

Compact Torsion Spring (CTS)

Installation, Operation, and Maintenance Manual

Revised: November 2023

OPW Compact Torsion Spring (CTS) Bottom Loading Arms are ideal to replace loading arms in situations where tight clearances are required. The CTS Loader features a fully integrated internal torsion spring for a streamlined profile. Ideal for replacing existing FMC TL Loaders or any application where space is a premium.

The CTS has been engineered to be easier to adjust and maintain.



Features:

- Fully Integral Torsion Spring
- Integral Upward, Downward Travel Stops
- Carbon Steel/ Aluminum Construction
- Lo Temp Fluorocarbon Seals
- Braided Stainless Steel or Rackmaster Composite Hose
- Available in Left-Hand, Right-Hand, Upfeed, Downfeed Configurations
- 360° Rotation allows Loading on Both Sides of Loading Bay
- Removable End cap for Easy Maintenance

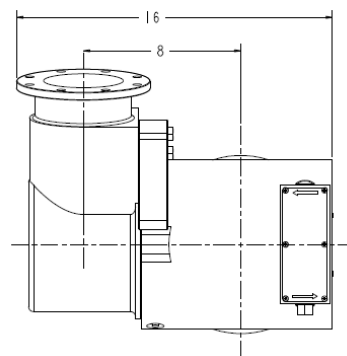
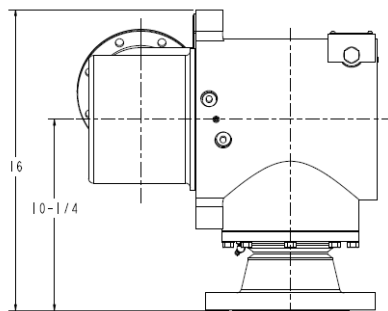
Benefits:

- Safe, Easy Spring Adjustment
- Ideal for Extremely Tight Riser Spacing
- Horizontal Bearing Module for Added Strength



Compact Torsion Spring (CTS) Swivel

Specifications		
Working Pressure	125 psi	862 kPa
Test Pressure	188 psi	1296 kPa
Operating Temp	-20F to 140F	-29C to 60C
Up/Down Angular Movement	+45° to -15°	From horizontal
Typical Horizontal Spacing	11"	
Typical Vertical Spacing	12"	
Inlet	ANSI 150#	
Outlet	Tank Truck (TTMA)	



Materials of Construction	
Base Swivel	1018 Carbon Steel
Swivel Body	A356-T6 Aluminum
Swivel Tail	A356-T6 Aluminum
Ball Bearings	Chrome Steel
Stop Block	1018 Carbon Steel
Spring	SAE 5160 Hot Rolled

