. I.		TOLERANCES (PER ANSI Y 14.5)		MACHINED SURFACES 250	
DATE 25-Jan-05		TOLERANCES (PER ANSI Y 14.5)		TORCHCUT SURFACES 1000	
LATEST REVISION		TOLERANCES (PER ANSI Y 14.5)		DO NOT SCALE DOCUMENT	
NAME N. d. K.		TOLERANCES (PER ANSI Y 14.5)		SCALE 1:4	
DATE 25-JAN-05		TOLERANCES (PER ANSI Y 14.5)		THIS DOCUMENT IS DWS CONTROLLED	
E.C.N. 601428		TOLERANCES (PER ANSI Y 14.5)		UNITS INCH (mm)	
REV. A		TOLERANCES (PER ANSI Y 14.5)		PROJ.	
TITLE BX ELEVATOR FRAME 5 D		TOLERANCES (PER ANSI Y 14.5)		SHEET 1 of 1	
SIZE DD-50004000-30		TOLERANCES (PER ANSI Y 14.5)			
DRAWING NO.		TOLERANCES (PER ANSI Y 14.5)			

1	2	3	4	5	6	7	8																
A	<div><div>B1</div><div>C1</div></div>	<table><tr><th>PART NUMBER</th><th>TYPE</th></tr><tr><td>203202</td><td>BX ELEVATOR FRAME IV</td></tr><tr><td>203302</td><td>BX ELEVATOR FRAME III</td></tr><tr><td>50004002</td><td>BX ELEVATOR FRAME V</td></tr></table>	PART NUMBER	TYPE	203202	BX ELEVATOR FRAME IV	203302	BX ELEVATOR FRAME III	50004002	BX ELEVATOR FRAME V			<div><div>B1</div><div>C1</div></div>	<table><tr><th>PART NUMBER</th><th>TYPE</th></tr><tr><td>203203</td><td>BX ELEVATOR FRAME IV</td></tr><tr><td>203303</td><td>BX ELEVATOR FRAME III</td></tr><tr><td>50004003</td><td>BX ELEVATOR FRAME V</td></tr></table>	PART NUMBER	TYPE	203203	BX ELEVATOR FRAME IV	203303	BX ELEVATOR FRAME III	50004003	BX ELEVATOR FRAME V	A
		PART NUMBER	TYPE																				
		203202	BX ELEVATOR FRAME IV																				
		203302	BX ELEVATOR FRAME III																				
50004002	BX ELEVATOR FRAME V																						
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203203	BX ELEVATOR FRAME IV																						
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50004003	BX ELEVATOR FRAME V																						
B																							
	C					C																	
		D																					
			E																				
F																							
	1	2	3	4	5	6	7	8															

NOTES:

1. HATCHED ARES ARE CONSIDERED CRITICAL.
2. NON HATCHED ARES 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

—		—		—		—		M										
PART NO.		QTY.		NEXT ASSY		FINAL ASSY		L										
<div><div><div><div>Varco® BJ™</div><div>OIL TOOLS</div></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 <sup>250</sup> √						K				
	NAME	DATE	PROJ.	MATERIAL —				J										
PREPARED	P.D.	04-Dec-97						H										
CHECKED	A.J.	04-Dec-97	SCALE -					G										
APPROVED	J.Tiebout	04-Dec-97	UNITS INCH (MM)					F										
TITLE CRITICAL AREAS DOORS BX ELEVATOR <div>B1</div>								E										
REDRAWN / REPLACED BY:								WEIGHT LBS/ KG		D								
DRAWING NO. CA-252								C	545003	P.D.	25-Feb-00	A.K.						
REPLACES:								B	550501	P.D.	17-Aug-98	A.J.						
								A	545001	P.D.	04-Dec-97	A.J.						
								REV.	E.C.N.	NAME	DATE	CHECKED						
								ACAD FILE NO. : CA-252.DWG										
								SHEET 1 OF 1										

A

B

C

D

E

F

A

B

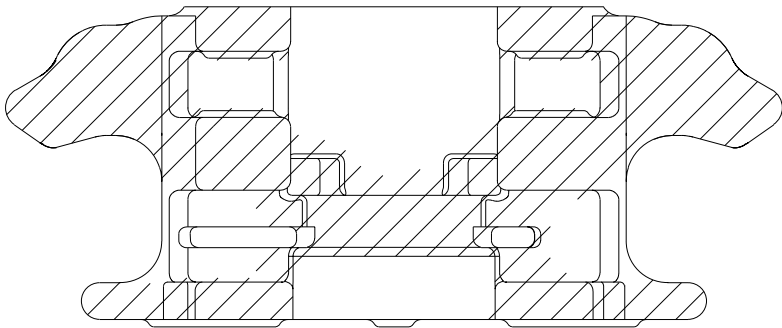
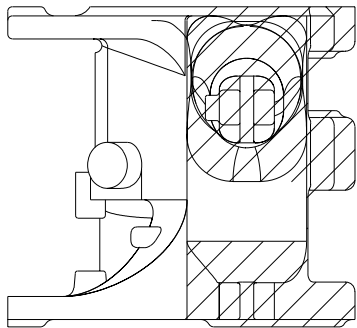
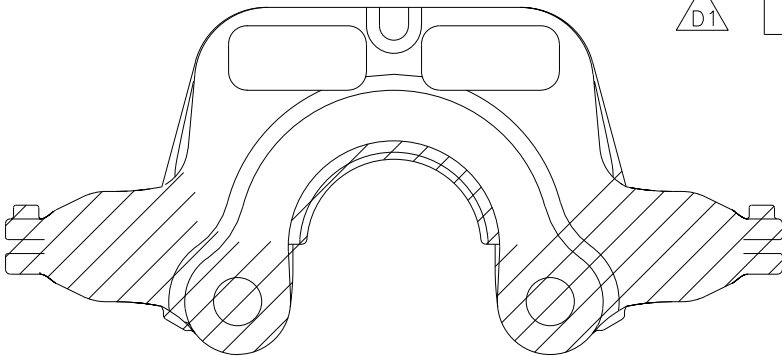
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E

