

# LINKS

Weldless Links  
Perfection Links

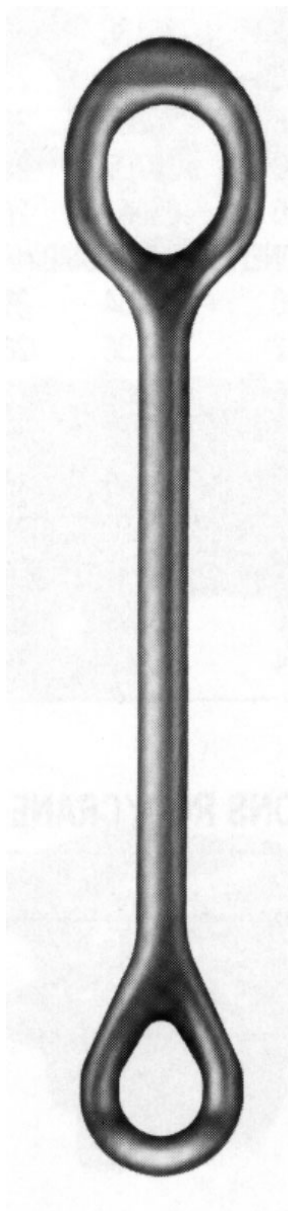


REFERENCE Links	REFERENCE DESCRIPTION Weldless Links and Perfection Links
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# NATIONAL OILWELL VARCO



## User's Manual

Weldless Links

Perfection Links

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<p>DOCUMENT NUMBER <b>50000870-MAN-001</b></p>	<p>REV <b>C</b></p>



# NATIONAL OILWELL VARCO

## Revision History

Revision	Change Description
-	First Issue
A	New style
B	Corrections
C	Corrections

## Change Description

C	18.05.2009	Added wear size Perfection links	PGF	NdK	AK
B	28.10.2008	Added Link connector info	PGF	BdP	AK
B	30.06.2008	Page 14: The SLX 5.1/2" - 24.1/2" link DOES fit in 500 tons 3.1/2" links, pn 25469	PGF	BdP	AK
A	26.03.2007	Data updated; part numbers, inspection, handle	PGF	BdP	AK
-	12.03.2007	Issued for Implementation	PGF	BdP	AK
<b>Rev</b>	<b>Date</b>	<b>Reason for issue</b>	<b>Prepared</b>	<b>Checked</b>	<b>Approved</b>

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## **Table of Contents**


## General Information


This manual contains installation, operation, maintenance and parts information. Information in this manual should enable qualified personnel to install, operate and troubleshoot this system. Every effort has been made to ensure the accuracy of the information contained herein. National Oilwell Varco (NOV) 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 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 application, 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.*

## 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.*

## 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.

## 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 before beginning work.
- ❑ Avoid performing maintenance or repairs while the equipment is in operation.
- ❑ Wear proper protective equipment during equipment installation, maintenance, or repair.

## Replacing Components

- ❑ Verify that all components (such as cables, hoses, etc.) are tagged and labeled during assembly and disassembly of equipment to ensure correct installment.
- ❑ Replace failed or damaged components with genuine NOV 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 the service 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.

## Link restrictions

The Link is designed to be used as an connecting element between Top Drive Systems and elevators, or between Hooks and elevators, and must not be used for any other purpose.



### **Design safety factor**

The design-safety factor and design verification of the links is in accordance with requirements of API specification 8A, 8C PSL 1 or 8C PSL2.

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

### **Safe Working Load**

Per API Specification 8C – The operator of the equipment shall be responsible for determination of the safe working load for any hoisting operation. The Safe working load is equal to the design load minus the dynamic load.

### **Limited warranty**

The warranty will be void if the Link were either:

- unauthorized modified, repaired or serviced
- replacement parts not manufactured by NOV were utilized
- not properly stored or maintained
- any welding is carried out

### **Identification numbers**

You will find the serial number of the tool stamped into the shank near the small eye.

### **CE marking**

The link complies with the Machinery Directive 98/37/EC

The marking is as follows:





## General specifications

### Description

#### Weldless Links

Weldless links are forged from a single billet of high strength alloy steel and heat treated to provide maximum strength and toughness. Additional material is added in critical wear areas for extended life. NOV Weldless Links are available in 250, 350, 500, 750, and 1000 ton ratings.

#### Perfection Links

Dependable, efficient perfection links are designed for light loads. They are made by forging, bending and electric welding of high quality steel bar stock, which is then heat-treated and magnafluxed. For loads which exceed capacity ratings of perfection links Varco BJ Weldless links are recommended.