Ordering Guide

CTS50 RH – 04 02

CTS

Compact Torsion Swivel
Style 50

Orientation

RH = Right Hand
LH = Left Hand

Seal Material

02 = Fluorocarbon

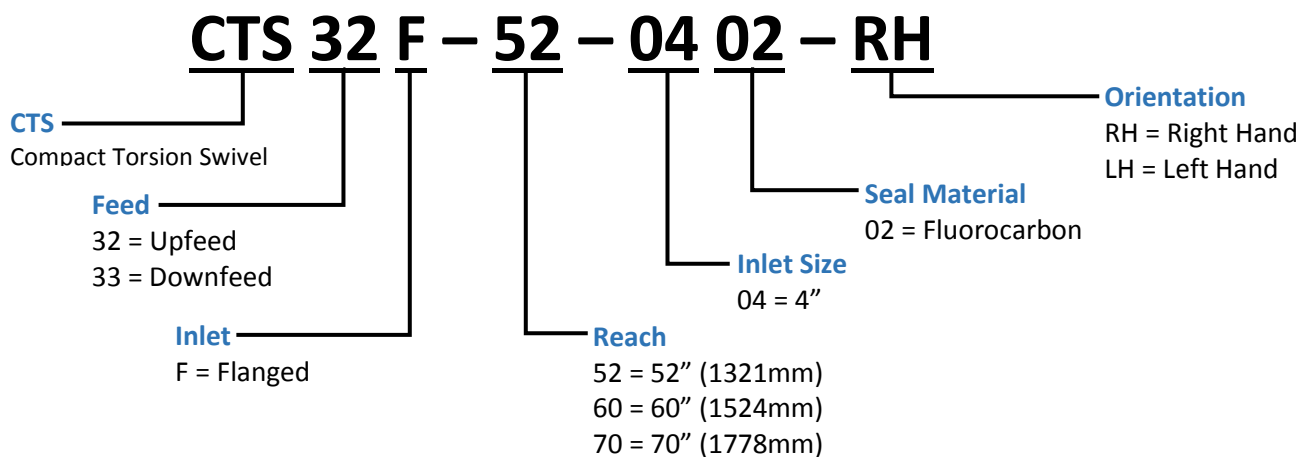
Inlet Size

04 = 4"

Compact Torsion Spring (CTS) Hose Loader

Accessories		
Drop Spool	4" Aluminum or Carbon Steel	As Required
Drop Hose	4" Rackmaster Composite 60" OAL, TTMA Flanged Ends	L19080
	4" Braided Stainless Steel, 60" OAL, TTMA Flanged Ends	L19081
Coupler Swivel	4" Style 30 (90°) Swivel Joint with Maneuvering Handle TTMA Flanged Ends, Aluminum/ Lo Temp Fluorocarbon	3635FTH-0402
Butterfly Valve	4" Full Flow, Position Locked Butterfly Valve	LBV450VGL
Spacer Spool	4" Loading Arm Coupler Spool, TTMA Flanged ends, Aluminum 6" OAL	VSS4
Sight Glass	4" Acrylic Sight Glass, Tempered, Cast Acrylic	BF4-SG-25
API Coupler	4" API Bottom Loading Coupler	
	Manual Version:	1004D3-0402
	Semi-Automatic Version:	Lynx852

Ordering Guide



Installation Instructions



SAFETY PRECAUTIONS



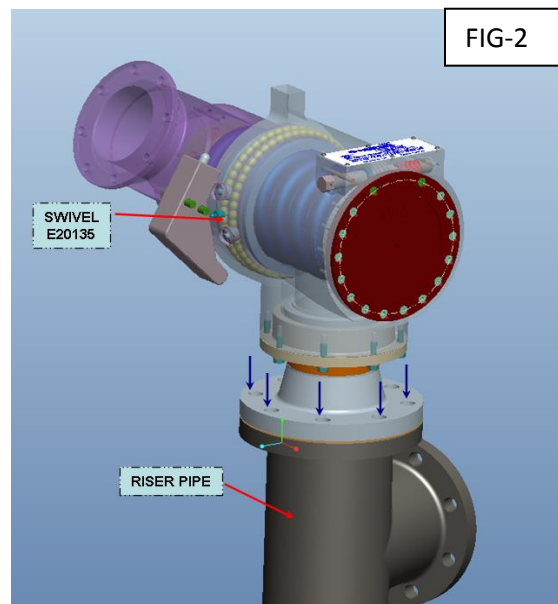
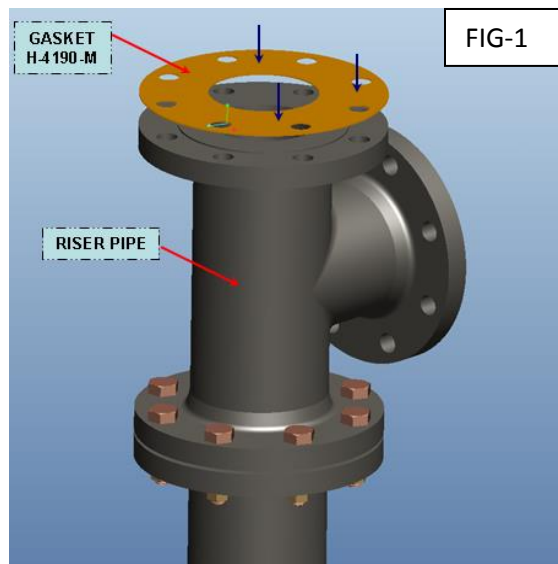
WARNING: Read and understand these instructions before starting installation:

- Swivel to be used for its designed purpose only
- Local regulations for operation and use must be followed at all times
- Although the swivel is designed for higher pressure, proper measures must be taken within the system to allow for thermal expansion
- OPW instructions must be followed for installation
- Make sure to use adequate personal protection at all times during installation and operation

