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1004D3/1005E3 API BOTTOM LOADING COUPLER

Installation, Operation & Maintenance (IOM) Manual

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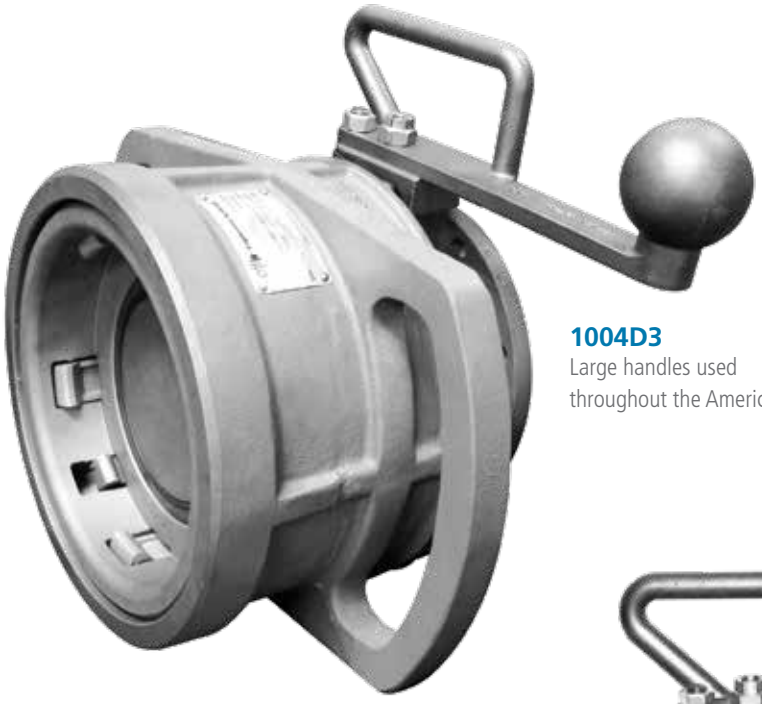
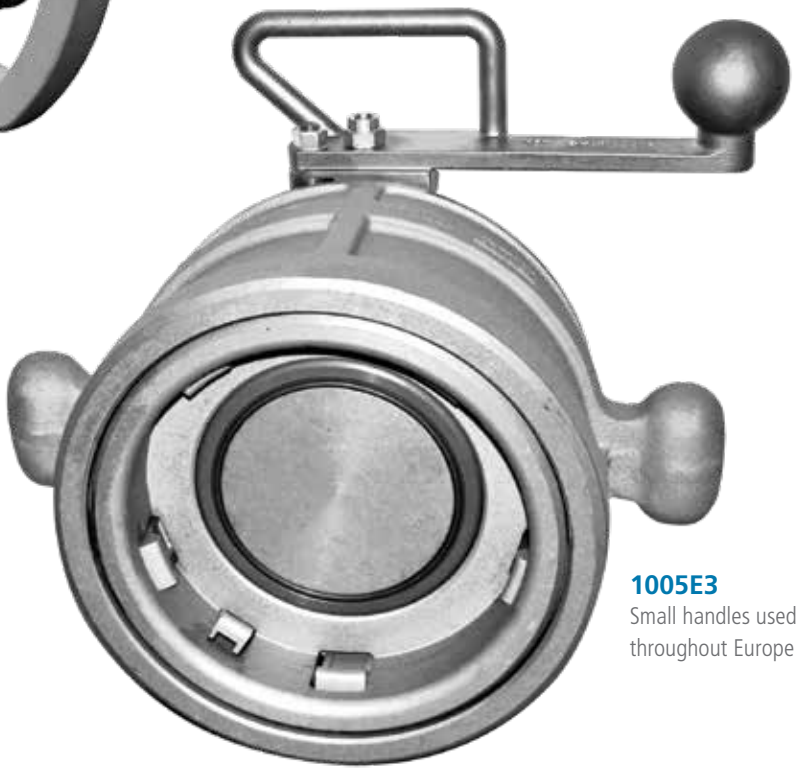
ENGINEERING | WHAT'S NEXT

The 1004D3 is the standard in "drip-less" bottom-loading couplers and a proven performer at major oil terminals worldwide. The 1004D3 mates with all 4" bottom-loading adapters built in accordance with API RP-1004 requirements to significantly reduce liquid loss at disconnect.