### Intended usage

The links are designed to hang elevators from Top Drive Systems, Hooks, Beckets and Link Adapters.

*VARCO BJ  
 Weldless Links  
 2 1/4" to 3 1/2"*

*VARCO BJ  
 Weldless Links  
 4 3/4" to 5 1/2"*

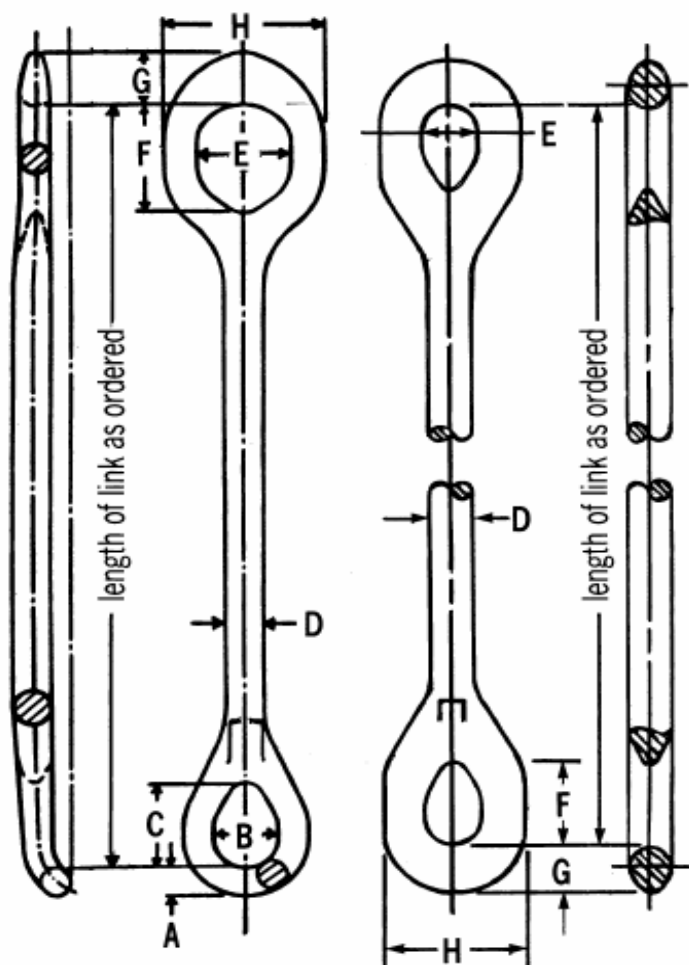


Fig. 1

<b>Part No.</b>	<b>Nominal link size (inch)</b>	<b>Size, in (mm)</b>	<b>Rated Capacity /Set, tons (tonnes)</b>	<b>Weight/Set, lb (Kg)</b>
16363-1060	2.1/4 x 60	60" (1524)	250 (226.8)	480 (218.2)
16363-1072	2.1/4 x 72	72" (1828.8)	250 (226.8)	530 (240.9)
16363-1084	2.1/4 x 84	84" (2133.6)	250 (226.8)	580 (263.6)
16363-1096	2.1/4 x 96	96" (2438.4)	250 (226.8)	630 (286.4)
16363-1108	2.1/4 x 108	108" (2743.2)	250 (226.8)	680 (309.1)
16363-1132	2.1/4 x 132	132" (3353)	250 (226.8)	780 (354.6)
16363-1168	2.1/4 x 168	168" (4267)	250 (226.8)	880 (399)
26940-1060	2.3/4 x 60	60" (1524)	350 (317.5)	620 (281.8)
26940-1072	2.3/4 x 72	72" (1828.8)	350 (317.5)	685 (311.4)
26940-1084	2.3/4 x 84	84" (2133.6)	350 (317.5)	740 (335.7)
26940-1096	2.3/4 x 96	96" (2438.4)	350 (317.5)	805 (365.9)
26940-1108	2.3/4 x 108	108" (2743.2)	350 (317.5)	870 (394.6)
26940-1120	2.3/4 x 120	120" (3048)	350 (317.5)	935 (425)
26940-1132	2.3/4 x 132	132" (3353)	350 (317.5)	1,000 (453.6)
26940-1144	2.3/4 x 144	144" (3657)	350 (317.5)	1,064 (483)
26940-1150	2.3/4 x 150	150" (3810)	350 (317.5)	1,095 (497.7)
26940-1168	2.3/4 x 168	168" (4267.2)	350 (317.5)	1,190 (540.9)
26940-1180	2.3/4 x 180	180" (4572)	350 (317.5)	1,255 (570.5)
26940-1192	2.3/4 x 192	192" (4876.8)	350 (317.5)	1,320 (600)
26940-1200	2.3/4 x 200	200" (5080)	350 (317.5)	1,363 (618)
26940-1216	2.3/4 x 216	216" (5486.4)	350 (317.5)	1,450 (659.1)
26940-1240	2.3/4 x 240	240" (6096)	350 (317.5)	1,580 (718.2)
26940-1264	2.3/4 x 264	264" (6705)	350 (317.5)	1,770 (800)
26940-1290	2.3/4 x 290	290" (7366)	350 (317.5)	1,944 (882)
26940-1350	2.3/4 x 350	350" (8890)	350 (317.5)	2,180 (988)
26940-1360	2.3/4 x 360	360" (9144)	350 (317.5)	2,235 (1014)
26940-1480	2.3/4 x 480	480" (12192)	350 (317.5)	2,885 (1306)
26940-1540	2.3/4 x 540	540" (13716)	350 (317.5)	3,187 (1446)