Note: Images depict Right Hand Swivel

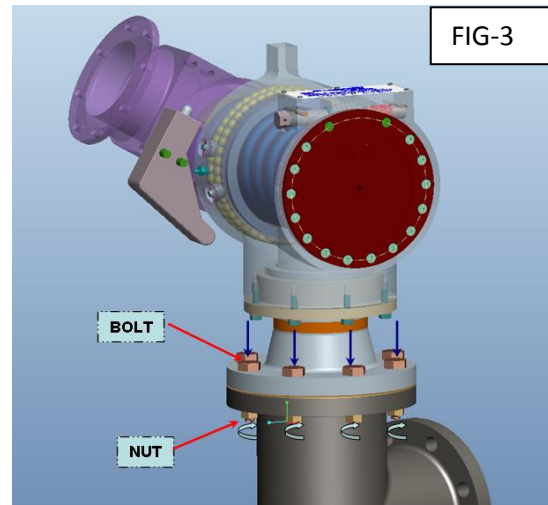
Step 1:

- fix an appropriate gasket on the riser pipe
- Install the 150# flange of the base swivel
Onto the riser pipe



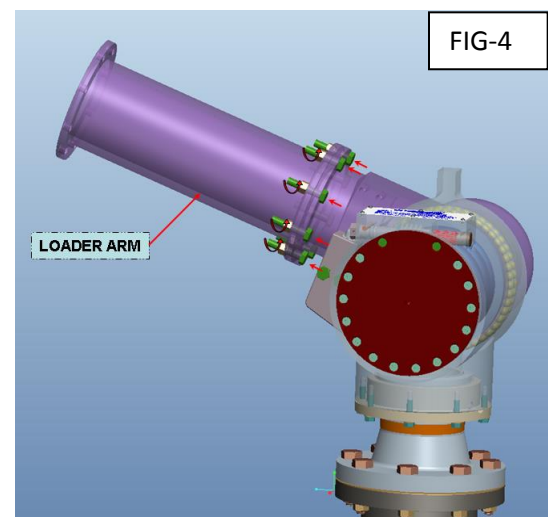
Step 2:

- Align the bolt holes
- Insert the bolts and tighten the nuts down on the riser flange



Step 3:


- Install the Loading Arm Pipe Spool
- Install desired accessories



Tension Adjustment Instructions



WARNING: Read and understand these instructions before starting installation:

- Local regulations for operation and use must be followed at all times
- OPW instructions must be followed for adjustment
- Make sure to use adequate personal protection at all times during operation
-  Do not attempt to adjust the spring tension while the spring is being loaded by the arm. This can damage the tension shaft and gear

Note: Images depict Right Hand Swivel

Tools Needed:

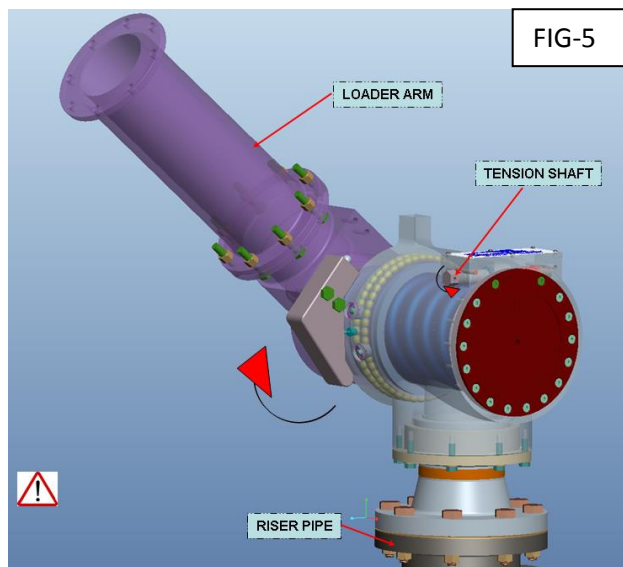
- $\frac{3}{4}$ " socket or wrench

Step 1:

- Lift the arm so that there is little or no Tension on the spring
- Rotate the tension shaft in the direction Indicated on the swivel label to Increase the tension on the spring

Step 2:

- Drop the arm slowly and see if the desired Balance is achieved
- If not repeat step 1 until desired balance is achieved




