



Technical Manual  
SAFE-Weight 1" 3:16 Plug Valve



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**WARNING:**

This equipment is intended for use in high-pressure and high flow well service applications. High pressure equipment, if not used and maintained properly, can cause serious injury or death and damage to equipment and property.

Only operate the valve in the full open or full close position, never flow through the valve in a partially open state as severe erosion may occur and create a hazardous situation.

Not taking proper precautions and failing to perform routine maintenance and inspections can also contribute to loss of well control, and such loss could cause serious injury or death and damage to equipment and property.

**ALL OPERATORS AND MAINTENANCE PERSONNEL SHOULD BE THOROUGHLY TRAINED IN THE SAFE OPERATION, MAINTENANCE, AND INSPECTION OF THIS EQUIPMENT.**

## SECTION 1 GENERAL DESCRIPTION

The MSI model 3:16 is a quarter turn plug valve intended for the control of high pressure fluids. It is normally provided with a handle adapter for operating with a valve bar but can also be provided with hydraulic or pneumatic actuators.

Compared to other plug valves of the same nominal size the model 3:16 valve is lighter at 33 lbs, requires less grease, and reduces total cost of ownership over the life of the valve due to precise alignment of the internal flow bores.

The standard (STD) service valve is intended for use in non-sour service wells. A sour service (H2S) version is available for use in wells defined by NACE MR0175 as sour. The operating temperature is -20F to 250F in STD service, and -50F to 250F in H2S trim. Working pressures are up to 15,000 psig for STD service and 10,000 psig for H2S service.

API Product Specification Level 1 is standard and PSL2 and PSL3 are available.

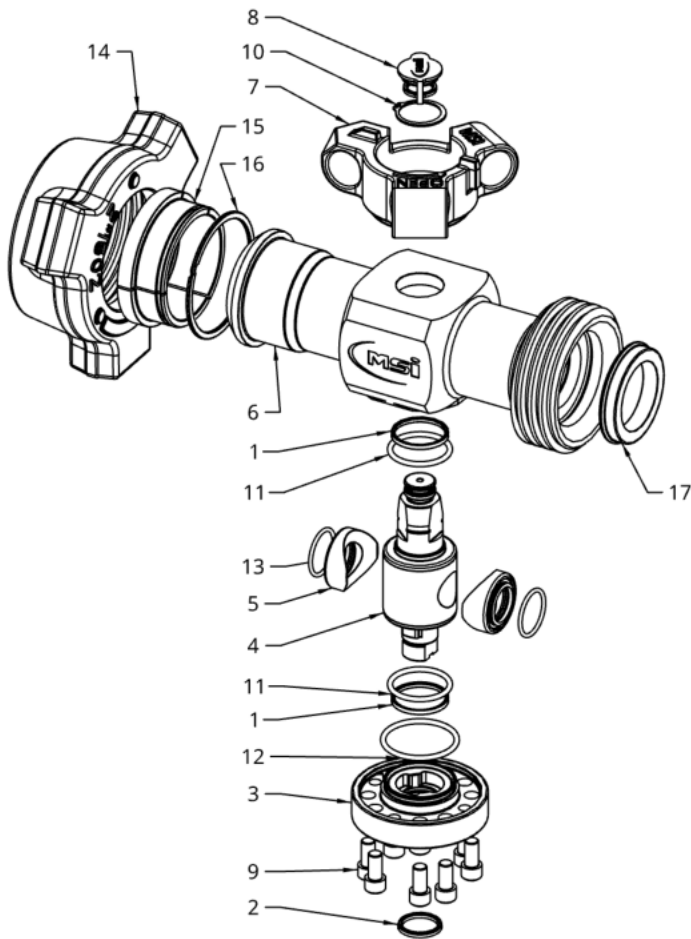
Breakaway torque is approximately 120 ft-lbs with a 15,000 psi differential pressure applied across the plug.

General materials of construction:

- valve body and cap: low-alloy steel (STD and H2S)
- plug: low-alloy steel (STD), stainless steel (H2S)
- seats: ductile iron (STD), bronze (H2S)
- seals: NBR (STD), HNBR or FKM (H2S)

Alternate seal materials are available for service conditions that require special considerations for temperature or chemical compatibility.

## SECTION 2 PARTS



ITEM NO.	STD	H2S	DESC
1	316C-1-R-1		PLUG SEAL RING
2	316C-1-R-2		CAP DUST RING
3	316C-1S-C-1	316C-1H-C-1	CAP
4	316C-1S-P-1	316C-1H-P-1	PLUG
5	316C-1S-S-1	316C-1H-S-1	SEAT
6	VARIES		BODY
7	316C-2-H-1		HANDLE ADAPTER
8	316C-P-GC		GREASE CAP
9	HC2103		CAP SCREW
10	HC3032		SNAP RING
11	OC0053	OC0258	PLUG SEAL
12	OC0237	OC0260	CAP SEAL
13	OC0253	OC0259	SEAT SEAL
14	UC0002	UC0131	WINGNUT
15	UC0003		NUT RETAINER SET
16	UC0004		RETAINER RING
17	UC0011	UC0012	UNION SEAL