26940-1600	2.3/4 x 600	600" (15240)	350 (317.5)	3,408 (1546)
25469-1072	3.1/2 x 72	72" (1829)	500 (453.6)	705 (320)
25469-1096	3.1/2 x 96	96" (2438)	500 (453.6)	1058 (480)
25469-1108	3.1/2 x 108	108" (2743.2)	500 (453.6)	1,450 (659.1)
25469-1120	3.1/2 x 120	120" (3048)	500 (453.6)	1,622 (736)
25469-1132	3.1/2 x 132	132" (3353)	500 (453.6)	1,670 (759.1)
25469-1144	3.1/2 x 144	144" (3688)	500 (453.6)	1,780 (809.1)
25469-1160	3.1/2 x 160	160" (4064)	500 (453.6)	1,927 (875.9)
25469-1168	3.1/2 x 168	168" (4267.2)	500 (453.6)	2,000 (909.1)
25469-1180	3.1/2 x 180	180" (4572)	500 (453.6)	2,110 (959.1)
25469-1190	3.1/2 x 190	190" (4826)	500 (453.6)	2,202 (998)
25469-1192	3.1/2 x 192	192" (4826)	500 (453.6)	2,220 (1007)
25469-1216	3.1/2 x 216	216" (5486)	500 (453.6)	2,422 (1098)
25469-1226	3.1/2 x 226	226" (5740)	500 (453.6)	2,596 (1177)
25469-1264	3.1/2 x 264	264" (6705.6)	500 (453.6)	2,882 (1307)
25469-1360	3.1/2 x 360	360" (9144)	500 (453.6)	3,174 (1440)
25469-1480	3.1/2 x 480	480" (12192)	500 (453.6)	3,968 (1800)
25469-1540	3.1/2 x 540	540" (13716)	500 (453.6)	4,519 (2050)

Part No.	Nominal link size (inch)	Size, in (mm)	Rated Capacity /Set, tons (tonnes)	Appr. weight/ Set, lb (Kg)
16143-1132	4.3/4 x 132	132" (3352)	750 (680.4)	1,741 (790)
16143-1144	4.3/4 x 144	144" (3688)	750 (680.4)	2,312 (1050.9)
16143-1160	4.3/4 x 160	160" (3688)	750 (680.4)	3,178 (1444.6)
16143-1180	4.3/4 x 180	180" (4572)	750 (680.4)	3,900 (1769)
16143-1200	4.3/4 x 200	200" (5080)	750 (680.4)	4,550 (2063)
16143-1216	4.3/4 x 216	216" (5486)	750 (680.4)	5,200 (2363.6)
16143-1240	4.3/4 x 240	240" (6096)	750 (680.4)	5,864 (2660)
16143-1264	4.3/4 x 264	264" (6705)	750 (680.4)	7,275 (3300)
16143-1300	4.3/4 x 300	300" (7620)	750 (680.4)	8,800 (3991)

**Specials**

For Varco Type 1000 ton Elevator/Spider only:

70101-1200	5.1/2 x 200	200" (5080)	1000 (907.2)	5,100 (2315)
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For TDS-4 and TDS-5

15386-1108	2.3/4 x 108	108" (2743.2)	350 (317.5)	920 (418.2)
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**Reference Numbers\***