Disassembly Instructions



SAFETY PRECAUTIONS



WARNING: Read and understand these instructions before starting installation:

- Local regulations for operation and use must be followed at all times
- OPW instructions must be followed for disassembly
- Make sure to use adequate personal protection at all times during operation
-  The swivel contains a very strong spring under torsion. Uncontrolled release of the spring can cause personal injury and damage the swivel. The avoid risk follow the instruction sequence

Tools Needed:

- Open End Wrenches – 13mm, 17mm, 9/16", 3/4"
- Allen Wrench – 4mm
- Pliers - Internal retaining ring

Step 1:

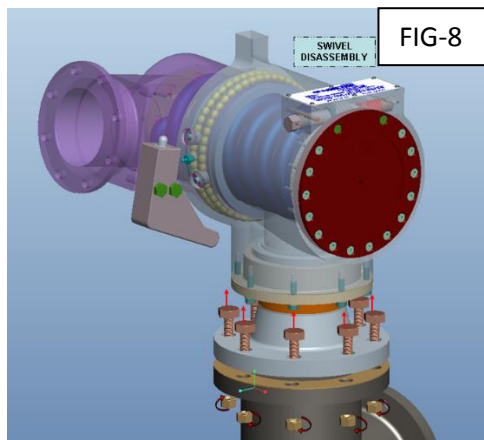
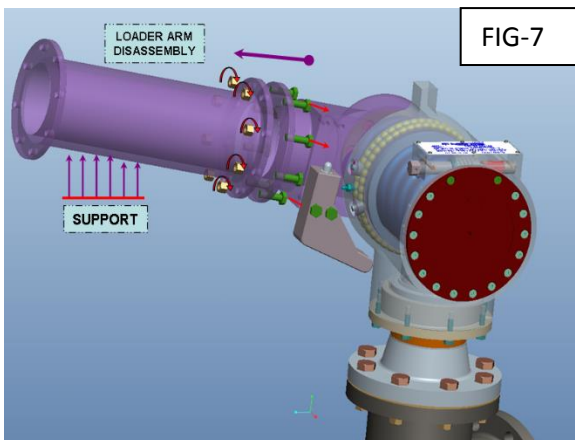
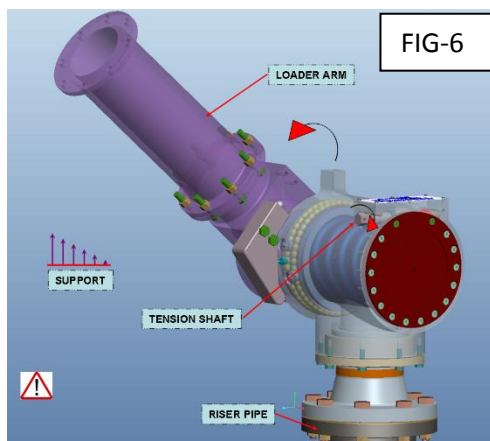
- Drain the loading arm and swivel
- Remove the tension from the spring using the 3/4" wrench while providing support for the arm



Make sure the tension has been relieved



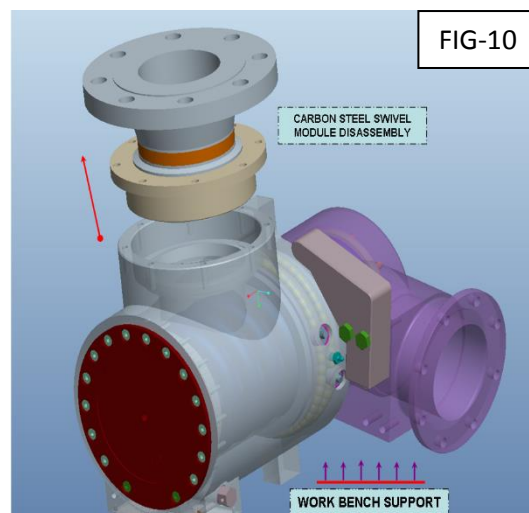
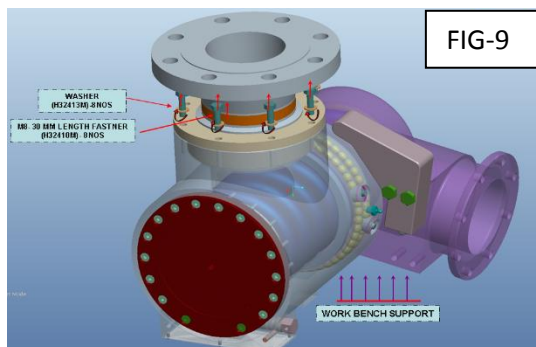
- Remove the loading arm and remove The swivel from the riser pipe using the 9/16" wrenches