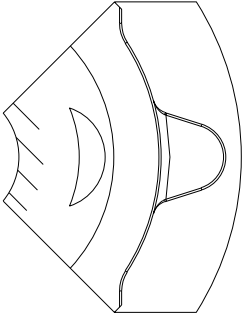
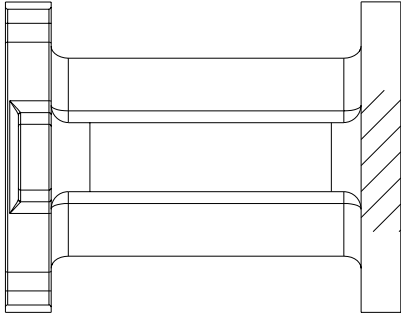
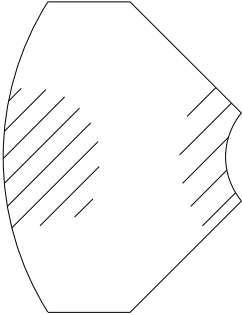
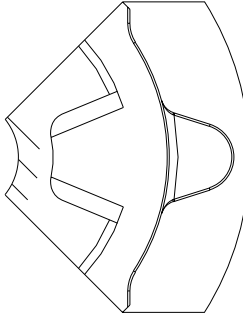
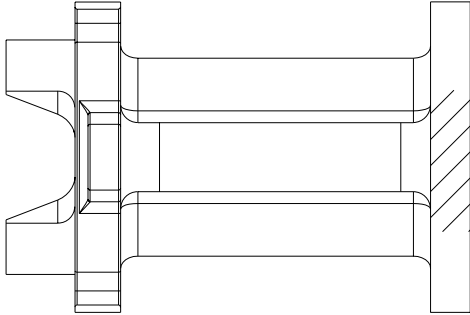
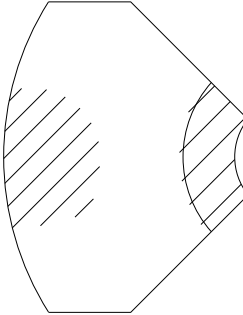

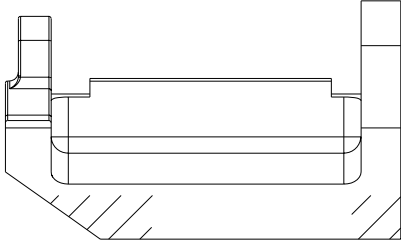


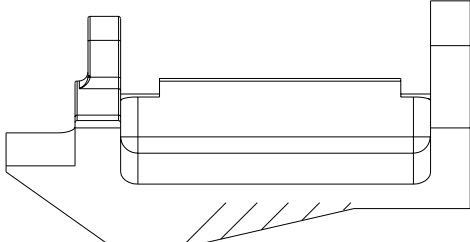




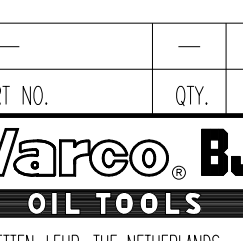
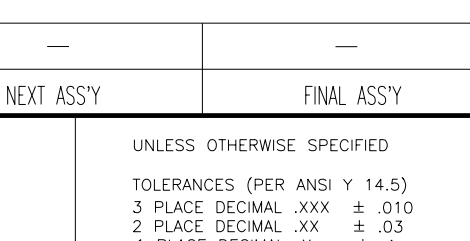
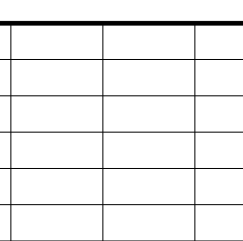


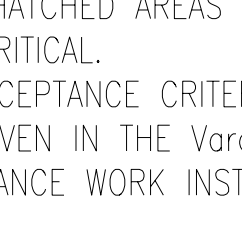
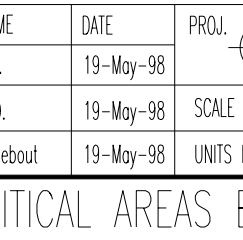
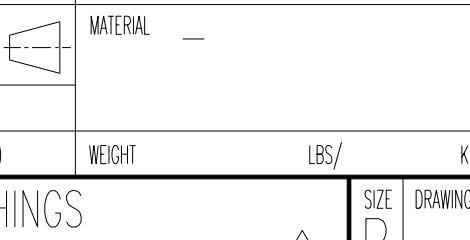
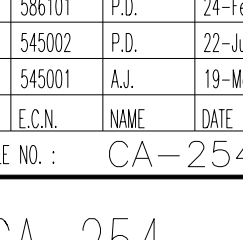
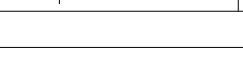
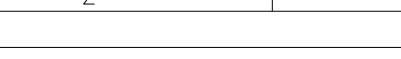
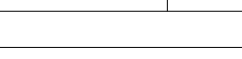
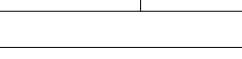
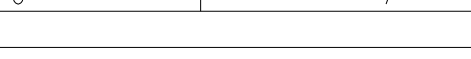
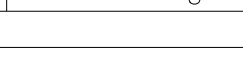
F

PART NUMBER	TYPE
203201	BX ELEVATOR FRAME IV
203301	BX ELEVATOR FRAME III
203291	BX ELEVATOR FRAME IV 500ton
50004001	BX ELEVATOR FRAME V



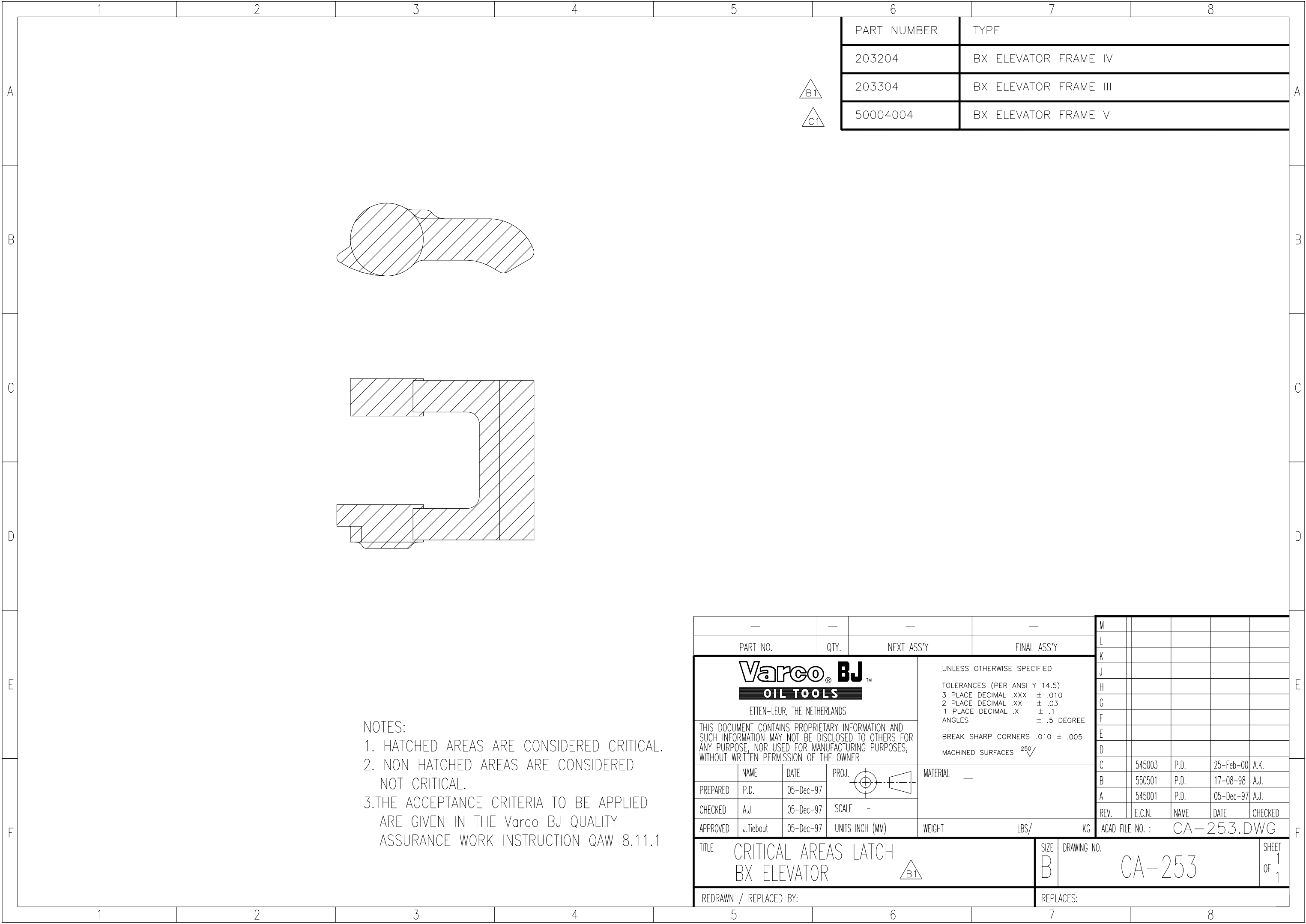
- NOTES:
- 1. HATCHED AREAS ARE CONSIDERED CRITICAL.
  - 2. NON HATCHED AREAS ARE CONSIDERED NOT CRITICAL.
  - 3. THE ACCEPTANCE CRITERIA TO BE APPLIED ARE GIVEN IN THE Varco BJ QUALITY ASSURANCE WORK INSTRUCTION QAW 8.11.1