Link P/N	Nominal Dim.	A	B	C	D	E	F	G	H	
<b>250 Ton</b>										
16363	2.1/4"	in	2-5/16"	5-1/2"	7-1/2"	2-7/8"	9-1/2"	12"	5"	15"
"		(mm)	58.7	139.7	190.5	73	241.3	304.8	127	381
<b>350 Ton</b>										
26940	2.3/4	in	2-13/16"	5-5/8"	8-3/8"	3-1/2"	9-1/2"	12"	5"	15"
"		(mm)	71.4	142.9	212.7	88.9	241.3	304.8	127	381
<b>500 Ton</b>										
25469	3.1/2	in	3-5/8"	6-1/2"	10-1/8"	4-1/2"	9-1/2"	12"	6"	17"
"		(mm)	92.1	165.1	257.2	114.3	241.3	304.8	152.4	431.8
<b>750 Ton</b>										
16143	4.3/4	in	7-1/2"	10"	14-5/8"	6"	10"	14-5/8"	7-1/2"	23"
"		(mm)	190.5	254	371.5	152.4	254	371.5	190.5	584.2
<b>For Varco-type elevator/spider 1000 Ton</b>										
70101	5.1/2	in	8-1/4"	12-3/4"	17-1/2"	6"	12-3/4"	17-1/2"	8-1/4"	29-1/4"
"		(mm)	209.6	323.9	444.5	152.4	323.9	444.5	209.6	743

\* The dimensions are nominal and actual dimensions will vary slightly due to manufacturing tolerances. All API contact radius dimensions are manufactured to API specifications, see Fig. 1

## Perfection links

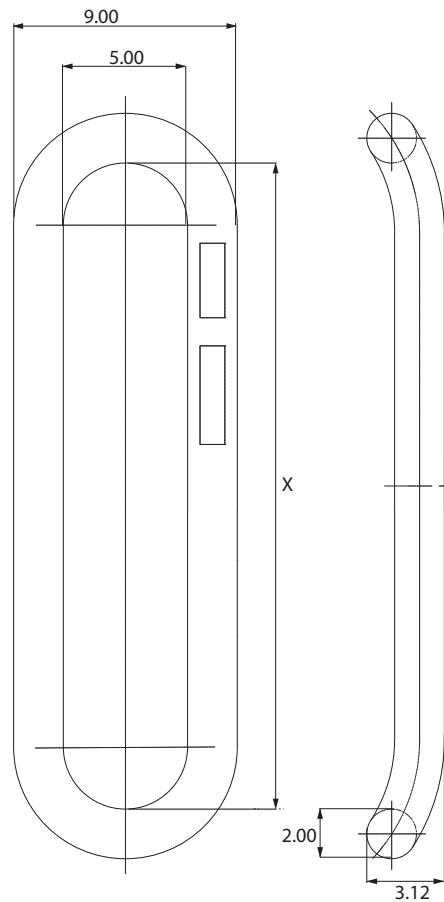


Fig. 2

Part No.	Size, in (mm)	Rated Cap/Set, tons (tonnes)	Weight/Set, lb (Kg)	Dimension X inch (mm)
200450-130	2" x 30" (50.8 x 762)	100 (89.3)	49 (108)	30 (762)
200450-136	2" x 36" (50.8 x 914)	100 (89.3)	58 (128)	36 (914)
200450-142	2" x 42" (50.8 x 1,067)	100 (89.3)	67 (148)	42 (1,067)
200450-148	2" x 48" (50.8 x 1,219)	100 (89.3)	76 (168)	48 (1,219)
200450-160	2" x 60" (50.8 x 1,524)	100 (89.3)	95 (208)	60 (1,524)

