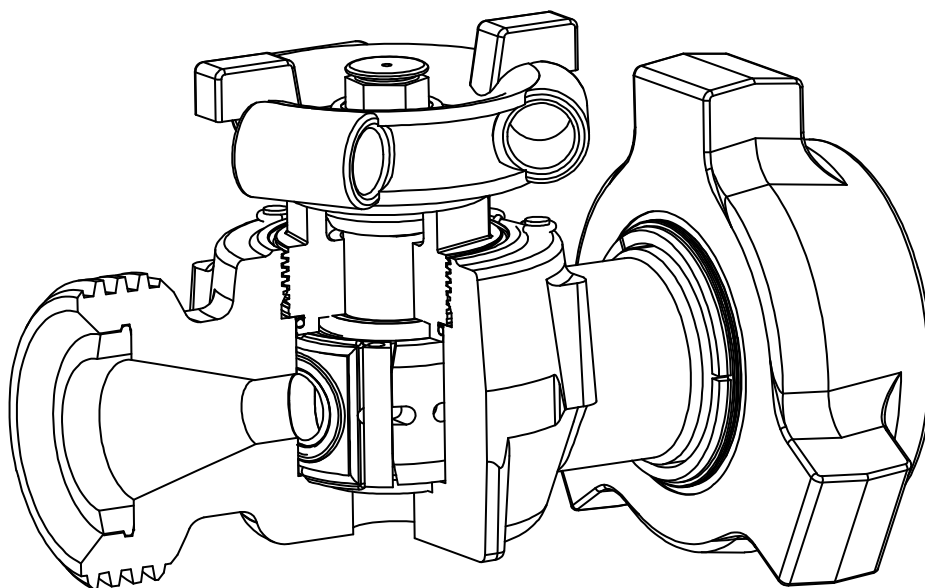


## OPERATION AND MAINTENANCE MANUAL - 1 INCH ULT PLUG VALVE

Rev	ECN No.	Date	Reviewed By	Approved By	Status
A	5014837	17-FEB-2006	Soltau, James	Crawford, Paul	RELEASED

### Summary:

This document covers the safe operation, maintenance, troubleshooting and repair of the 1 inch ULT Plug Valve.



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# Operating and Maintenance Manual

## 1.0 Warnings

FMC cannot anticipate all of the situations a user may encounter while installing and using FMC products. Therefore, the user of FMC products **MUST** know and follow all applicable industry specifications on the safe installation and use of these products. Refer to the FMC product catalogues, product brochures and installation, operating and maintenance manuals for additional product safety information or contact FMC at 800-772-8582.