—		—		—		—		M					
PART NO.		QTY.		NEXT ASSY		FINAL ASSY		L					
<div><b>Varco® BJ™</b> OIL TOOLS</div> <div>ETTEN-LEUR, THE NETHERLANDS</div>		<div>UNLESS OTHERWISE SPECIFIED</div> <div>TOLERANCES (PER ANSI Y 14.5)</div> <div>3 PLACE DECIMAL .XXX ± .010</div> <div>2 PLACE DECIMAL .XX ± .03</div> <div>1 PLACE DECIMAL .X ± .1</div> <div>ANGLES ± .5 DEGREE</div> <div>BREAK SHARP CORNERS .010 ± .005</div> <div>MACHINED SURFACES <math>\sqrt{.250}</math></div>						K					
								J					
<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>MATERIAL — —</div>						H					
								G					
NAME		DATE		PROJ.		<div></div>		F					
PREPARED		P.D.		04-Dec-97				E					
CHECKED		A.J.		04-Dec-97		SCALE —		D	545004	P.D.	25-Feb-00	A.K.	
APPROVED		J.Tiebout		04-Dec-97		UNITS INCH (MM)		C	545003	P.D.	31-Mar-99	L.S.	
								B	545002	P.D.	17-Aug-98	A.J.	
								A	545001	P.D.	04-Dec-97	A.J.	
								REV.	E.C.N.	NAME	DATE	CHECKED	
								ACAD FILE NO. : CA-251.DWG					
TITLE								SIZE	DRAWING NO.			SHEET	
CRITICAL AREAS BODY								B	CA-251			1	
BX ELEVATOR												OF	
												1	
REDRAWN / REPLACED BY:								REPLACES:					

1	2	3	4	5	6	7	8					
A	PART NUMBER		TYPE		PART NUMBER		TYPE					
	203210Y		BX ELEVATOR FRAME IV		203212Y		BX ELEVATOR FRAME IV					
	50004010Y		BX ELEVATOR FRAME V		50004012Y		BX ELEVATOR FRAME V					
B												
C												
D												
E												
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

—		—		—		—		M						
PART NO.		QTY.		NEXT ASSY		FINAL ASSY		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						
—		—		—		—		DRAWING NO. CA-254						
—		—		—		—		REPLACES:						
—		—		—		—		REDRAWN / REPLACED BY:						