## Link handle kit

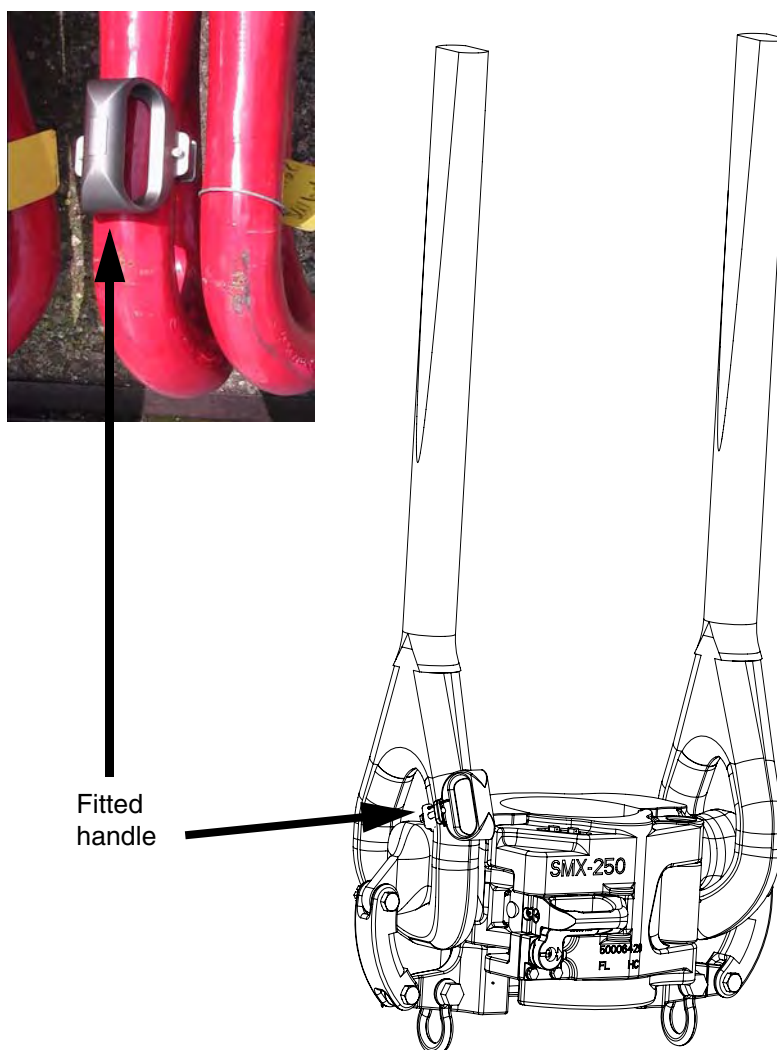
The Link handle kit can be used in combination with any Manual Operated Elevator. It is developed for easier handling of links and functions as a safe gripping point when closing and opening elevators. It suitable for 250 (2.1/4") and 350 (2.3/4")ton links.

Part number 50006435.

### Fitting

The handle(s) must be mounted to the eye of the link, and not to the shank.

Ensure no interference occurs between handle and elevator when rotating the elevator.



## Elevator link compatibility



**WARNING: Never use links which have a capacity too low for carrying the load intended (dynamic + static), even if the links may fit on the elevator.**

Elevator links	Top Drive Solid Body Elevator Rating				
	250T	400T	500T	650T	750T
250 Ton 2.1/4" pn16363	yes	no	no	no	no
350 Ton 2.3/4" pn26940	yes	yes	yes	yes	yes
500 Ton 3.1/2" pn 25469	no	yes	yes	yes	yes
750 Ton 4.3/4" pn16143	no	no	no	yes	yes
1000 Ton 5.1/2" pn70101	no	no	no	no	no

Elevator links	Elevator Y series						
	YC	MYC	HYC	YT	HYT	LYT*	MYT
250 Ton 2.1/4" pn16363	yes	yes	yes	yes	yes	no	yes
350 Ton 2.3/4" pn26940	yes	yes	yes	yes	yes	no	yes
500 Ton 3.1/2" pn 25469	no	no	yes	no	yes	no	no
750 Ton 4.3/4" pn16143	no	no	no	no	no	no	no
1000 Ton 5.1/2" pn70101	no	no	no	no	no	no	no

\*Requires link 7/8" - 1.3/4"

Elevator links	Elevator T(M)A series			
	TA 1.050 - 2.7/8	TMA 2.3/8 - 5	TA 4.3/4 - 8.5/8 up to 100 ton	TA 4.3/4 - 11.1/4 150 ton only
250 Ton 2.1/4" pn16363	no	yes	yes	yes
350 Ton 2.3/4" pn26940	no	yes	yes	yes
500 Ton 3.1/2" pn 25469	no	no	no	yes
750 Ton 4.3/4" pn16143	no	no	no	no
1000 Ton 5.1/2" pn70101	no	no	no	no

Elevator links	Elevator G series							
	MG	RGG	MGG	GG	HGG	RGA	GA	GGA
250 Ton 2.1/4" pn16363	yes	yes	yes	yes	no	yes	yes	yes
350 Ton 2.3/4" pn26940	yes	yes	yes	yes	yes	yes	yes	yes
500 Ton 3.1/2" pn 25469	no	no	yes	yes	yes	no	yes	yes
750 Ton 4.3/4" pn16143	no	no	no	no	yes	no	no	no
1000 Ton 5.1/2" pn70101	no	no	no	no	no	no	no	no