**Failure to follow these warnings could result in serious injury or death!**

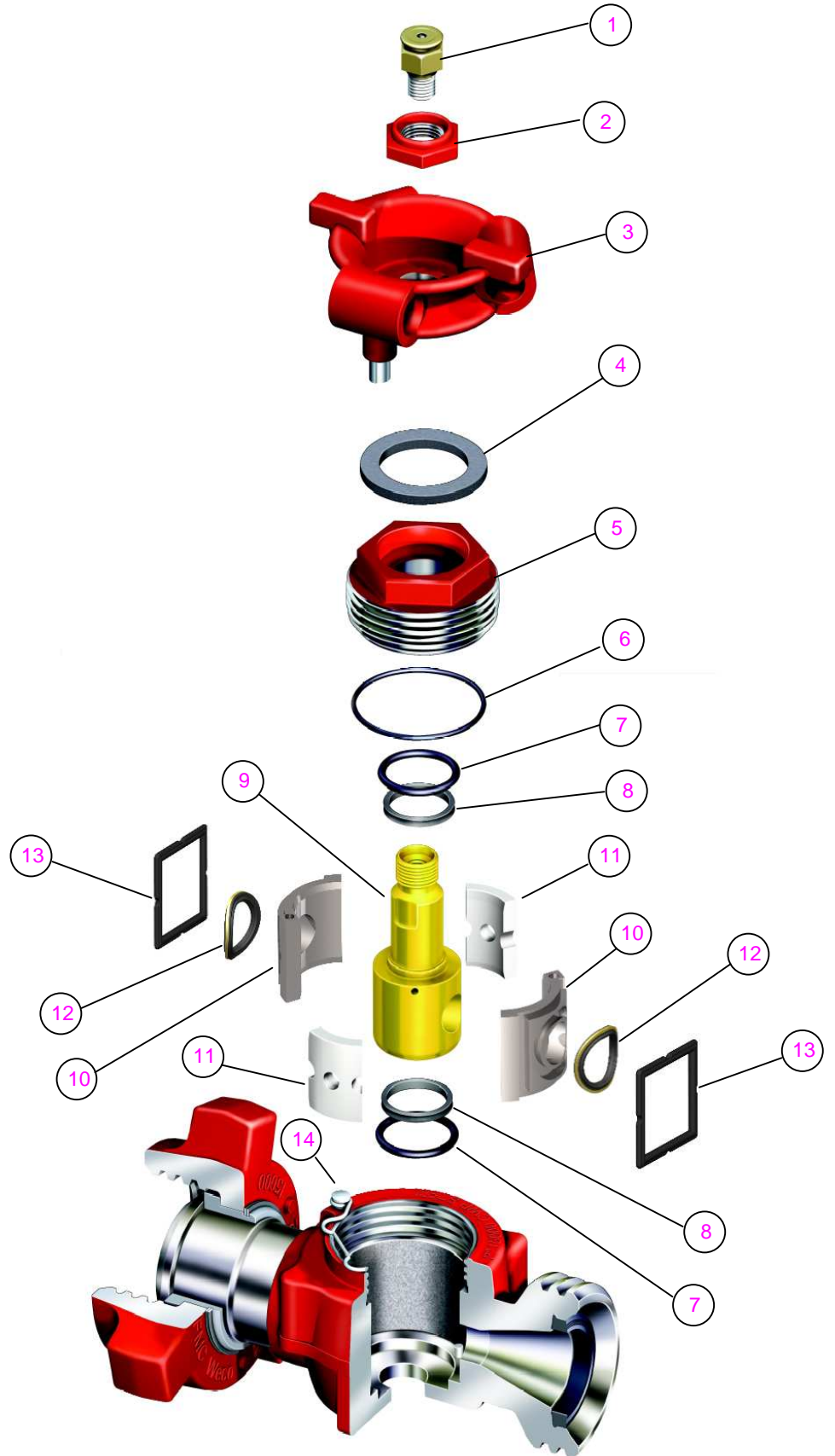
### **WARNING**

1. Do not mix or assemble components, parts or end connections with different pressure ratings. Mismatched parts may fail under pressure.
2. Do not use or substitute non-FMC components or parts in FMC products and assemblies.
3. Do not strike, tighten or loosen pressurized components or connections.
4. Do not exceed the rated working pressure or temperature rating of the product.
5. Complete and proper make-up of components and connections is required to attain rated working pressure.
6. Do not use severely worn, eroded or corroded products. Contact FMC for more information on how to identify the limits of erosion and corrosion.
7. Follow safe practices when using products in overhead applications. Products not properly secured could fall.

8. Select only appropriate product and materials for the intended service:
9. Do not expose standard service products to sour gas fluids. (Refer to NACE MR0175). Do not interchange sour gas with standard service components.
10. Use appropriate safety precautions when working with ferrous products in below freezing temperatures. Freezing temperatures lower the impact strength of ferrous materials.
11. Follow manufacturers instructions and Material Safety Data Sheet directions when using solvents
12. Make certain that personnel and facilities are protected from residual hazardous fluids before disassembly of any product.
13. If any leakage is detected from FMC products, remove them from service immediately to prevent potential damage and personal injury.

## **2.0 Safety instructions**

The applications of FMC products are in working environments where general personnel safety procedures and policies **MUST** be followed. Always use appropriate protective equipment in high pressure, extreme temperature or severe service applications.



### 3.0 Operating Instructions

1. Grease valves after each use with FMC approved Plug Valve grease.
  - Between 32°F and 250°F use Weco® plug valve lubricant and sealant No. 3256666.
  - Between -20°F and 50°F use Weco® plug valve lubricant and sealant No. 3251968.

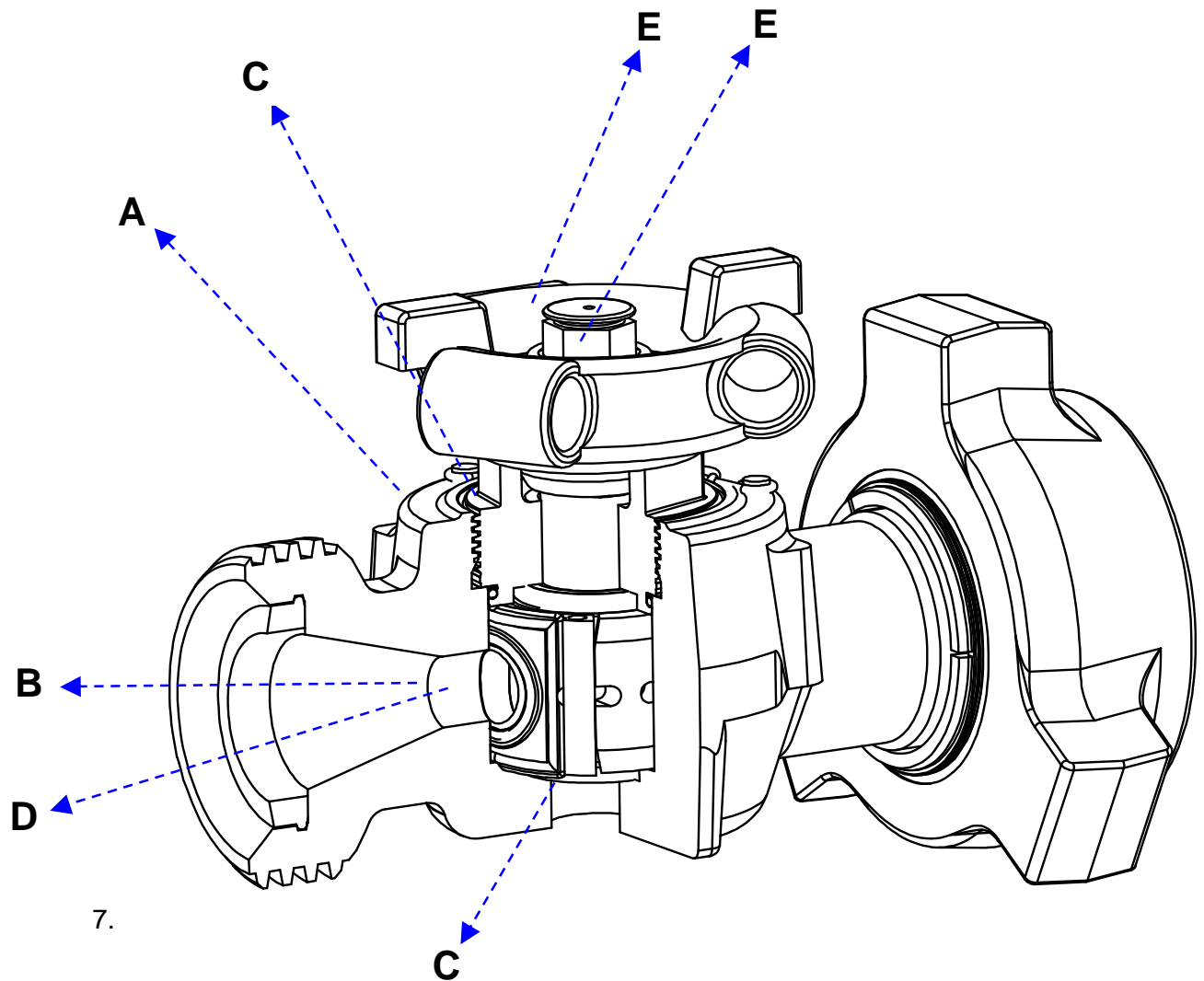
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Grease valve in open position until grease can be seen through the bore of the valve. Cycle valve closed to open and pump a little more grease into valve while valve is in the open position.