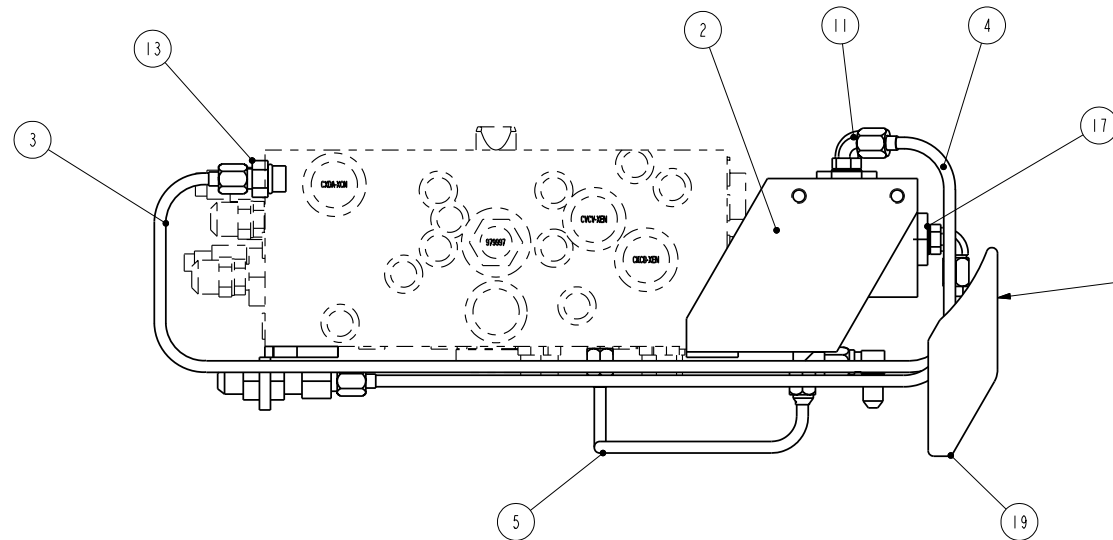


PART NUMBER	TYPE
203204	BX ELEVATOR FRAME IV
203304	BX ELEVATOR FRAME III
50004004	BX ELEVATOR FRAME V

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

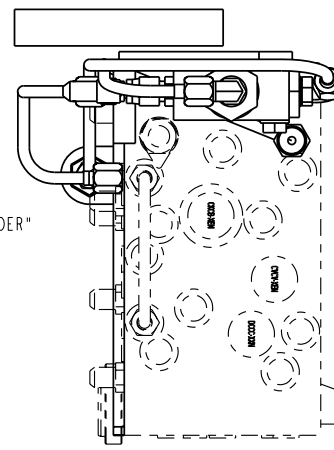
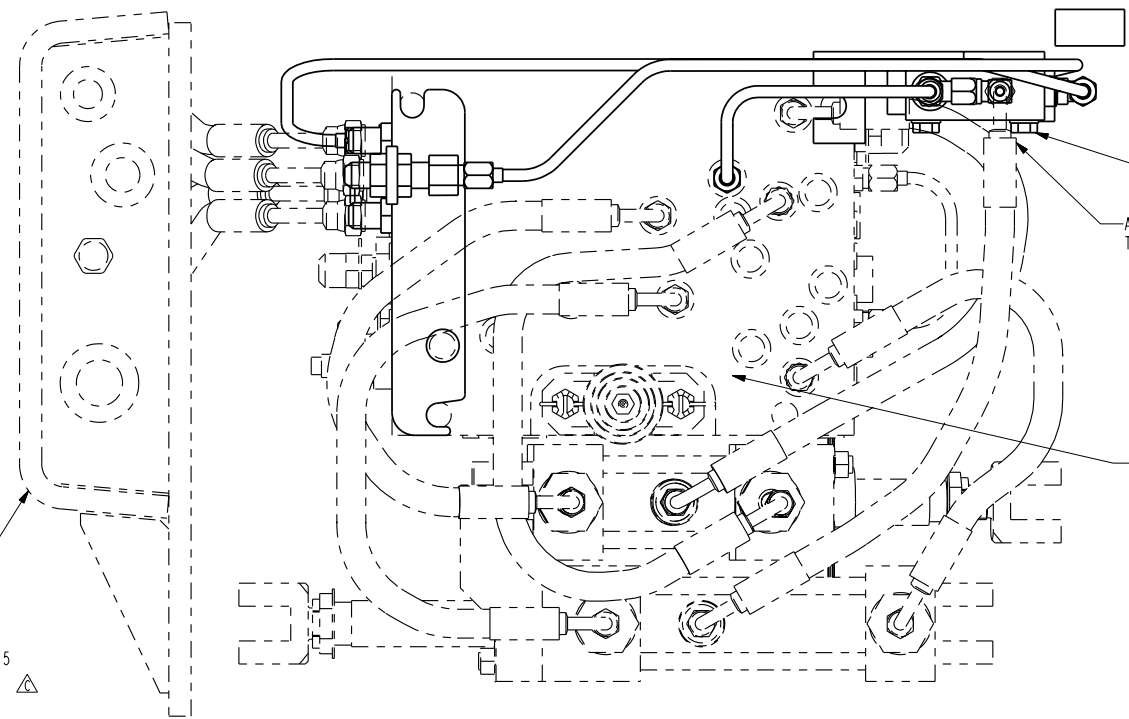
—		—		—		—		M										
PART NO.		QTY.		NEXT ASSY		FINAL ASS'Y		L										
<div><div><div><b>Varco® BJ™</b></div><div><b>OIL TOOLS</b></div><div>ETTEN-LEUR, THE NETHERLANDS</div></div><div>THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, 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 <sup>250</sup> √						K				
	NAME	DATE	PROJ.	MATERIAL —				J										
PREPARED	P.D.	05-Dec-97						H										
CHECKED	A.J.	05-Dec-97	SCALE -	WEIGHT LBS/ KG				G										
APPROVED	J.Tiebout	05-Dec-97	UNITS INCH (MM)					F										
TITLE CRITICAL AREAS LATCH BX ELEVATOR								E										
REDRAWN / REPLACED BY:								D										
REPLACES:								C	545003	P.D.	25-Feb-00	A.K.						
								B	550501	P.D.	17-08-98	A.J.						
								A	545001	P.D.	05-Dec-97	A.J.						
								REV.	E.C.N.	NAME	DATE	CHECKED						
								ACAD FILE NO. : CA-253.DWG										
SIZE B								DRAWING NO. CA-253				SHEET 1 OF 1						

203200  
PART NUMBER

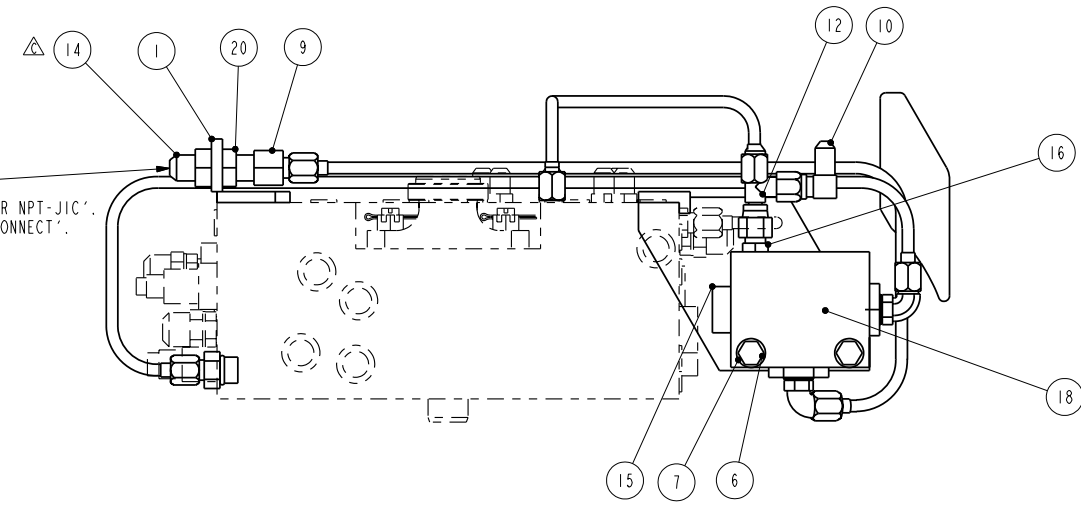


APPLIES ONLY TO BX 4  
WELD ITEM 19 TO ELEVATOR BODY  
UNDERSIDE FLUSH WITH UNDERSIDE  
OF TOP-FLANGE.

WELDSIZE 0.2" MINIMUM.  
WELD SPEC. WPS E-005



QD GUARD.  
KIT PARTNUMBER  
203200-14 BX 4  
203300-14 BX 3  
50004000-14 BX 5



PARTNUMBERS:  
-56558-4-6-S - 'BULKHEAD ADAPTER NPT-JIC'.  
-55909-4-4 - 'MALE QUICK DISCONNECT'.  
ALSO SUPPLIED WITH KIT FOR  
ELEVATORS WITHOUT QD GUARD.