1004D3
Large handles used throughout the Americas



1005E3
Small handles used throughout Europe

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1004D3/1005E3 API Bottom Loading Coupler

Section 1: Introduction

Feature and Benefits

- **5-Cam Design** – Design ensures easy alignment, tight connection, and resists side forces during loading
- **Fully Interlocked** – The 1004D3 cannot be opened unless it is properly connected to an API adaptor nor can it be disconnected when the poppet is open
- **Redundant Sealing** – Simple and reliable, consisting of dual heavy duty cross-section O-rings
- **Smoother, Easier Operation** – Built-in roller bearing handle and PTFE impregnated poppet and cylinder provide for smoother, easier movement

Easy and inexpensive to maintain!

Selection Guide

1004D3 **04** **01**

1004D3 = Large handles, U.S. version
1005E3 = Small handles, European version

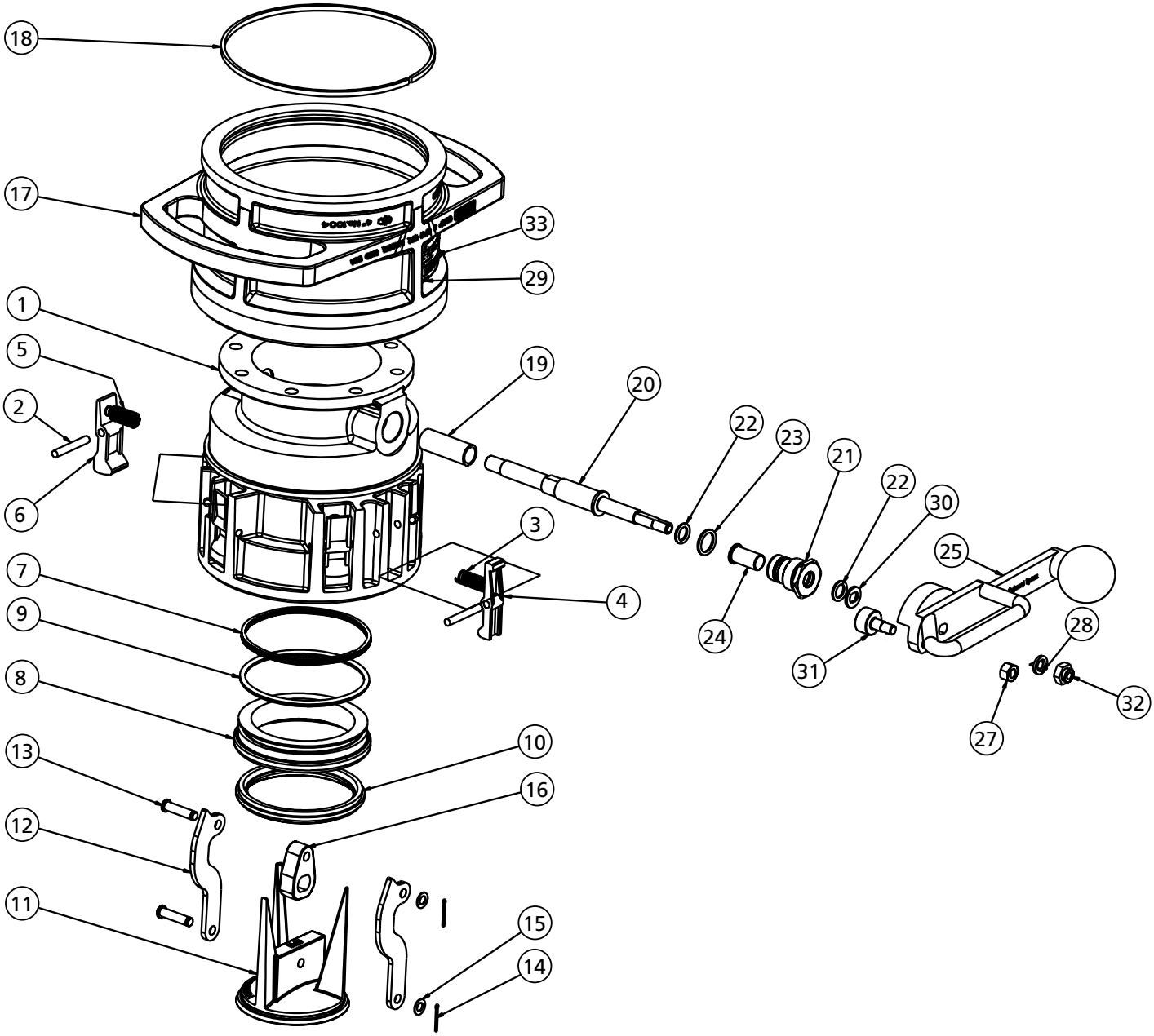
04 = Size (4" only)