**NOTE:** If valve is in line, grease valve a moderate amount until maximum grease pressure is attained during greasing, then cycle valve and re-grease. Typical grease gun pressures attained during greasing of valve range from 6,000 PSI to 15,000

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2. Re-grease valves immediately after pumping solvents through them.
3. Thoroughly flush valves with clean water after each use to wash away any cement or acids that may have been left in the valve (where applicable).
4. Spray rust preventative oil over exposed threads on valve to prevent rusting during storage.
5. Replace grease fittings that become damaged to prevent leaks and to allow proper greasing of the valve.
6. Disassemble plug valves and replace worn parts on a routine basis to prevent corrosion and erosion of the valve body and remove old grease.



**Figure 1: Possible Leak Path**

<b>A</b>	<b>LEAK AT BODY CAP THREADS</b>
<b>B</b>	<b>LEAK BETWEEN SEAL SEGMENT &amp; BODY</b>
<b>C</b>	<b>LEAK AT TOP OR BOTTOM OF VALVE PAST PLUG STEM SEAL</b>
<b>D</b>	<b>LEAK BETWEEN SEAL SEGMENT &amp; PLUG</b>
<b>E</b>	<b>LEAK AT GREASE FITTING</b>

**Table 1: Trouble Shooting Guide**

Problem	Possible Cause	Recommended Repair
<p>Leak at body cap threads. <b>Fig. 1 leak path "A"</b></p>	<p>Damaged body cap o-ring.</p>	<p>Remove body cap. Replace cap o-ring. Check for scratches, dents or corrosion/erosion in the body cap sealing area. Repair minor scratches and corrosion with 400 grit sandpaper. Deep dents or gouges may require the body and/or cap to be replaced.</p>
<p>Leak between seal segment and body. <b>Fig. 1 leak path "B"</b></p>	<p>Contamination between the seal segment and body.</p> <p>Damaged or aged segment seals</p> <p>Damaged seal segment seal area due to scratches, corrosion or erosion</p> <p>Damaged body seal segment sealing surface due to scratches, corrosion or erosion.</p>	<p>Cycle valve open and close several times. Fully grease valve and cycle several more times.</p> <p>Disassemble valve. Replace segment seals.</p> <p>Disassemble valve. Inspect the seal segment for scratches, dents or corrosion/erosion of the OD sealing area and seal grooves. Repair minor scratches and corrosion with 400 grit sandpaper. Deep dents or gouges may require the seal segment to be replaced.</p> <p>Disassemble valve. Inspect the body to seal segment seal area for scratches, dents or corrosion/erosion. Repair minor scratches and corrosion with 400 grit sandpaper. Deep dents or gouges may require the body to be replaced.</p>