ITEM 8  
REMOVED

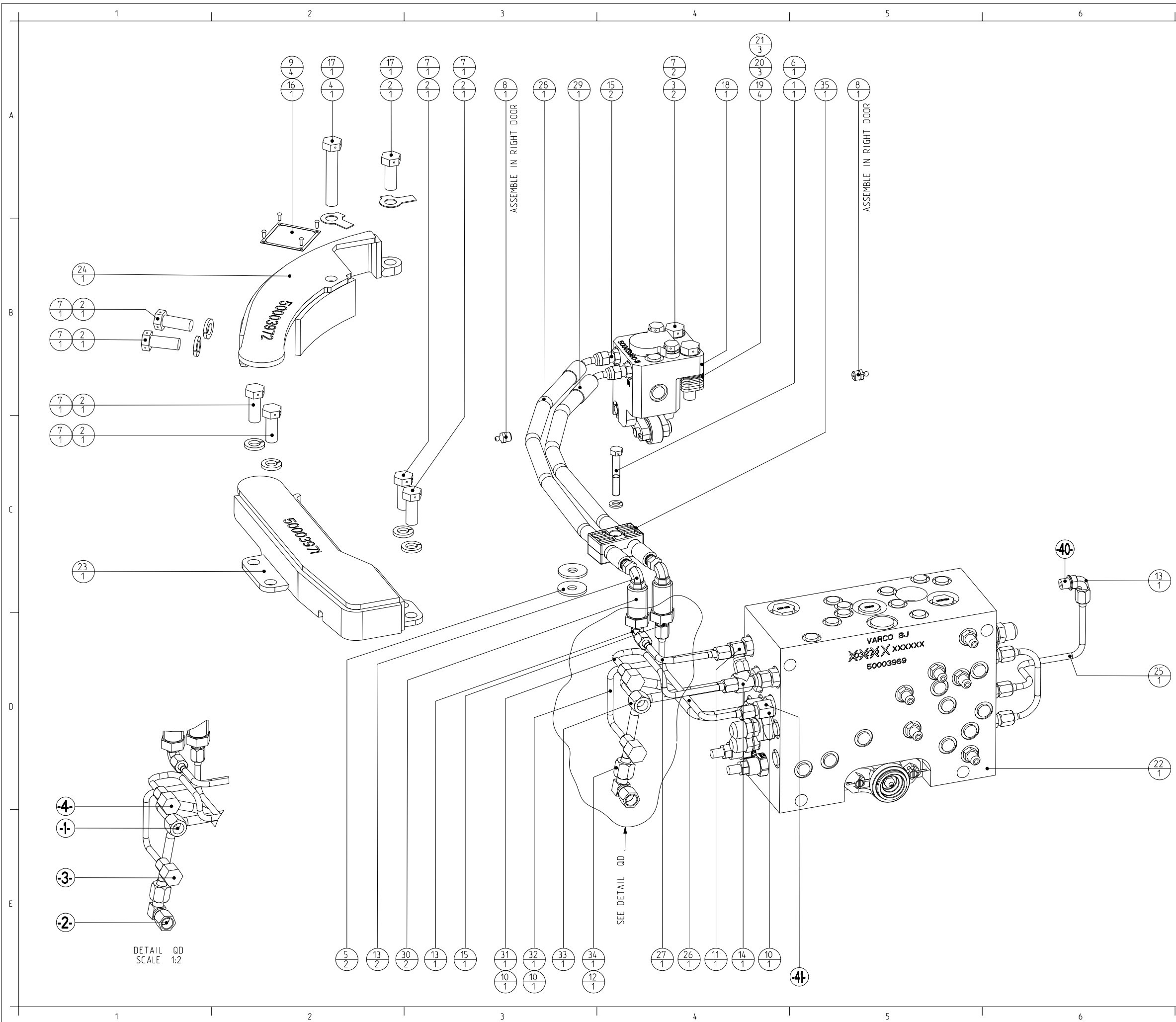
ITEM	QTY	DWG SIZE	PART NUMBER	DESCRIPTION
1	1		203270-14	QD BRACKET
2	1		203270-15	CHECK-VALVE BRACKET
3	1		203270-16	TUBING CHECK-VALVE TO XP PORT
4	1		203270-17	TUBING CHECK-VALVE TO XP QD
5	1		203270-18	TUBING CHECK-VALVE TO SIGNALPORT
6	2		50005-12-C8D	SCREW,CAP-HEX HD (UNC 5/16")
7	2		50805-N-C	WASHER, FLAT 5/16" NARROW
9	1		56517-6-4-S	REDUCER, 9/16-16JIC SWIVEL - 7/16-18JIC MALE
10	1		56518-04-04-S	ELBOW 90° 7/16"-20JIC SWIVEL - 7/16-20JIC MALE
11	2		56519-04-04-S	ELBOW 90° O-RING EXT.7/16UNF TO EXT.7/16UNF
12	1		56525-4-4-S	T-FITTING, 7/16"-20 JIC
13	1		56529-06-04-S	CONNECTOR SAE O-RING #6 TO 37 JIC #4
14	1		56538-6-6-S	UNION BULKHEAD EXT. 3/8 UNF TO EXT. 3/8 UNF
15	1		93547-1B30N	PILOT TO OPEN CHECK VALVE INT. DRAIN
16	1		979532-4-4	CONNECTOR BSP 1/4 #4 TO 37 JIC #4
17	2		979852-8-4	ADPTER 0.5 BSP TO SAE 4
18	1		979940-ECV	LINE MOUNTED BODY
19	1		203270-19	PROTECTION PLATE
20	1		56547-6-S	LOCKNUT, BULKHEAD 9/16"UNF

NOTE:  
TEST ACCORDING TSEL-0078.  
AFTER RETROFITTING  
ON ELEVATOR.

VIEWS UPDATED TO SHOW  
HOSE ROUTING  
AND QD GUARD.

SEE VARCO SERVICE BULLETIN OTSB#73


203200	QTY.	NEXT ASSY.	FINAL ASSY.	A					
PART NO.				J					
<b>Varco</b> OIL TOOLS ETTER-LEUR, THE NETHERLANDS				I					
TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .10 ANGLES ± .5 DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES				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	600305	P.D.	26-Apr-2001	A.K.	
				B	594902	P.D.	25-Sep-00	A.K.	
				A	594901	P.D.	06-Sep-00	A.K.	
				REV.	E.C.N	NAME	DATE	CHECKED	
APPROVED	A.K.	06-Sep-00	PROJ.						
CHECKED	A.K.	06-Sep-00	SCALE 1:2						
PREPARED	P.D.	06-Sep-00	UNITS INCH (MM)						
TITLE				SIZE	1672.395	LBS/	KG	PROVE FILE NO.:	203270-13
RETROFIT KIT CHECK-VALVE				D					
DRAWING NO.									
REPLACES:									
REPLACES:									