Horizontal Swivel Leak Repair

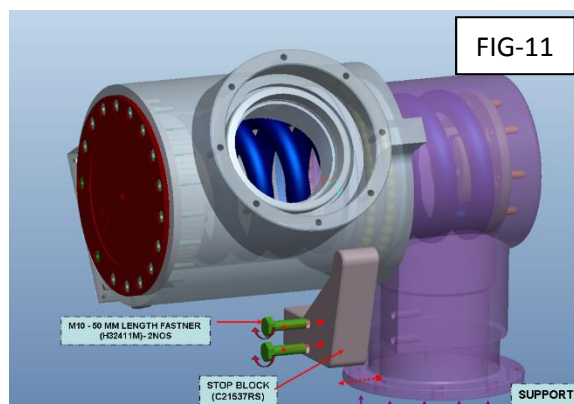
Step 2:

- Remove the 4" diameter carbon steel base, (PN: C22853), swivel module using the 13mm wrench
- Remove the PTFE H-block and the two O-ring seals, Repair Kit PN: CTS-SRK-H-0402
- Clean sealing areas and inspect for wear before installing seals
- Apply a small amount of lube to seals prior to installation



Step 3:

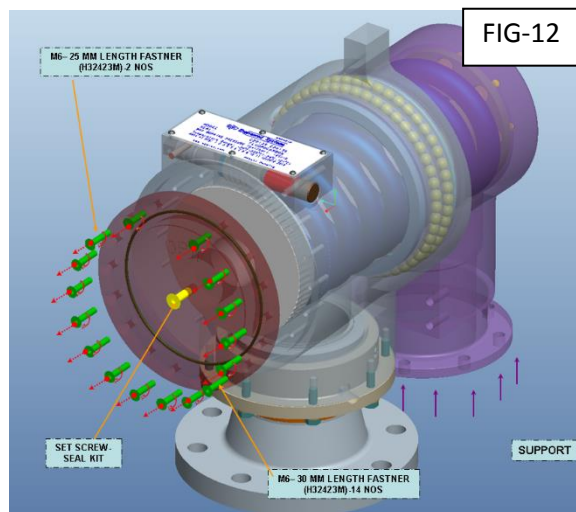
- If possible secure the aluminum TTMA flange securely to your work area
- Remove the stop block using the 17mm wrench



Vertical Swivel Leak Repair

Step 4:

- Hand thread a 3/8-16 bolt included in the seal kit into the center of the end plate to use as a temporary handle
- Unscrew end plate fasteners using a hex bolt wrench or hex bolt socket



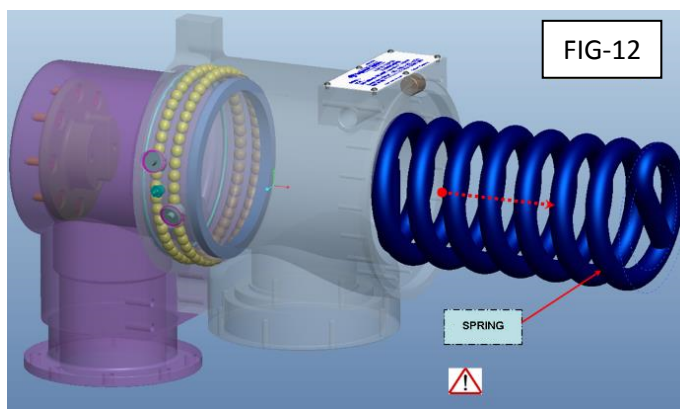
Step 5:

- Remove the round sector gear

Note: this action may require some minor adjusting to find the correct position to let the round gear slide out past the worm gear