01 = Seal
01 = Buna-N
02 = Fluorocarbon
02-LT = Lo-Temp Fluorocarbon
04 = EPDM

DESIGN PARAMETERS		MATERIALS	
Max. Design Pressure:	125 psi (g), 8.6 bar (g)	Body, Sleeve, Poppet	Aluminum (A356-T6)
Max. Allowable Working Pressure:	75 psi (g), 5 bar (g)	Cam, Interlock	316 SST ASTM A351 CF8M
Max. Flow Rate:	600 gpm, 135 m^3/h	Cylinder	Aluminum (6061-T6)
Max. Temperature:	See Seal Options	Shaft	13-8 Condition RH 950 SST
Weight:	18.5 lbs (8.39 kg)	Seals	See Seal Options
Pressure Drop (@ Max. Flow Rate)	2-5 psi (g), .24 bar (g)	Clevis Pin	17-4 PH SST Condition H900 Hardened

*Unit tested to 300 psi (21 bar) in the closed position to withstand excessive thermal expansion. Reference API Standard RP-1004 for additional information.

1004D3/1005E3 API Bottom Loading Coupler



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1004D3/1005E3 API Bottom Loading Coupler

#	DESCRIPTION	QTY	MATERIAL	PART #	
1	Body, API Coupler, Alum, 1004D3	1	Aluminum A356-T6, ASTM B26 Anodized	E20064AH	
2	Spiral Pin	7	Carbon Steel Zinc Plated	H31396M	
3	Compression Spring	2	Carbon Steel Zinc Plated	H31743M	
4	Interlock	2	316 SST, ASTM A351 CF-8M	C20062M	
5	Cam Spring	5	18-8 SST	H06753M	
6	Cam Arm, 1004 CPLR, SST	5	SST	C20063M	
7	Wave Spring	1	Inconel	H31091M	
8	Cylinder	1	ASTM SB241 (Aluminum 6061-T6)	C21283AH	
9	Cylinder O-Ring	1	Fluorocarbon	H30217M	*
10	Nose Seal, API CPLR, Fluorocarbon	1	Fluorocarbon	H30483M	*
11	Poppet	1	A356-T6 Aluminum	D20069AH	
12	High Pressure Link	2	410 SST Hardened	H30552M	
13	Clevis Pin	2	17-4 PH SST	H30610RE	
14	Cotter Pin	2	316 SST	H30205M	
15	Washer, Flat, SST, 5/16	2	18-8 SST	H30206M	
16	Drive Link	1	316 SST	C21255EW	
17	Sleeve, API Coupler, AL, 4"	1	Aluminum A356-T6 ASTM B26 Anodized	E20013AH (1004D3) E20026AH (1005E3)	
18	Dust Seal	1	Felt	H30214M	
19	Tube Spacer, API, SST	1	316 SST	C21254RE	
20	Handle Shaft	1	ASTM A564 (13-8, Condition RH950 SST)	C21290RE	
21	Stuff Box, API and LOK, SST	1	316 SST	C20812RE	
22	O-Ring, Fluorocarbon	2	Fluorocarbon	H20175M	*
23	O-Ring, Fluorocarbon	1	Fluorocarbon	H31706M	*
24	Sleeve Bearing	1	PTFE	H32163M	*
25	Operating Handle	1	316 SST, ASTM A351 CF-8M	E20070EW	
26	Loctite	As Required	Thread Locking Compound	TYPE 242	
27	Nut, Hex, CST, ZP, 3/8"-24	1	ZP CST	H30220M	
28	Lock Washer, SST, NL 10ss	1	SST	H31920M	
29	6-20 X 3/16" Long Thread Screw	4	Steel, Zinc Plated	H32149M	
30	Load Distribution Washer	1	410 SST	H32246RE	
31	Roller Bearing	1	Carbon Steel	H30219M	
32	Distorted Thread Nut, 10mm	1	Steel, Zinc Plated	H32256M	
33	Nameplate, 1004D3-0402, Fluorocarbon	1	0.12 Satin	H32157M	

* Items included in seal replacement kits (1004D3SRK)

1004D3/1005E3 API Bottom Loading Coupler

Section 2: Assembly

Installation Preparations

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Safety Precautions

WARNING: Failure to follow these warnings could result in personal injury, property damage or product failure.