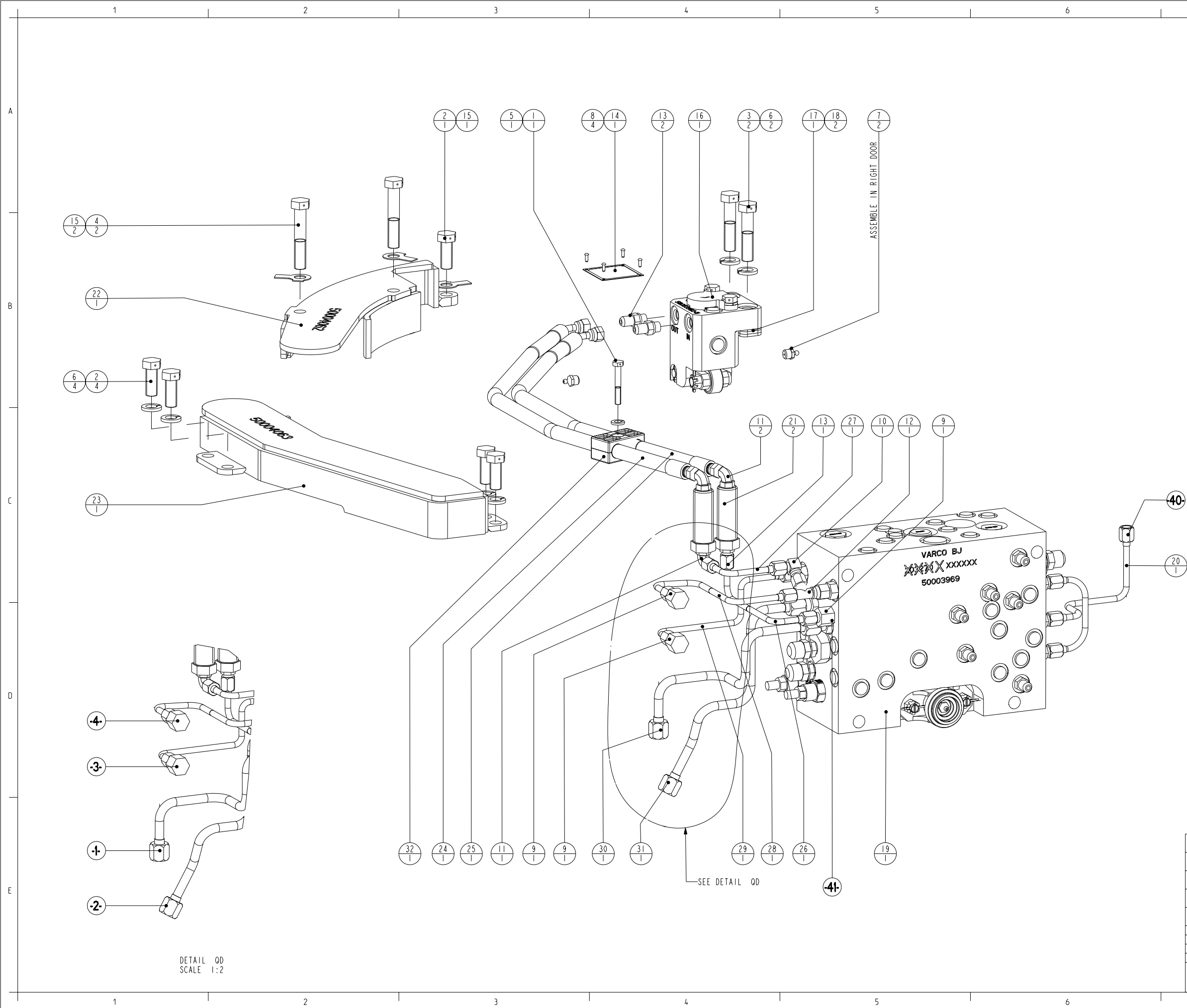


ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	50005-16-C8D	SCREW,CAP-HEX HD (UNC 5/16")
2	7	50008-10-C8D	SCREW,CAP-HEX HD (UNC 1/2")
3	2	50008-18-C8D	SCREW,CAP-HEX HD (UNC 1/2")
4	1	50008-22-C8D	SCREW,CAP-HEX HD (UNC 1/2")
5	2	50806-W-C	WASHER, FLAT
6	1	50905-C	WASHER, LOCK-REGULAR 0.312
7	8	50908-C	WASHER, LOCK-REGULAR 0.500
8	2	53201	GREASE FITTING, STRAIGHT
9	4	53301-4-5	SCREW, DRIVE 0.114 DIA X 5/16
10	3	56517-6-4-S	REDUCER, 9/16-16JIC - 7/16-18JIC MALE
11	1	56518-4-4-S	ELBOW 90° 7/16"-20JIC SWIVEL - 7/16-20JIC MALE
12	1	56518-6-6-S	ELBOW 90° 9/16"-18JIC SWIVEL - 9/16"-18JIC MALE
13	4	56519-04-04-S	ELBOW 90° O-RING EXT.7/16UNF TO EXT.7/16UNF
14	1	56525-4-4-S	TEE-SWIVEL, 7/16"-20 JIC
15	3	56529-04-04-S	CONNECTOR SAE O-RING #4 TO 37 JIC #4
16	1	203263	WARNING PLATE
17	2	979785-12	TAB WASHER M12 DIN 463
18	1	50003960-11	LATCH VALVE, ASS'Y FOR BX FRAME IV
19	4	50003968-1	SHIM 1MM FOR LATCH VALVE BX-IV
20	3	50003968-2	SHIM 2MM FOR LATCH VALVE BX-IV
21	3	50003968-3	SHIM 3MM FOR LATCH VALVE BX-IV
22	1	50003969-11	MANIFOLD ASS'Y UPGRADED FOR LATCH VALVE
23	1	50003971	HOSE PROTECTION (BODY) FOR LATCH VALVE BX-IV
24	1	50003972	HOSE PROTECTION (DOOR) FOR LATCH VALVE BX-IV
25	1	50003973	HYDRAULIC TUBE, STEEL FITTINGS 1/4"
26	1	50003974	HYDRAULIC TUBE, STEEL FITTINGS 1/4"
27	1	50003975	HYDRAULIC TUBE, STEEL FITTINGS 1/4"
28	1	50003976	HOSE, ASS'Y FOR LATCH VALVE BX-IV
29	1	50003977	HOSE, ASS'Y FOR LATCH VALVE BX-IV
30	2	50003981	ADAPTER, STRAIGHT FOR LATCH VALVE
31	1	50003982	HYDRAULIC TUBE, STEEL FITTINGS 1/4"
32	1	50003983	HYDRAULIC TUBE, STEEL FITTINGS 1/4"
33	1	50003984	HYDRAULIC TUBE, STEEL FITTINGS 3/8"
34	1	50003985	HYDRAULIC TUBE, STEEL FITTINGS 3/8"
35	1	980262-10	TWIN PIPE SUPPORT 5/8" PIPE

CONNECTION NO.	LINE / CONNECT TO
-1-	PRESSURE
-2-	TANK
-3-	XP
-4-	FLOAT
-40-	LINE MOUNT BODY 979940-ECV (- LINE 40 -> G TO X)
-41-	TUBE 203270-17 (-LINE 41 -> X TO Y)