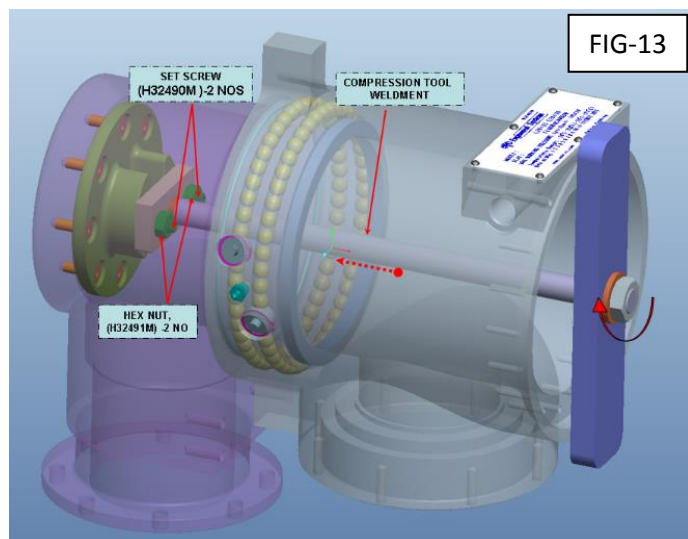
Step 6:

- Remove the spring



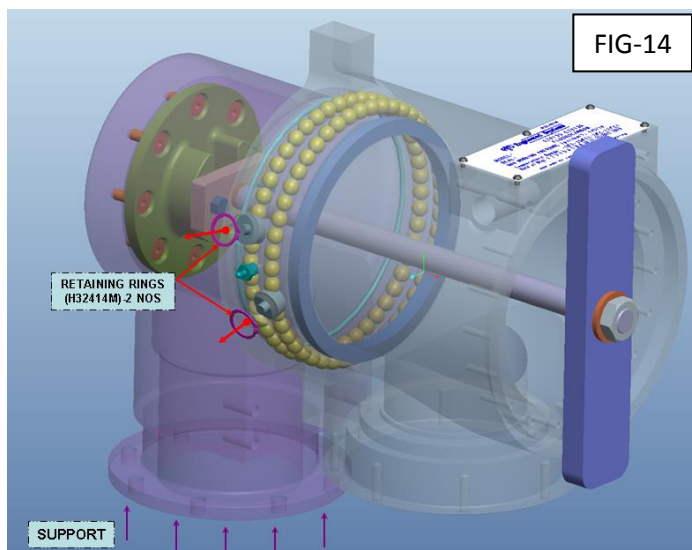
Step 7:

- Compress the body and tail together using the compression tool (PN: CTS-TOOL-COMP)



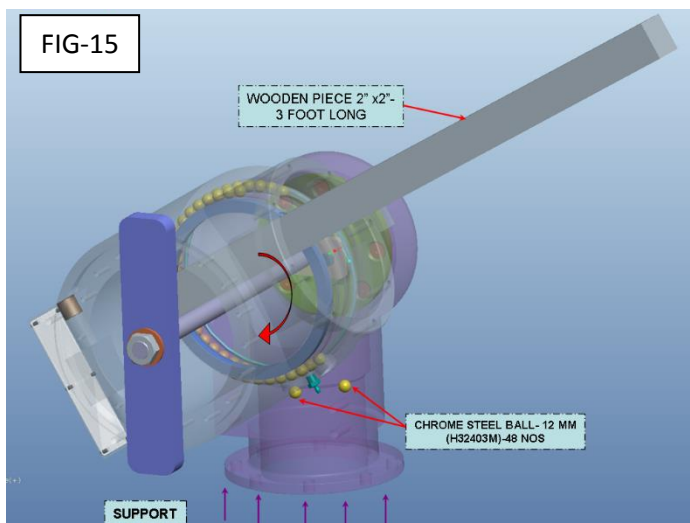
Step 8:

- Remove the ball plug retaining rings
- Remove the ball plugs



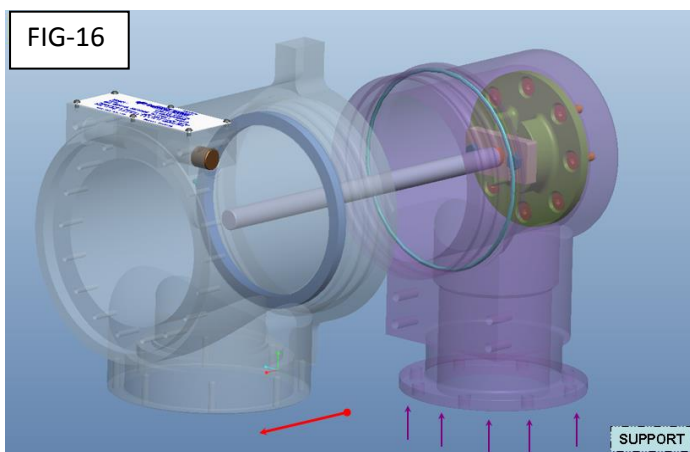
Step 9:

- Remove the balls by rotating the swivel body and adjusting the swivel compression
- A magnet and/or de-greasing fluid may be necessary to remove all of the ball bearings



Step 10:

- With all the balls removed, remove the body from the tail
- Remove the PTFE H-block and both main O-ring seals, Repair Kit (PN: CTS-SRK-V-0402)
- Clean and inspect sealing areas
- Apply a small amount of lube to the seals and install new seals into the sealing areas

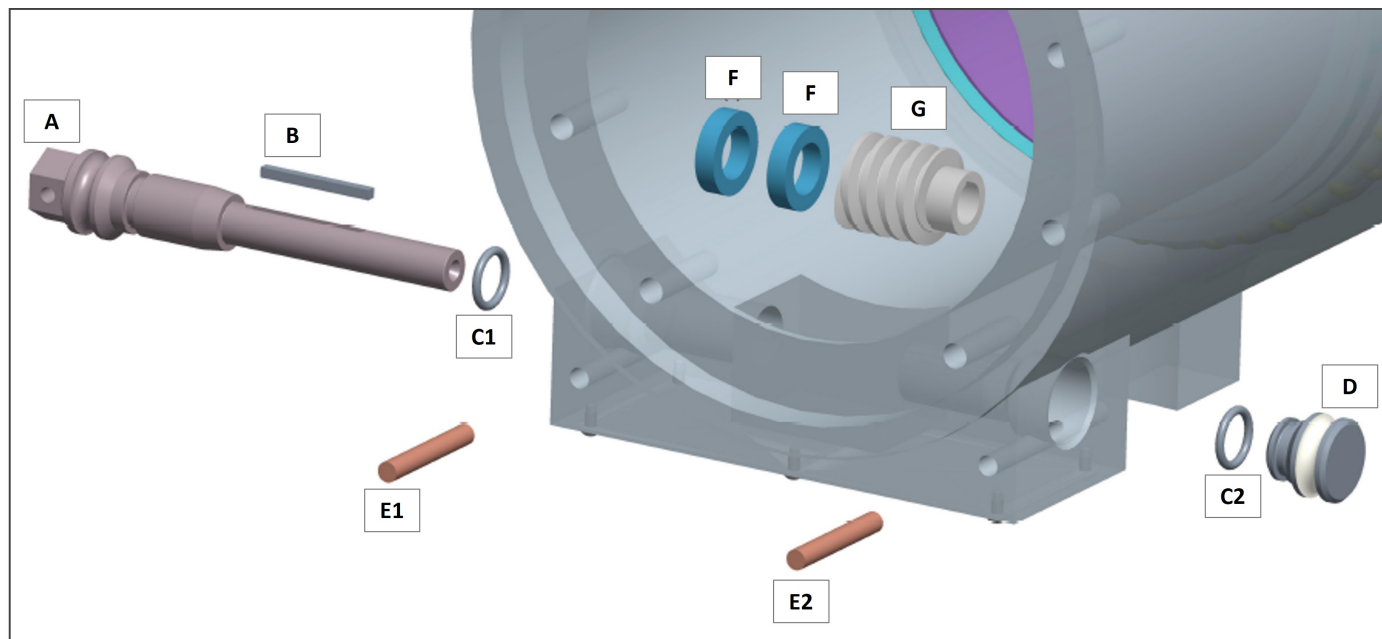


Reassembly Note: For reassembly, instructions can be followed in reverse order. Please contact OPW Engineered Systems Engineering Department with any additions questions.