1) Do not attempt any maintenance service while the equipment is in operation. System pressure must be relieved and the product drained before attempting any service on the unit. The line must be locked out while service is in progress. Proper thermal relief must be provided at all times while equipment is in service.

2) OPW products do not eliminate possible exposure to hazardous substances. The conditions of handling and use are beyond our control, and we make no guarantee and assume no liability for damages or injuries related to the use of our products. Follow the safety precautions outlined in the Material Safety Data Sheets for the material being used. It is the responsibility of the user to comply with all federal, state and local regulations. Always employ proper safety precautions and handling techniques.

3) Proper seal and wetted material part selection are critical for safe operation. To assure maximum life for the service intended, use only those materials compatible with the fluids being handled. Please note material being supplied and make certain that it is suited for the intended service.

4) Read and understand these instructions before starting installation:

- Coupling is to be used for its designated purpose only
- Local regulations for (un)loading must be followed at all times
- Product flow may result in static electricity; grounding of equipment is required
- OPW instructions must be followed for installation
- Make sure to use adequate personal protection at all times during operation

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Seal Options

SEAL MATERIAL	COUPLER MODEL #	NOSE SEAL (10)	STUFF BOX SEAL (22)	STUFF BOX SEAL (23)	CYLINDER SEAL (9)	TEMP RATING
Buna-N	1004D3-0401/1005E3-0401	H30482M	H20129M	H31705M	H30258M	-20°F - 250°F (-29°C - 121°C)
Fluorocarbon	1004D3-0402/1005E3-0402	H30483M	H20175M	H31706M	H30217M	-20°F - 400°F (-29°C - 204°C)
EPDM	1004D4-0404/1005E3-0404	H31957M	H20176M	H31707M	H31956M	-50°F - 225°F (-46°C - 107°C)

Consult factory for additional seal options.

Seal Replacement Kits

OPW 1004D3SRK Seal Replacement Kits include everything needed to change the seals in the 1004D3/1005E3 API coupler. **Seal Replacement Kits are always recommended as spare parts.**

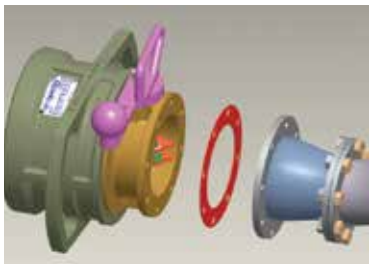
SEAL MATERIAL	SEAL REPLACEMENT KIT PART #
Buna-N	1004D3SRK-0401
Fluorocarbon	1004D3SRK-0402
Lo-Temp Fluorocarbon	1004D3SRK-0402-LT
EPDM	1004D3SRK-0404

TOOLS NEEDED	
11/16-inch or 17-mm socket	1-1/4-inch or 32-mm deep-reach socket

Assembly Procedure

NOTE: All images depict the 1004D3 (large handles). The steps for 1005E3 coupler (small handles) are the same as 1004D3.

Step 1



Secure whatever device coupler will be mounted to, e.g., loading arm.

Sandwich gasket between coupler and load device flanges.

Step 2

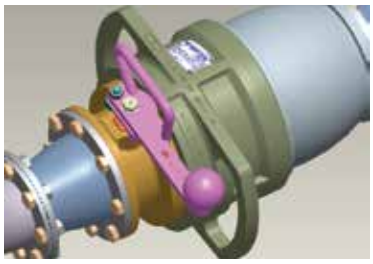
Align coupler bolt holes with bolt holes on loading device.

Insert two (2) bolts into the highest bolt holes on the flange and hand tighten.

This is to secure coupler and prevent damage due to bending as the remaining bolts are installed.

WARNING: Under pressure, poppet will cause handle to rotate violently if not restrained.

Step 3



Connect the coupler to the adapter. Slide the sleeve fully forward.

Fully rotate the operating handle and in the open position, the operating handle cam surface should prevent the sleeve from sliding back.