Problem	Possible Cause	Recommended Repair
<p>Leak at top or bottom of valve past plug stem seals. <b>Fig. 1 leak path "C"</b></p>	<p>Damaged plug o-rings or backups</p> <p>Damaged or contaminated plug to body cap seal surfaces.</p> <p>Damaged or contaminated body to plug seal surfaces</p>	<p>Disassemble valve. Inspect the plug o-rings and backup rings for age, cracks or damage. Replace any damaged o-rings or backups.</p> <p>Disassemble valve. Inspect plug to body cap seal area for scratches, dents, or corrosion/erosion. Repair minor scratches and corrosion with 400 grit sandpaper. Deep dents or gouges may require the plug or body cap to be replaced.</p> <p>Disassemble valve. Inspect the body seal area for scratches, dents, or corrosion/erosion. Repair minor scratches and corrosion with 400 grit sandpaper. Deep dents or gouges may require the body to be replaced.</p>
<p>Leak between seal segment and plug. <b>Fig. 1 leak path "D"</b></p>	<p>Damaged seal segment due to scratches, corrosion or erosion</p> <p>Damaged plug sealing surface due to scratches, corrosion, erosion, chipped or damaged plating</p>	<p>Disassemble valve. Inspect the seal segment for scratches, dents, or corrosion/erosion on the I.D. sealing area. Repair minor scratches and corrosion with 400 grit sandpaper. Because this is a metal seal surface it is sensitive to surface defects. Even minor dents or gouges may require the seal segments to be replaced.</p> <p>Disassemble valve. Inspect the plug for scratches, dents, or corrosion/erosion in the sealing area. Repair minor scratches and corrosion with 400 grit sandpaper. Because this is a metal seal surface it is sensitive to surface defects. Even minor dents or gouges may require the plug to be replaced.</p>

Problem	Possible Cause	Recommended Repair
<p>Leak at grease fitting. <b>Fig. 1 leak path “E”</b></p>	<p>Loose Grease fitting</p> <p>Damaged or contaminated grease fitting</p> <p>Damaged or contaminated grease fitting threads</p>	<p>Relieve line pressure and tighten grease fitting*.</p> <p>Relieve line pressure and remove grease fitting and replace with new grease fitting using Teflon tape on threads (two wraps maximum) and pressure and tighten grease fitting*.</p> <p>Relieve line pressure and remove grease fitting. Clean and inspect threads. If threads are intact wrap grease fitting with new Teflon tape (two wraps maximum) and reinstall. If threads are damaged, replace the grease fitting with a new grease fitting and wrap threads with new Teflon tape (two wraps maximum) and reinstall*.</p> <p>*Tighten grease fitting to 50-60 ft-lbs.</p>

## 4.0 Maintenance Instructions

### 4.1 Recommended Routine Maintenance

1. Grease valves after each use with FMC approved Plug Valve grease\*\*.
  - Grease valve in full open position until grease can be seen through the bore of the valve
  - Cycle valve closed to open position and pump a little more grease into valve while valve is in the full open position.
  - If valve is in line, grease valve a moderate amount until maximum grease pressure is attained during greasing, then cycle valve and re-grease.



Typical grease gun pressures attained during greasing of valve range from 6,000 psi to 15,000 psi.

**NOTE**

2. Re-grease valves immediately after pumping solvents through them.
3. Thoroughly flush valves with clean water after each use to wash any cement or acids that may have been left in the valve (where applicable). See comments under Operating Instructions.
4. Spray rust preventative oil over exposed threads on valve to prevent rusting during storage.
5. Replace grease fittings that become damaged to prevent leaks and to allow proper greasing of the valve.

## 4.2 Required Tools

400 grit sandpaper, soft-faced mallet, adjustable wrench, and screwdriver

3236521 Wrench, Body Cap, Plug Cap Nut, Grease Fitting.

3256567 Wrench, Body Cap Only

3251969 Hi-pressure Grease Gun with Pressure Gage (Uses "K" size stick grease)

3251970 Grease Gun Head and Handle Assembly

3251971 Giant Button Head Coupler

3251972 Giant Button Head to Vent Cap Adapter

## 4.3 Disassembly

**Tools:** Body cap wrench, 400 grit sandpaper, soft-faced mallet, adjustable wrench, screwdriver.



Remove all pressure from the system and valve before beginning any maintenance. Use this box as a warning notice that failure to follow these procedures can result in bodily harm.

**WARNING**

1. Remove plug cap (3) or actuator/operator and mounting bracket.
2. Using the appropriate body cap wrench, remove body cap (5).
3. Remove plug (9) by lifting (while twisting it back and forth) with an adjustable wrench on the plug flats. If necessary, hammer plug out using a punch placed through the bottom hole in the valve body. Be careful not to damage plug.
4. Remove side segments (11) by prying them up from the body cavity with a screwdriver.
5. Remove seal segments (10). If seal segments and side segments must be pried loose, be careful not to score or dent body cavity wall.
6. Remove grease fitting (1), seals (6), (7), and (8). It is recommended that all seals be replaced during servicing.
7. Remove grease from all valve components. Some solvents and some detergent solutions will soften or partially dissolve the grease, allowing it to be wiped away with a rag.
8. After degreasing parts, visually inspect them for wear and corrosion. The portions of the body cavity that are contacted by the seal segment seals (12 and 13), the plug stem seals (7 and 8) and the body cap seal (6) must be smooth. The mating surfaces of the plug (9) and seal segments (10) must be smooth and free of score marks and surface defects.
9. Use a file or sandpaper to remove rust from outside diameter portion of seal segments (10) that contact the body. Scrape and then lightly sand rust from body surfaces touching the outside diameter portion of the seal segments.
10. Using 400 grit sandpaper clean all other seal surfaces.