Elevator links	Elevator X series							
	SLX 1.66-5.1/2	SLX 5.1/2-24.1/2	SSD 1.66-7.5/8	SSD 8.5/8-10.3/4 + 11.3/4-14	SX except 350 ton	SX 350 ton	SLX SD	
250 Ton 2.1/4" pn16363	yes	yes	yes	yes	no	yes	yes	
350 Ton 2.3/4" pn26940	yes	yes	yes	yes	yes	yes	yes	
500 Ton 3.1/2" pn 25469	no	yes	no	yes	yes	yes	yes	
750 Ton 4.3/4" pn16143	no	no	no	no	no	no	no	
1000 Ton 5.1/2" pn70101	no	no	no	no	no	no	no	



Elevator links	Elevator X series	
	SMX 150 Ton	SMX 250 + 350 Ton
250 Ton 2.1/4" pn16363	yes	yes
350 Ton 2.3/4" pn26940	yes	yes
500 Ton 3.1/2" pn 25469	no	yes* (rotation limited)
750 Ton 4.3/4" pn16143	no	no
1000 Ton 5.1/2" pn70101	no	no

\*250 and 350 ton SMX elevators in combination with 500 ton links gives reduced rotation possibility. Be advised to use 350 ton links.

Elevator links	Casing Elevators / Spiders Varco Type						Casing Elevators / Spiders BJ Type			
	200T	350T	500T	750T 14"	750T 24.1/2"	1000T 24.1/2"	250T	350T	500T	1000T
250 Ton 2.1/4" pn16363	yes	yes	no	no	no	no	yes	no	no	no
350 Ton 2.3/4" pn26940	yes	yes	yes	no	no	no	yes	yes	no	no
500 Ton 3.1/2" pn 25469	yes	yes	yes	yes	yes	no	yes	yes	yes	yes
750 Ton 4.3/4" pn16143	no	no	no	yes	yes	yes	no	yes	yes	yes
1000 Ton 5.1/2" pn70101	no	no	no	no	no	yes	no	no	no	no

Elevator links	Riser handling solid body elevator rating					
	250 T	400 T	500 T	650T	750 T	1000T
250 Ton 2.1/4" pn16363	yes	no	no	no	no	no
350 Ton 2.3/4" pn26940	yes	yes	yes	yes	yes	no
500 Ton 3.1/2" pn 25469	no	yes	yes	yes	yes	no
750 Ton 4.3/4" pn16143	no	no	no	yes	yes	yes
1000 Ton 5.1/2" pn70101	no	no	no	no	yes	yes

Elevator links	BX1	BX2	BX3	BX4-35
	450 T	500 T	350 T	350 T
250 Ton 2.1/4" pn16363	yes	no	no	no
350 Ton 2.3/4" pn26940	yes	yes	yes	yes
500 Ton 3.1/2" pn 25469	yes	yes	yes	yes
750 Ton 4.3/4" pn16143	no	no	yes	yes
1000 Ton 5.1/2" pn70101	no	no	no	no