1004D3/1005E3 API Bottom Loading Coupler

Section 3: Maintenance, Disassembly & Reassembly

Consider the following when servicing the coupler:

- When coupler is over pressurized, it must be inspected thoroughly.
- After maintenance is performed, it must be tested before the next use (see Coupler Testing).
- Periodic inspection (every three months) for leakages (especially with toxic or hazardous mediums).
- Maintenance must be performed by authorized personnel.
- Periodic maintenance (once a year) is required according to the maintenance instructions.
- If any leaks are discovered, have seals replaced immediately to obtain a safe and correct use of the coupler. If leakages continue contact the OPW distributor or OPW Engineered Systems for consultation.

Disassembly Instructions

Step 1: Dismantle API coupler

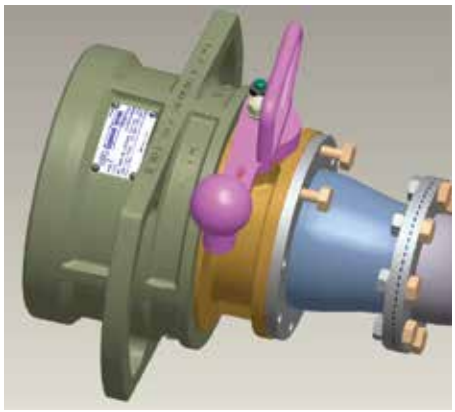
CAUTION: Dismantling must be performed by authorized and trained personnel only.
CAUTION: The same risks and procedures of initial installation apply.

Before dismantling coupler, please make the following, yet necessary preparations.

Figure A

Secure from movement the device the coupler is attached to (Figure A).

Figure B



Make sure to use adequate personal protection at all times during the operation.

Clear surrounding areas and shut off any working devices.

Make sure the surrounding area is clear from obstacles.

Barricade surrounding area so no unauthorized persons can access work floor.

Arrange necessary permits or paperwork with plant holder, owners, or local authorities, before taking any actions.

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Step 1: Dismantle API coupler – (Continued)

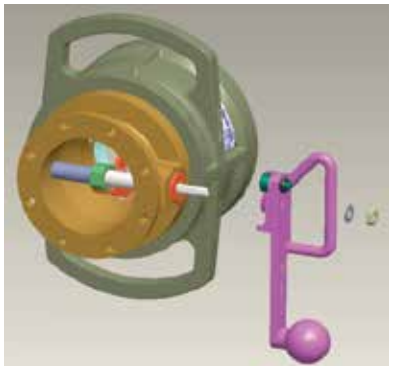
When the coupler is clean and dry and the necessary preparations have been made, the coupler can be disassembled from the device it is attached to.

- With the corresponding loading arm secured from movement, loosen bolts mounting the coupler to the loading arm. Support coupler while removing all bolts except top two. This is to prevent bending moments from causing damage to the flanges and bolts (Figure B).
- While supporting the loose coupler, remove the final two bolts. Coupler should fall away.
- Remove gasket between both flanges.

Step 2:

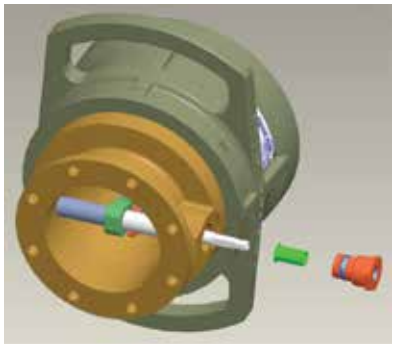
Carefully, manually defeat the interlocks and slide the sleeve fully forward. Fully rotate the operating handle.

Step 3:



Remove the 10 mm nut and the Lock washer using the 11/16-inch or 17-mm deep-reach socket. Discard the nut and Nord-lock washer. Remove operating handle.

Step 4:



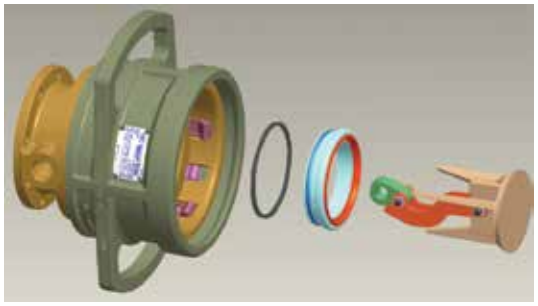
Remove the load distribution washer, stuff box, seals, and sleeve bearing. Remove the stuff box using the 1-1/4-inch or 32-mm deep-reach socket. Discard the load distribution washer.