**IMPORTANT:** Parts with sealing surfaces that cannot be made smooth should be replaced.

**NOTE**

## 4.4 Assembly

1. Check parts pulled out of warehouse against assembly print to insure correct parts are used to assemble valve. Follow parts list. Do not mix components.
2. Clean inside of valve body with clean rag soaked in solvent. Blow remaining dirt out of body with compressed air.
3. Clean two seal segments (10) using a clean rag soaked in solvent. Blow dry with compressed air.
4. Install both segment seals (12) & (13) on seal segments. Die formed inner segment seal (12) must be installed with brass anti-extrusion ring facing outward.
5. Apply a very thin film of plug valve grease\*\* to the surface of the seal segments (10) which contacts the body. Install both seal segments in valve body.



**Over greasing between segment seals will increase effort to push the plug in which can cause plug/segment damage or displacement of the outer seal.**

### NOTE

6. Apply a liberal amount of plug valve grease\*\* to exposed surface of seal segments (10) and to exposed portion of body cavity which will contact side segments. Install both seal segments in the body cavity.
7. Clean side segments (11) with clean rag.
8. Apply a liberal amount of plug valve grease\*\* to side segments (11) and install them half way in the body cavity between the seal segments (10).
9. Clean plug with clean rag soaked in solvent. Blow dry with compressed air. Blow all dirt out of grease passageways.
10. Apply liberal amount of plug valve grease\*\* to outside diameter of plug (9) and to stem seal areas of plug. Place stem seal o-rings (7) and nylon backup ring (8) on top and bottom of plug.
11. Orient the plug in a fully closed position (plug bores facing the side segments). Using the side segments (11) as guide, install the plug (9) by applying firm pressure to plug. After the plug is partially installed by hand, a soft face mallet may be used to drive the plug the remaining distance into valve. After installation, check to assure that the top of the outer seals (13) stay in the groove. Use a blunt object such as blade type screw driver to push top of the seal back in the groove if necessary.
12. Push side segments (11) into body cavity until they reach bottom.

13. Install o-ring (6) on body cap (5). O-ring should fit firmly in groove in body cap (5).
14. Remove excess grease from the body cap shoulder area of body. Apply anti-seize compound (or lithium molybdenum disulfide grease) to body cap threads and install body cap into body. Tighten body cap (5) by hand using proper body cap wrench.
15. Finish tightening body cap (5) using impact or hammer wrench. Mark line on body cap and body and tighten body cap until no movement is noticed between the body cap and body.
16. Check both detent spring retaining pins (14) for tightness. If loose, lightly tap pin with hammer until tight.
17. Install felt ring (4) on plug cap (3). Install plug cap on plug (9), and tighten elastic stop nut (2) until snug.
18. Apply thread sealant or Teflon tape (two wraps maximum) to 3/8" NPT grease fitting (1). Install grease fitting on plug (9). Tighten fitting to 50-60 ft-lbs.

**WARNING**

Mismatched hammer union connections and components result in hazardous assemblies that can fail under pressure causing serious personal injury, death, and/or property damage. For information on make-up/break-out of hammer unions, including a copy of FMC Fluid Control Safety and Technical Alert, Avoiding the Dangers of Mismatching Hammer Unions, call 1-800-772-8582 or visit [www.fmcfluidcontrol.com](http://www.fmcfluidcontrol.com)

**NOTE**

FMC Fluid Control cannot anticipate all of the situations a user may encounter while installing and using FMC Fluid Control products. Therefore, the user of FMC Fluid Control products **MUST** know and follow all applicable industry specifications on the safe installation and use of these products. Refer to FMC Fluid Control product catalogs, product brochures and installation, operating and maintenance manuals for additional product safety information or contact FMC Fluid Control at 800/772-8582 or visit our web site at [www.fmcfluidcontrol.com](http://www.fmcfluidcontrol.com)

**\*\*USE ONLY FMC APPROVED PLUG VALVE GREASE. FOR STANDARD TEMPERATURE (32°F TO 250°F) USE P/N 3256666. FOR LOW TEMPERATURE (-20°F TO 50°F) USE P/N 3251968.**