## SECTION 3 TOOLS

### **Recommended tools:**

1. engineers' hammer
2. ball peen hammer
3. torque wrench rated for 100 ft-lbs
4. breakover bar
5. adjustable wrench for turning plug
6. 5/16" hex bit (to fit torque wrench and breakover bar)
7. 5/16" hex wrench
8. small pick for seal removal
9. pipe or bar for turning handle
10. snap ring pliers (external) for removing handle snap ring

**NOTE: It is important that the workstation being used to disassemble the valve is clean and free of contaminants such as metal shavings, dirt, rust, old paint, etc.**

## SECTION 4 DISASSEMBLY

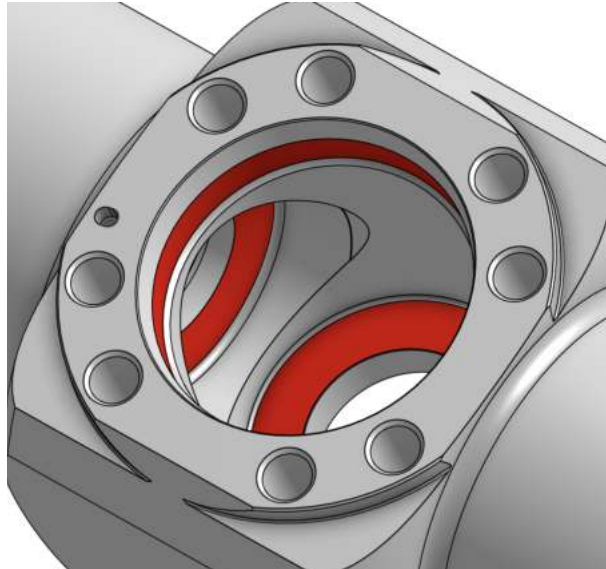
1. Prepare a work area and tools for maintenance. A sturdy table with a 2"1502 female union welded to it is helpful.
2. Attach the valve to the table union, or clamp it in a vise handle facing up.
3. Remove the flexible grease cap, snap ring, and then handle.
4. Rotate the valve so that the cap is facing up.
5. Use a wrench and 5/16" hex bit to remove the 8 socket head cap screws.
6. Remove the cap. It can be pried against the body or the screws can be used to jack it out.
7. Extract the plug.
8. Extract the seats. If stuck, try striking the side of the body to loosen them.

## SECTION 5 INSPECTION

Metallic parts may be reused if they are in good condition. The following images detail critical areas where corrosion, pitting, or scratches may render the part unusable. Clean the following areas thoroughly then inspect. If parts are damaged they should be replaced.

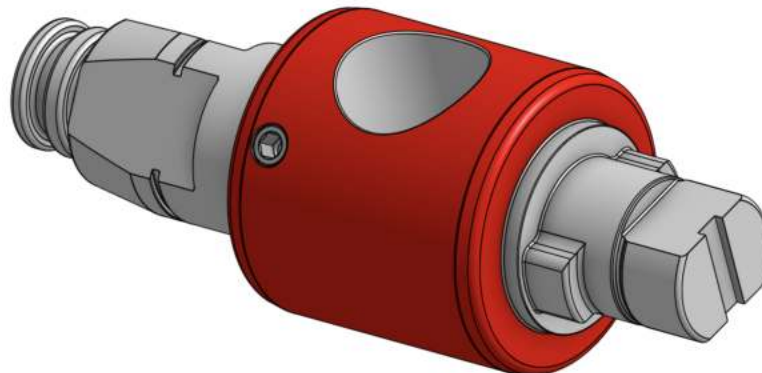
### **BODY**

Cap seal bore, both seat seal faces, and plug seal face.



### **PLUG**

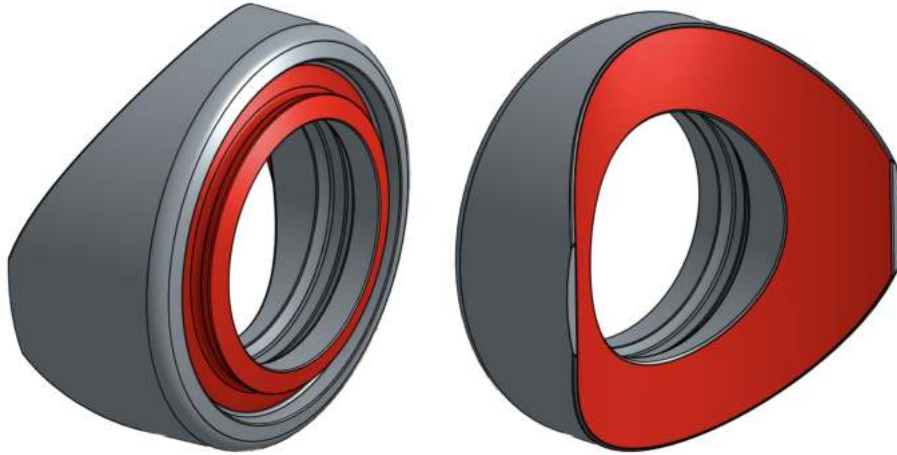
Seat sealing surface and the stem sealing surfaces on both ends of the plug. Verify that the check valve plug is not protruding from the surface.