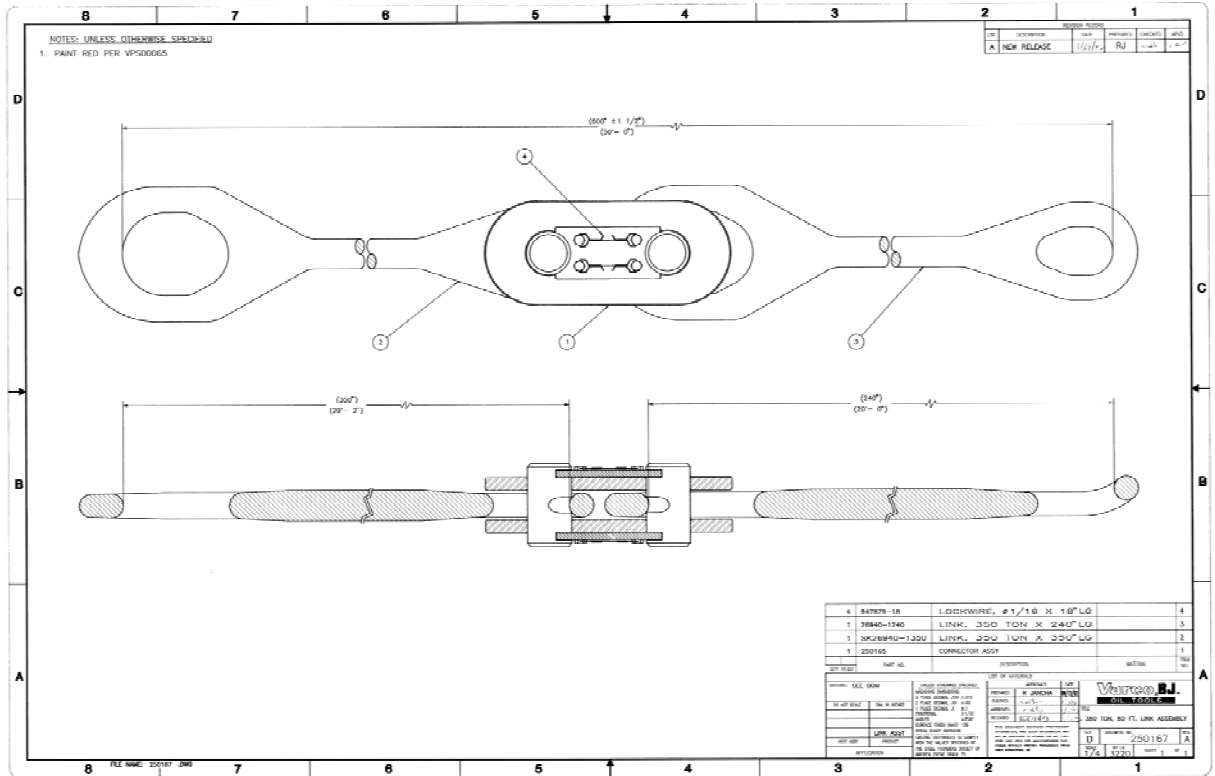
Elevator links	BX4-50	BX4-75	BX5	BXS, Slip type
	500 T	750 T	1000 T	350 T
250 Ton 2.1/4" pn16363	no	no	no	yes
350 Ton 2.3/4" pn26940	yes	no	no	yes
500 Ton 3.1/2" pn 25469	yes	yes	no	yes
750 Ton 4.3/4" pn16143	yes	yes	yes	no
1000 Ton 5.1/2" pn70101	no	no	yes	no

## NOTES:

1. Compatibility is based on API 8C radii unless specific link part No's are listed.
2. If a link part No. is not listed, suitable fit with the SBE is to be confirmed
3. In some cases special links are required for use on Top Drive SBE's to permit proper operation of link tilt.
4. In general, an elevator will fit one size larger and one size smaller noted link. However, fit should always be confirmed when combining sizes of links and elevators.

### Link connectors

The link connector can be used to make a link assembly up to 50/60 Feet long, partnumber 250167.



## Inspection & wear data

### Safety



**WARNING:** NOV does not allow welding of links and bails. Links and bails cannot be repaired or reconditioned by welding.



**WARNING:** Ensure daily if the secondary retention (wire, cotter pins) is in good condition. Replace or repair if needed.



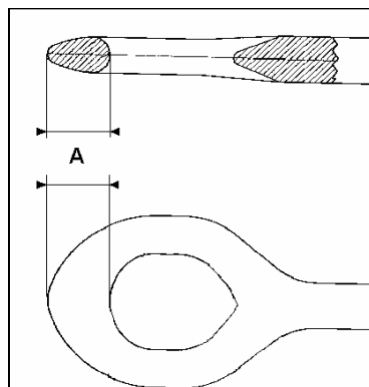
**NOTE:** Capacity of set is that of the weakest link.

### Wear chart shaft (shank)

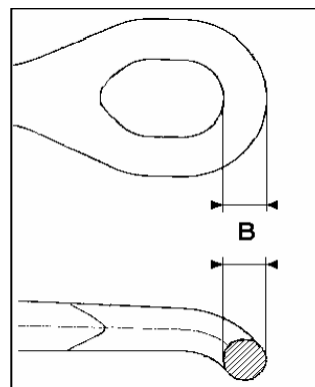
Wear/damage may result in a reduced section of the material, hence this will lead to a derating of the link according to below table.