SCAN THE CODE TO WATCH THE CTS REBUILD VIDEO



Shaft Repair



Replace Adjustment Shaft O-Ring (C1)

Prior to Adjustment Shaft and Plug O-Ring replacement, follow Steps 4-6 on page 9

1. Use punch to remove Spiral Pin (E1)
2. Remove Adjustment Shaft (A)
 - a. Note that Key (B) and O-Ring (C) comes out with Adjustment shaft
 - b. Note the placement of the 2 Bronze Washers (F) and Worm Gear (G)
3. Remove O-Ring and replace with new one, PN: H32415M
4. Insert Adjustment Shaft back into body
 - a. Make sure Key in inserted into key slot on Adjustment Shaft
 - b. Make sure to have both Bronze Washers and Worm Gear are in place aligning Key with key slot on Worm Gear
5. Align pin groove with pin hole and reinsert Spiral Pin

Replace Plug O-Ring (C2)

1. Use punch to remove Spiral Pin (E2)
2. Remove Plug (D)
3. Remove O-Ring and replace with new one, PN: H32415M
4. Insert Plug back into body
5. Align pin groove with pin hole and reinsert Spiral Pin

Reassembly Note: For reassembly, instructions can be followed in reverse order. Please contact OPW Engineered Systems Engineering Department with any additions questions.

Exploded View with Part Numbers

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	H32409M	.125 X .125 X 1.46 LONG, KEY, CST
2	1	H32405M	.750 X .500 X 1.125 LONG, BRONZE BUSHING
3	2	H32414M	.88 INCH, RETAINING RING, CST
4	2	C21536AH	12MM, BALL PLUG, ALUM, DUAL RACE
5	96	H33316M	12MM, GRADE 200 BALL, 440 STAINLESS STEEL
6	8	H32417M	3/8"-16 X 7/8" LNG, FLAT HEAD SOCKET CAP ,CST
7	1	E20129AH	4", CTS, END PLATE ,ALUM, DUAL RACE
8	1	C22853	4", CTS, MODULE, BASE
9*	1	H32482RA	4", CTS, PLUG, ALUM, DUAL RACE
10	1	H32406M	4", CTS, RH SPRING, CST
11	1	E20131AH	4", CTS, TAIL, ALUM, DUAL RACE
12*	1	C21534RS	4", PS, SHAFT, CST, DUAL RACE
13	1	C21537RS	4", PS, STOP BLOCK, CST, DUAL RACE
14	1	C21539RS	4", PS, TANG PLATE, CST, DUAL RACE
15	1	H32424M	4", SEAL, FLUOROCARBON,DUAL RACE, #163
16	2	H32415M	4", SEAL,FLUOROCARBON, #113
17	1	E20130AH	4", CTS, BODY, DUAL RACE
18	9	H31855M	BOLT, HEX, ZP, 3/8-16 x 1-1/4
19	8	H40109M	BOLT, HEX, ZP, 3/8-16 x 1-1/4
20	2	H33042M	BOLT, HEX, ZP, 3/8-16 x 2.75
21	1	TS-SRK-H-0402	CTS, SWIVEL REPAIR KIT, HORIZONTAL PLANE, FLUOROCARBON GFLT
22	1	TS-SRK-V-0402	CTS, SWIVEL REPAIR KIT, VERTICAL PLANE, FLUOROCARBON GFLT
23	2	H33217M	GRESE FITTING, 1/8" BARBED
24	19	H30134M	LOCK WASHER, CST, ZP, REGULAR, 3/8" BOLT
25	1	H32481M	NAMEPLATE, CTS
26	6	H32149M	SCREW, PH, ZP, 6-20 x 3/16
27	2	H31396M	SPIROL PIN
28	2	H32426M	WASHER,FLAT,SINTERED BRONZE
29	1	H32399M	SPUR/WORM GEAR SET
N/A	N/A	880-0089	LUBRICANT, CARTRIDGE

REPAIR PART LIST SUMMARY

HORIZONTAL SWIVEL REPAIR	PART NUMBER
Seal Kit	CTS-SRK-H-0402
Replacement 4" Moduule (Carbon Steel)	C22853
VERTICAL SWIVEL REPAIR	PART NUMBER
Seal Kit	CTS-SRK-V-0402
Compression Tool (Needed for Repair)	CTS-TOOL-COMP
SHAFT REPAIR	PART NUMBER
4" Shaft	C21534RS
O-Ring	H32415M