## 4.5 Repair Kit Bill Of Material

**Table 2: 1" ULT Plug Valve Repair Kits**

Item No.	Part Name	Qty	1" ULT50 & 1"x2" ULT150	1" ULT50 & 1"x2" ULT150 Sour Gas	1"x2" ULT150 w/Plug Lock	1"x2" ULT150 & 1"x2" ULT200 with 3/8" bore	1"x2" ULT200 with 3/8" bore Sour Gas
	Repair Kit		P516137	P516206	P516138	P516213	P516212
1 <sup>(1)</sup>	Grease Fitting	1	3226457	3262409	Consult Factory	Consult Factory	Consult Factory
2	Lock Nut, Hex	1	3226654	3226654		3226654	3226654
3 <sup>(1)</sup>	Plug Cap	1	3217019	3217019	3217019	3223399	3223399
4	GRS Retainer Ring	1	3230039	3230039	3230039	3235985	3235985
5 <sup>(1)</sup>	Body Cap	1	3248654	3252283	3248654	3223401	3258851
6	O-Ring for Body Cap	1	3226703	3233600	3226703	3226703	3233600
7	O-Ring for Plug	2	3226712	3233676	3226712 <sup>(2)</sup>	3226712	3233676
8	Nylon Backup Ring	2	3217027	3217027	3217027 <sup>(2)</sup>	3217027	3217027
9	Plug	1	3261403	3261403	3261403	3261404	3261404
10	Seal Segment	2	P522273	P516003	P522273	P516050	P516052
11	Side Segment	2	P515486	P515486	P515486	P515486	P515486
12	Inner Seal	2	P522275	P523749	P522275	P522275	P523749
13	Outer Seal	2	P522274	P523748	P522274	P522274	P523748
1. Not included in repair kit or replacement set							
2. For 1"x2" ULT150 with plug lock ONLY, repair kit consisting of one each of PN 3226712 & 3217027 as shown, plus PN 3226713 (O-ring) and 3221799 (Thrust Ring) for top of plug							

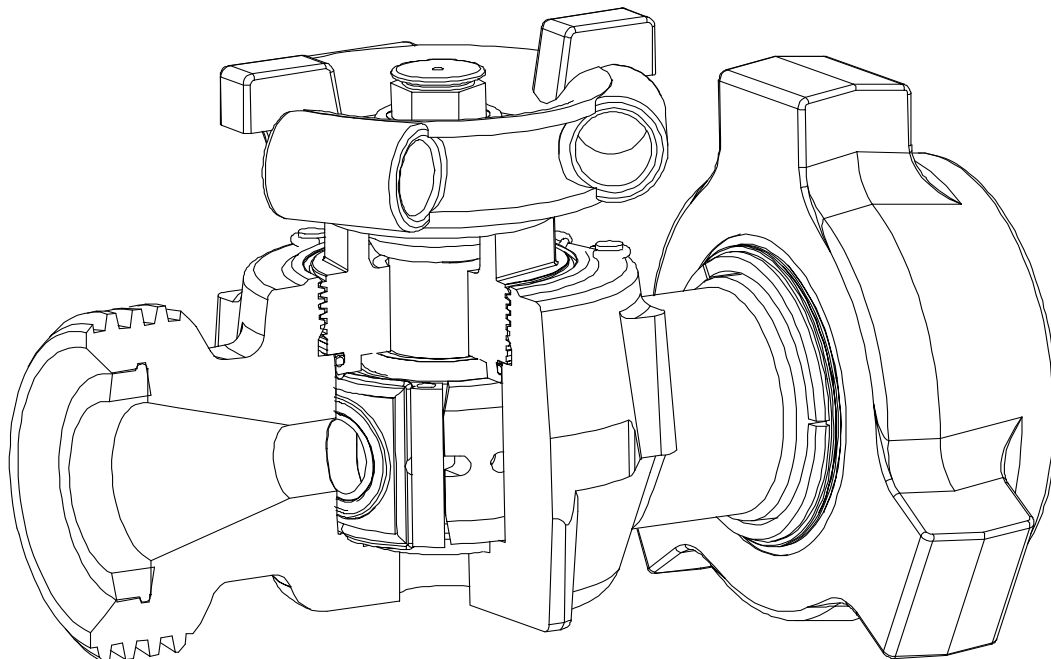
## 5.0 Storage Instructions

When not in use, the valve should be stored in an area that protects it from sun, rain, sand, and other debris. Before storing the valve, ensure that the operating fluids have been removed by flushing with water. After cleaning, fully drain all fluids from the valve and spray the valve with a water displacing lubricant such as a Teflon / oil mix. Spray inside both flow bores as far into the valve as possible. Also spray the threads of the union ends. During long-term storage keep the valve dry and painted to prevent corrosion.