- TEST ACCORDING TSEL-0128  
- FOR CONNECTION NUMBERS ETC. SEE HYDRAULIC SCHEMATIC 203270-32

PARTNUMBER	203200	UNLESS OTHERWISE SPECIFIED			Varco BJ. A Varco Company		
MATERIAL	-	TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .xxx ± .010 2 PLACE DECIMAL .xx ± .03 1 PLACE DECIMAL .x ± .5 ANGLES ± .5 DEGREE			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		
SURF. FINISH / PAINTSPEC.	-	BREAK SHARP CORNERS .010 ± .005					
COLOR	-	MACHINED SURFACES $\sqrt{25}$					
WEIGHT	1625.1 lbs	kg	TORNCUT SURFACES $\sqrt{100}$				
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT		SCALE 1:2	PROJ.
NAME	P. D.	NAME	N. d. K.	REV.	THIS DOCUMENT IS DMS CONTROLLED	UNITS INCH (mm)	
DATE	06-NOV-03	DATE	06-NOV-03	A			
		E.C.N.	601184				
TITLE				SIZE	DRAWING NO.		SHEET 1 OF 1
BX ELEVATOR FRAME 4				D	50003980		

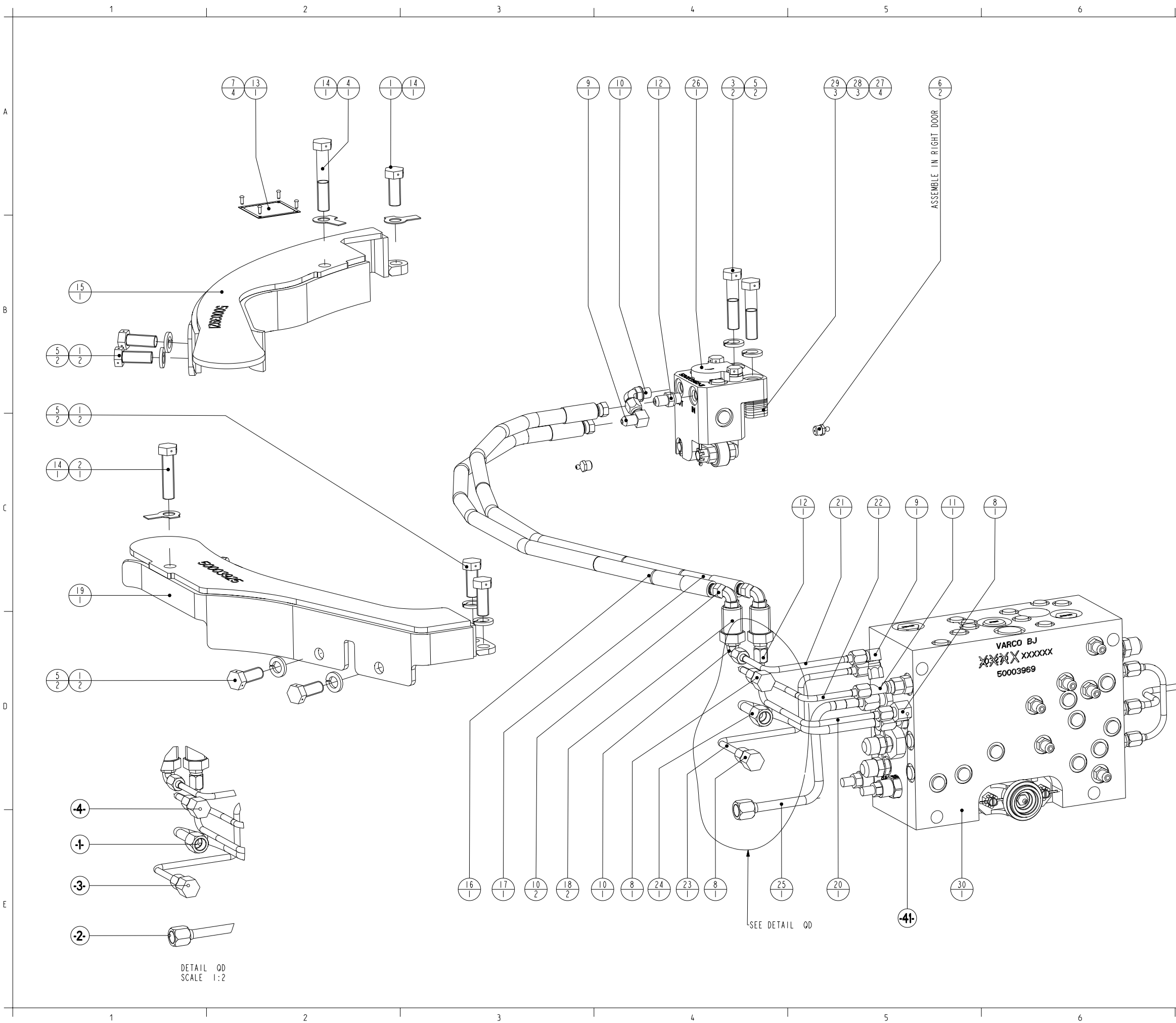


7		8	
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	50004-14-C8D	SCREW,CAP-HEX HD (UNC 1/4")
2	5	50008-10-C8D	SCREW,CAP-HEX HD (UNC 1/2")
3	2	50008-18-C8D	SCREW,CAP-HEX HD (UNC 1/2")
4	2	50008-22-C8D	SCREW,CAP-HEX HD (UNC 1/2")
5	1	50905-C	WASHER, LOCK-REGULAR 0.312
6	6	50908-C	WASHER, LOCK-REGULAR 0.500
7	2	53201	GREASE FITTING, STRAIGHT
8	4	53301-4-5	SCREW, DRIVE 0.114 DIA X 5/16
9	3	56517-6-4-S	REDUCER, 9/16-16JIC - 7/16-18JIC MALE
10	1	56518-4-4-S	ELBOW 90° 7/16"-20JIC SWIVEL - 7/16-20JIC MALE
11	3	56519-04-04-S	ELBOW 90° O-RING EXT.7/16UNF TO EXT.7/16UNF
12	1	56525-4-4-S	TEE-SWIVEL, 7/16"-20 JIC
13	3	56529-04-04-S	CONNECTOR SAE O-RING #4 TO 37 JIC #4
14	1	203263	WARNING PLATE
15	3	979785-12	TAB WASHER M12 DIN 463
16	1	50003960-11	LATCH VALVE, ASS'Y FOR BX FRAME IV
17	1	50003968-2	SHIM 2MM FOR LATCH VALVE BX-IV
18	2	50003968-3	SHIM 3MM FOR LATCH VALVE BX-IV
19	1	50003969-11	MANIFOLD ASS'Y UPGRADED FOR LATCH VALVE
20	1	50003973	HYDRAULIC TUBE, STEEL FITTINGS 1/4"
21	2	50004061	ADAPTER, STRAIGHT FOR LATCH VALVE
22	1	50004062	HOSE PROTECTION (DOOR) FOR LATCH VALVE BX-V
23	1	50004063	HOSE PROTECTION (BODY) FOR LATCH VALVE BX-V
24	1	50004064	HOSE, ASS'Y FOR LATCH VALVE BX-V
25	1	50004065	HOSE, ASS'Y FOR LATCH VALVE BX-V
26	1	50004066	HYDRAULIC TUBE, STEEL FITTINGS 1/4"
27	1	50004067	HYDRAULIC TUBE, STEEL FITTINGS 1/4"
28	1	50004068	HYDRAULIC TUBE, STEEL FITTINGS 1/4"
29	1	50004069	HYDRAULIC TUBE, STEEL FITTINGS 1/4"
30	1	50004070	HYDRAULIC TUBE, STEEL FITTINGS 3/8"
31	1	50004071	HYDRAULIC TUBE, STEEL FITTINGS 3/8"
32	1	980262-10	TWIN PIPE SUPPORT 5/8" PIPE