250 TON LINK		350 TON LINK		500 TON LINK		750 TON LINK		1000 TON LINK	
Diameter	Rating	Diameter	Rating	Diameter	Rating	Diameter	Rating	Diameter	Rating
2.75"	250	3.25"	350	3.688"	500	4.55"	750	5.25"	1000
2.688"	215	3.188"	325	3.625"	480	4.438"	725	5.125"	962
2.625"	200	3.125"	312	3.5"	450	4.375"	700	5"	915
2.5"	185	3"	288	3.375"	415	4.25"	662	4.875"	870

### Wear chart forged links



Upper eye



Lower eye

Fig. 3

Link	Upper Eye (A) (greater or equal to)	Lower Eye (B) (greater or equal to)	Rating (Short Ton)
1.3/4" - 150 TON	3.38"	1.625"	150
	3.25"	1.50"	125
	3.13"	1.44"	112.5
	Height less than 3.13	Height less than 1.44	Scrap

<b>Link</b>	<b>Upper Eye (A)</b>	<b>Lower Eye (B)</b>	<b>Rating</b>
	(greater or equal to)	(greater or equal to)	(Short Ton)
2.1/4" - 250 TON	4.75"	2.06"	250
	4.63"	1.88"	200
	4.5"	1.75"	180
	Height less than 4.5"	Height less than 1.75"	Scrap

<b>Link</b>	<b>Upper Eye (A)</b>	<b>Lower Eye (B)</b>	<b>Rating</b>
	(greater or equal to)	(greater or equal to)	(Short Ton)
2.3/4" - 350 TON	4.75"	2.56"	350
	4.63"	2.38"	290
	4.5"	2.25"	260
	Height less than 4.50"	Height less than 2.25"	Scrap

<b>Link</b>	<b>Upper Eye (A)</b>	<b>Lower Eye (B)</b>	<b>Rating</b>
	(greater or equal to)	(greater or equal to)	(Short Ton)
3.1/2" - 500 TON	5.625"	3.25"	500
	5.25"	3"	440
	5."	2.75"	375
	Height less than 5"	Height less than 2.75"	Scrap

<b>Link</b>	<b>Upper Eye (A)</b>	<b>Lower Eye (B)</b>	<b>Rating</b>
	(greater or equal to)	(greater or equal to)	(Short Ton)
750 TON	7"	7"	750
	6.75"	6.75"	700
	6.5"	6.5"	600
	Height less than 6.5"	Height less than 6.5"	Scrap

<b>Link</b>	<b>Upper Eye (A)</b>	<b>Lower Eye (B)</b>	<b>Rating</b>
	(greater or equal to)	(greater or equal to)	(Short Ton)
1000 TON	7.875"	7.875"	1000
	7.5"	7.5"	900
	7.125"	7.125"	800
	Height less than 7.125"	Height less than 7.125"	Scrap

**Wear data Perfection links.**

Standard diameter of a Perfection link is 2.00".

Minimum allowable diameter is 1.75"

## MPI and inspection

### References

1. ASTM E 709 (latest edition)

Standard Practice for Magnetic Particle Examination

2. ASTM A 275 (latest edition)

Standard Test Method for Magnetic Particle Examination of Steel Forgings.

3. API Specification 8A & 8C (latest edition)
4. API Recommended Practice RP 8B (latest edition)

### Qualifications and certification

All personnel performing and interpreting examinations shall be qualified in accordance with the guidelines of ASNT-TC-1A (latest edition) or an equivalent standard recognized by ASNT. All personnel performing NDE shall also be trained in the NDE of forgings as well as trained in the interpretation of the MPI with regard to the acceptance criteria.

### Evaluation of indications

#### Relevant indications:

Only those indications with major dimensions greater than 1/16 inch (1.6mm) and associated with a surface rupture shall be considered relevant. Relevant indications are indications that results from discontinuities within the test part. Non relevant indications are indications that results from excessive magnetizing current, structural design or permeability variances within the test parts. Any indication believed to be non relevant shall be regarded as relevant and shall be re-examined to determine whether an actual defect exists. Linear indications shall be considered as those having a length of more than three times the width. Rounded indications shall be considered as those having a length less than three times the width. Aligned indication should be considered as a group of three or more indications which touch an imaginary straight line connecting any two of the group.

### Acceptance criteria

The link is considered critical in all area's.

### Equipment covered

**Wrought material:** In all cases as specified in the following table.

#### Relevant Indications

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No relevant indications with a major dimension equal to or greater than 3/16 inch (4.8 mm)

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No more than ten indications of 1/16 inch (1.6 mm) long or greater in any continuous 6-square-inch (40 cm<sup>2</sup>) area

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No more than three 1/16 inch (1.6 mm) long or greater indications in a line separated by less than 1/16 inch (1.6 mm) edge to edge

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