**MAINTENANCE SERVICE PROCEDURE****MAINTENANCE SERVICE PROCEDURE FOR 1 INCH ULT PLUG VALVE**

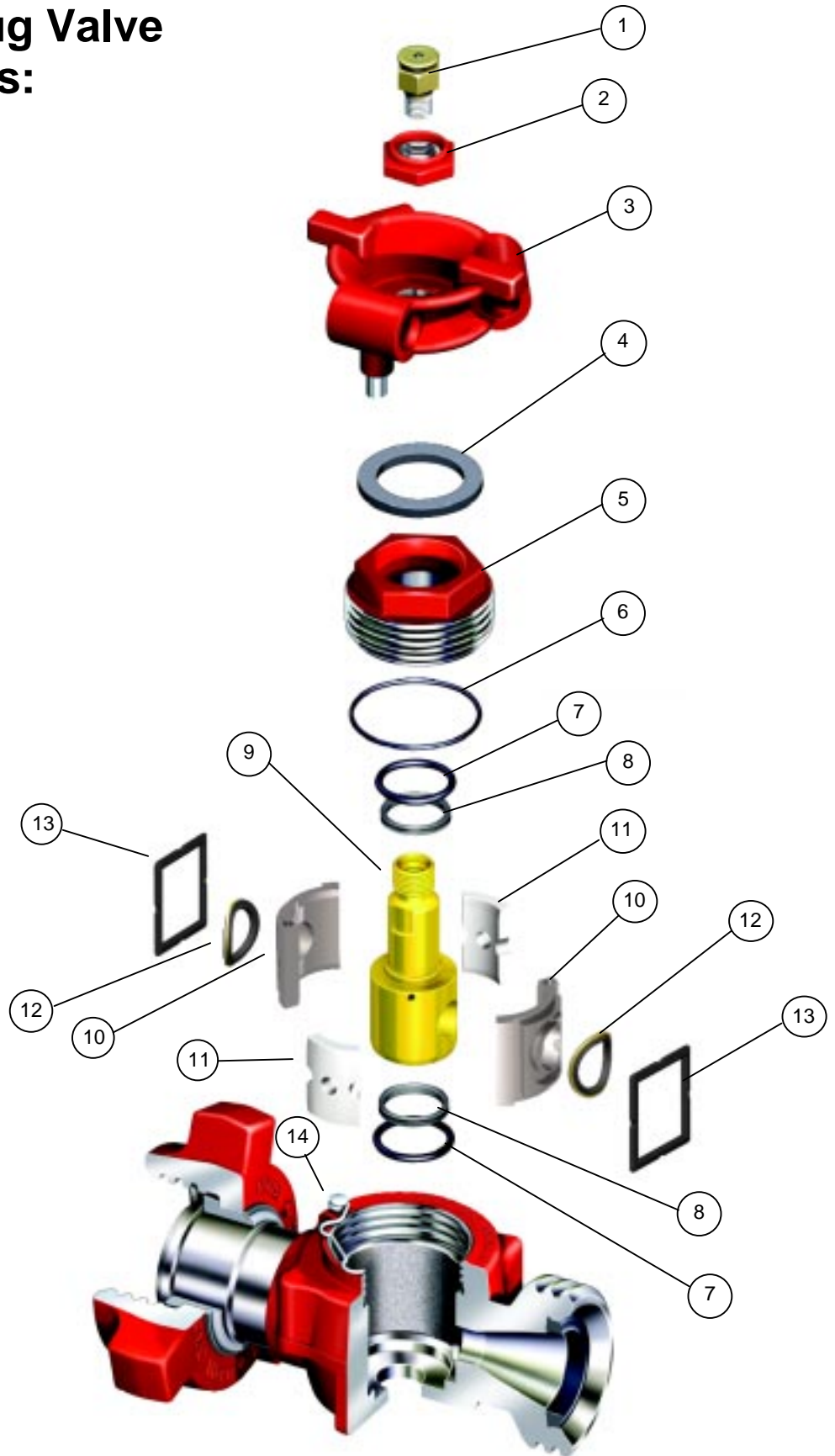
Rev	ECN No.	Date	Reviewed By	Approved By	Status
A	5011820	1-Apr-04	Douglas, Don	Soltau, James	RELEASED

Summary: Repair kit instructions for WECO<sup>®</sup> 1" ULT Plug Valve



**NOTES:**

# Weco® 1" ULT Plug Valve Repair Instructions:



## 1.0 DISASSEMBLY

**Tools:** Body cap wrench, 400 grit sandpaper, soft faced mallet, adjustable wrench, screwdriver



**WARNING:** Remove all pressure from the system and valve before beginning any maintenance.

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1. Remove plug cap (3) or actuator/operator and mounting bracket.
2. Using the appropriate body cap wrench, remove body cap (5).
3. Remove plug (9) by lifting (while twisting it back and forth) with an adjustable wrench on the plug flats. If necessary, hammer plug out using a punch placed through the bottom hole in the valve body. Be careful not to damage plug.
4. Remove side segments (11) by prying them up from the body cavity with a screwdriver.
5. Remove seal segments (10). If seal segments and side segments must be pried loose, be careful not to score or dent body cavity wall.
6. Remove grease fitting (1), seals (6), (7), and (8). It is recommended that all seals be replaced during servicing.
7. Remove grease from all valve components. Some solvents and some detergent solutions will soften or partially dissolve the grease, allowing it to be wiped away with a rag.
8. After degreasing parts, visually inspect them for wear and corrosion. The portions of the body cavity that are contacted by the seal segment seals (12 and 13), the plug stem seals (7 and 8) and the body cap seal (6) must be smooth. The mating surfaces of the plug (9) and seal segments (10) must be smooth and free of score marks and surface defects.
9. Use a file or sandpaper to remove rust from center portion of seal segments (10) that contact the body. Scrape and then lightly sand rust from body surfaces touching the center portion of the seal segments.
10. Using 400 grit sandpaper clean all other seal surfaces.

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**NOTE:** **IMPORTANT:** Parts with sealing surfaces that cannot be made smooth should be replaced.

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## 2.0 ASSEMBLY

1. Check parts pulled out of warehouse against assembly print to insure correct parts are used to assemble valve. Follow parts list. Do not mix components.
2. Clean inside of valve body with clean rag soaked in solvent. Blow remaining dirt out of body with compressed air.
3. Clean two seal segments (10) using a clean rag soaked in solvent. Blow dry with compressed air.
4. Install both segment seals (12) & (13) on seal segments. Die formed inner segment seal (12) must be installed with brass anti-extrusion ring facing outward.
5. Apply a very thin film of plug valve grease\* to the surface of the seal segments (10) which contacts the body. Install both seal segments in valve body.