CONNECTION NO.	LINE / CONNECT TO
-1-	PRESSURE
-2-	TANK
-3-	XP
-4-	FLOAT
-40-	LINE MOUNT BODY 979940-ECV (- LINE 40 -> G TO X)
-41-	TUBE 203270-17 (-LINE 41 -> X TO Y)
- TEST ACCORDING TSEL-0128	
- FOR CONNECTION NUMBERS ETC. SEE HYDRAULIC SCHEMATIC 203270-32	

PARTNUMBER 50004000-30				UNLESS OTHERWISE SPECIFIED				<b>Varco BJ.</b>	
MATERIAL				TOLERANCES (PER ANSI Y 14.5)				[A Varco Company]	
SURF. FINISH / PAINTSPEC. -				3 PLACE DECIMAL .xxx ± .010				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	
COLOR -				2 PLACE DECIMAL .xx ± .03					
				1 PLACE DECIMAL .x ± .1					
				ANGLES ± .5 DEGREE					
WEIGHT 4647.4 lbs 2108.0 kg				BREAK SHARP CORNERS .010 ± .005					
				MACHINED SURFACES 					
				TORNCUT SURFACES 					
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT				SCALE 1:2	
NAME J. W.		NAME J. W.		THIS DOCUMENT IS DMS CONTROLLED				PROJ.	
DATE 20-Aug-04		DATE 20-Aug-04						UNITS INCH (mm)	
E.C.N.		601428		REV. A					
TITLE BX ELEVATOR FRAME 5				SIZE D		DRAWING NO. 50004060		SHEET 1 OF 1	





7			8
ITEM	QTY	PART NUMBER	DESCRIPTION
1	7	50008-10-C8D	SCREW,CAP-HEX HD (UNC 1/2")
2	1	50008-16-C8D	SCREW,CAP-HEX HD (UNC 1/2")
3	2	50008-18-C8D	SCREW,CAP-HEX HD (UNC 1/2")
4	1	50008-22-C8D	SCREW,CAP-HEX HD (UNC 1/2")
5	8	50908-C	WASHER, LOCK-REGULAR 0.500
6	2	53201	GREASE FITTING, STRAIGHT
7	4	53301-4-5	SCREW, DRIVE 0.114 DIA X 5/16
8	3	56517-6-4-S	REDUCER, 9/16-16JIC - 7/16-18JIC MALE
9	2	56518-4-4-S	ELBOW 90° 7/16"-20JIC SWIVEL - 7/16-20JIC MALE
10	4	56519-04-04-S	ELBOW 90° O-RING EXT.7/16UNF TO EXT.7/16UNF
11	1	56525-4-4-S	TEE-SWIVEL, 7/16"-20 JIC
12	2	56529-04-04-S	CONNECTOR SAE O-RING #4 TO 37 JIC #4
13	1	203263	WARNING PLATE
14	3	979785-12	TAB WASHER M12 DIN 463
15	1	50003921	HOSE PROTECTION (DOOR) FOR LATCH VALVE BX-III
16	1	50003922	HOSE, ASS'Y FOR LATCH VALVE BX-III
17	1	50003923	HOSE, ASS'Y FOR LATCH VALVE BX-III
18	2	50003924	ADAPTER, STRAIGHT FOR LATCH VALVE
19	1	50003925	HOSE PROTECTION (BODY) FOR LATCH VALVE BX-III
20	1	50003926	HYDRAULIC TUBE, STEEL FITTINGS 1/4"
21	1	50003927	HYDRAULIC TUBE, STEEL FITTINGS 1/4"
22	1	50003928	HYDRAULIC TUBE, STEEL FITTINGS 1/4"
23	1	50003929	HYDRAULIC TUBE, STEEL FITTINGS 1/4"
24	1	50003930	HYDRAULIC TUBE, STEEL FITTINGS 3/8"
25	1	50003931	HYDRAULIC TUBE, STEEL FITTINGS 3/8"
26	1	50003960-11	LATCH VALVE, ASS'Y FOR BX FRAME IV
27	4	50003968-1	SHIM 1MM FOR LATCH VALVE BX-IV
28	3	50003968-2	SHIM 2MM FOR LATCH VALVE BX-IV
29	3	50003968-3	SHIM 3MM FOR LATCH VALVE BX-IV
30	1	50003969-11	MANIFOLD ASS'Y UPGRADED FOR LATCH VALVE
31	1	50003973	HYDRAULIC TUBE, STEEL FITTINGS 1/4"

CONNECTION NO.	LINE / CONNECT TO
-1-	PRESSURE
-2-	TANK
-3-	XP
-4-	FLOAT
-40-	LINE MOUNT BODY 97940-ECV (- LINE 40 -> G TO X)
-41-	TUBE 203270-17 (-LINE 41 -> X TO Y)

- TEST ACCORDING TSEL-0128  
- FOR CONNECTION NUMBERS ETC. SEE HYDRAULIC SCHEMATIC 203270-32

PARTNUMBER 203300-30		UNLESS OTHERWISE SPECIFIED		Varco BJ. [A Varco Company]	
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		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	
SURF. FINISH / PAINTSPEC. -		BREAK SHARP CORNERS .010 ± .005			
COLOR -		MACHINED SURFACES $\sqrt[250]{}$			
WEIGHT 3951.1 Lbs 1792.2 kg		TOUCHUP SURFACES $\sqrt[1000]{}$			
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	
NAME J. W.		NAME J. W.		SCALE 1:2	
DATE 20-Aug-04		DATE 20-Aug-04		PROJ.	
E.C.N. 601425		A		THIS DOCUMENT IS DWS CONTROLLED	
TITLE		SIZE D		DRAWING NO. 50003920	
BX ELEVATOR FRAME III				SHEET 1 OF 1	