Step 5:

Remove the handle shaft through the body being careful to catch the tube spacer. Thoroughly clean the handle shaft and tube spacer and inspect for wear or damage.

1004D3/1005E3 API Bottom Loading Coupler

Step 6:



Remove the poppet assembly, cylinder and cylinder wave spring.

Step 7:

Remove the nose seal and O-ring from the cylinder. Thoroughly clean the cylinder and inspect for wear or damage.

Step 8:

Remove the three O-rings from the stuff box. Use the seal pick provided in the seal kit to remove the internal O-ring.

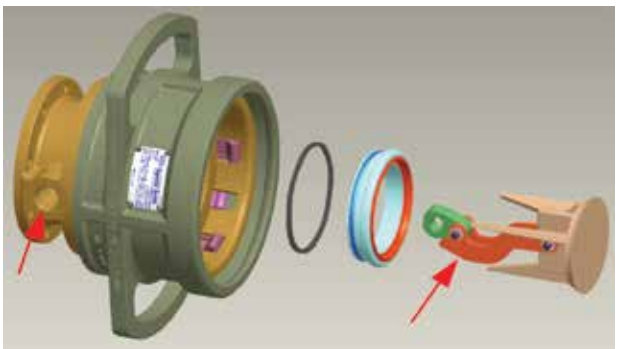
NOTICE: The inner most stuff box O-ring may remain on the handle shaft after the stuff box is removed. Remove the sleeve bearing from the stuff box and discard.

Reassembly Instructions

Step 1:

Replace the nose seal and the cylinder O-ring. Lubricate the O-ring with light oil.

Step 2:



Replace the interior, exterior O-rings, and the sleeve bearing in the stuff box. Lubricate the O-rings with light oil.

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Step 3:

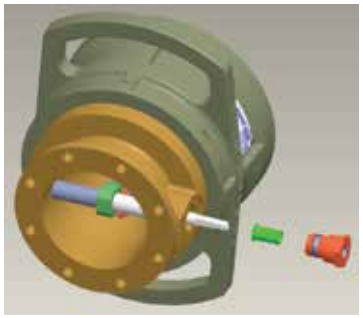
Reinstall the cylinder wave spring and cylinder then the poppet assembly into the body.

IMPORTANT: Note orientation of high pressure links to the through hole in the body.

Step 4:

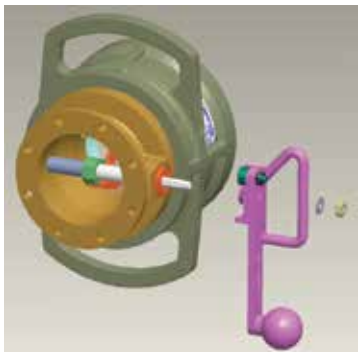
Slide the handle shaft into the body and through the drive link. As the shaft just pokes through the drive link, install the tube spacer. Rotate the shaft until the flats on the shaft and the drive link align and then push the shaft through and into the body.

Step 5:



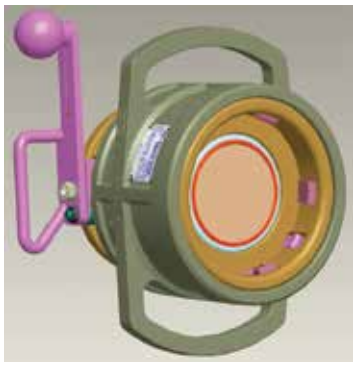
Install the stuff box using the 1-1/4 inch or 32 mm deep-reach socket. Tighten the stuff box firmly into the body.

Step 6:



Install the new load distribution washer on the handle shaft with the permanent mark toward the assembler. Install the operating handle, the new Lock washer, and new 10-mm nut. Tighten the 10-mm nut using the 11/16-inch or 17 mm deep reach socket to 25 ft-lb or 34 N•m torque.

Step 7:



Coupler assembly is complete.

WARNING: With sleeve forward, operating handle is unlocked and can rotate. Do not apply pressure to handle unless trying to open valve. Use caution when working around handle when system is under pressure. Once handle starts moving pressure can cause it to rotate violently.

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