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**NOTE:** Over greasing between segment seals will increase effort to push the plug in which can cause plug/segment damage or displacement of the outer seal.

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6. Apply a liberal amount of plug valve grease\* to exposed surface of seal segments (10) and to exposed portion of body cavity which will contact side segments. Install both seal segments in the body cavity.
7. Clean side segments (11) with clean rag.
8. Apply a liberal amount of plug valve grease\* to side segments (11) and install them half way in the body cavity between the seal segments (10).
9. Clean plug with clean rag soaked in solvent. Blow dry with compressed air. Blow all dirt out of grease passageways.
10. Apply liberal amount of plug valve grease\* to outside diameter of plug (9) and to stem seal areas of plug. Place stem seal o-rings (7) and nylon packing (8) on top and bottom of plug.
11. Orient the plug in a fully closed position (plug bores facing the side segments). Using the side segments (11) as guide, install the plug (9) by applying firm pressure to plug. After the plug is partially installed by hand, a soft face mallet may be used to drive the plug the remaining distance into valve. After installation, check to assure that the top of the outer seals (13) stay in the groove. Use a blunt object such as blade type screw driver to push top of the seal back in the groove if necessary.
12. Push side segments (11) into body cavity until they reach bottom.
13. Install o-ring (6) on body cap (5). O-ring should fit firmly in groove in body cap (5).

14. Remove excess grease from the body cap shoulder area of body. Apply anti-seize compound (or lithium molybdenum disulfide grease) to body cap threads and install body cap into body. Tighten body cap (5) by hand using proper body cap wrench.
15. Finish tightening body cap (5) using impact or hammer wrench. Mark line on body cap and body and tighten body cap until no movement is noticed between the body cap and body.
16. Check both detent spring retaining pins (14) for tightness. If loose, lightly tap pin with hammer until tight.
17. Install felt ring (4) on plug cap (3). Install plug cap on plug (9), and tighten elastic stop nut (2) until snug.
18. Apply thread sealant or Teflon tape (two wraps maximum) to 3/8" NPT grease fitting (1). Install grease fitting on plug (9). Tighten fitting to 50-60 ft-lbs.

**WARNING:**

**Mismatched hammer union connections and components result in hazardous assemblies that can fail under pressure causing serious personal injury, death, and/or property damage. For information on make-up/break-out of hammer unions, including a copy of FMC Fluid Control Safety and Technical Alert, Avoiding the Dangers of Mismatching Hammer Unions, call 1-800-772-8582 or visit [www.fmfluidcontrol.com](http://www.fmfluidcontrol.com)**

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**NOTE:**

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**\*USE ONLY FMC APPROVED PLUG VALVE GREASE. FOR STANDARD TEMPERATURE (32°F TO 250°F) USE P/N 3256666. FOR LOW TEMPERATURE (-20°F TO 50°F) USE P/N 3251968.**

### 3.0 REPAIR KIT BILL OF MATERIAL

Table 1: 1" ULT Plug Valve Repair Kits

Item No.	Part Name	Qty	1" ULT50 & 1"x2" ULT150	1" ULT50 & 1"x2" ULT150 Sour Gas	1"x2" ULT150 w/Plug Lock	1"x2" ULT150 & 1"x2" ULT200 with 3/8" bore	1"x2" ULT200 with 3/8" bore Sour Gas
	<b>Repair Kit</b>		<b>P516137</b>	<b>P516206</b>	<b>P516138</b>	<b>P516213</b>	<b>P516212</b>
1 <sup>(1)</sup>	Grease Fitting	1	3226457	3262409	Consult Factory	Consult Factory	Consult Factory
2	Lock Nut, Hex	1	3226654	3226654		3226654	3226654
3 <sup>(1)</sup>	Plug Cap	1	3217019	3217019	3217019	3223399	3223399
4	GRS Retainer Ring	1	3230039	3230039	3230039	3235985	3235985
5 <sup>(1)</sup>	Body Cap	1	3248654	3252283	3248654	3223401	3258851
6	O-Ring for Body Cap	1	3226703	3233600	3226703	3226703	3233600
7	O-Ring for Plug	2	3226712	3233676	3226712 <sup>(2)</sup>	3226712	3233676
8	Nylon Backup Ring	2	3217027	3217027	3217027 <sup>(2)</sup>	3217027	3217027
9	Plug	1	3261403	3261403	3261403	3261404	3261404
10	Seal Segment	2	P522273	P516003	P522273	P516050	P516052
11	Side Segment	2	P515486	P515486	P515486	P515486	P515486
12	Inner Seal	2	P522275	P523749	P522275	P522275	P523749
13	Outer Seal	2	P522274	P523748	P522274	P522274	P523748
1. Not included in repair kit or replacement set							
2. For 1"x2" ULT150 with plug lock ONLY, repair kit consisting of one each of PN 3226712 & 3217027 as shown, plus PN 3226713 (O-ring) and 3221799 (Thrust Ring) for top of plug							