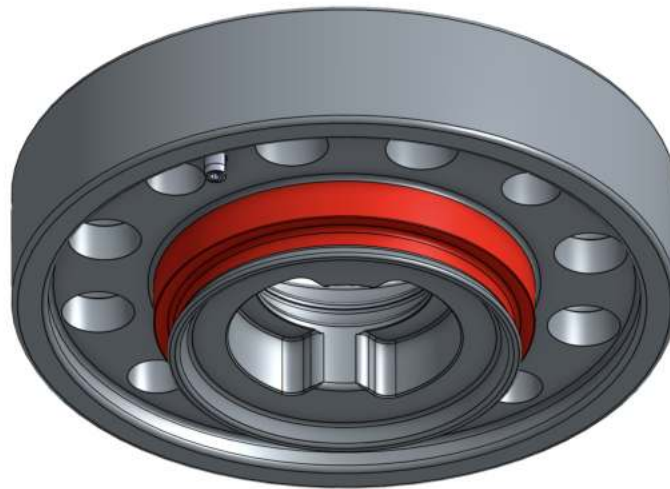
## SEATS

Front face and seal groove, plug sealing face.



## CAP

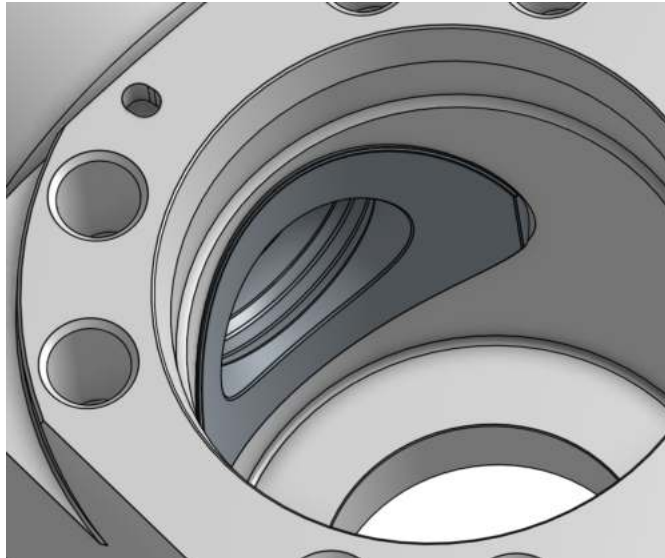
Seal groove and verify alignment pin is in place and not damaged.



## SECTION 6 ASSEMBLY

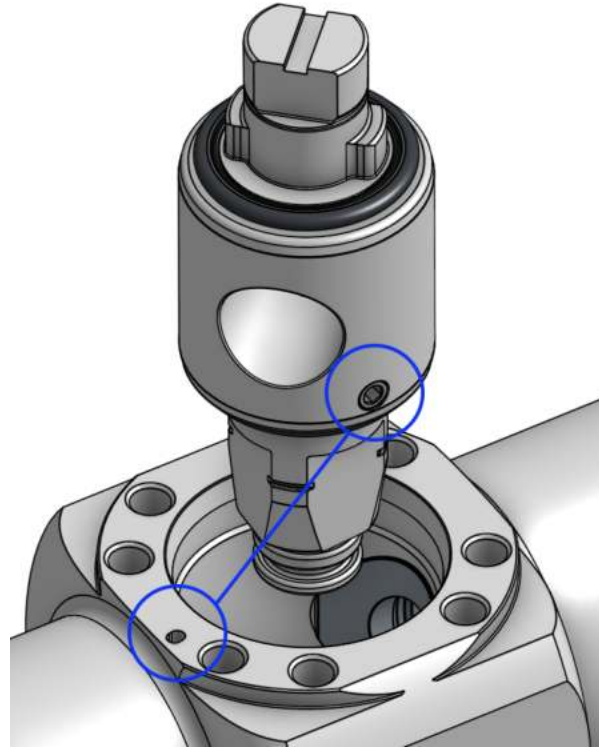
**NOTE: It is important that the workstation being used to assemble the valve is clean and free of any foreign materials that could possibly contaminate the parts. Do not sand or deburr near the workstation.**

1. Support the valve body on a sturdy table with a 2"1502 union welded to it, or use a vise.
2. Apply a small amount of grease to the seat seals then insert into the groove of each seat.
3. Apply a light coat of plug valve grease to the outside of the seats, being sure to avoid getting grease on the front face of the seat. If grease is on this face, wipe it off.
4. Lower the seat into the valve cavity and press it into the pocket with the plug sealing face aligned with the pocket axis. Repeat for the other side. Next apply a light coat of plug valve grease to the entire exposed face of each seat.

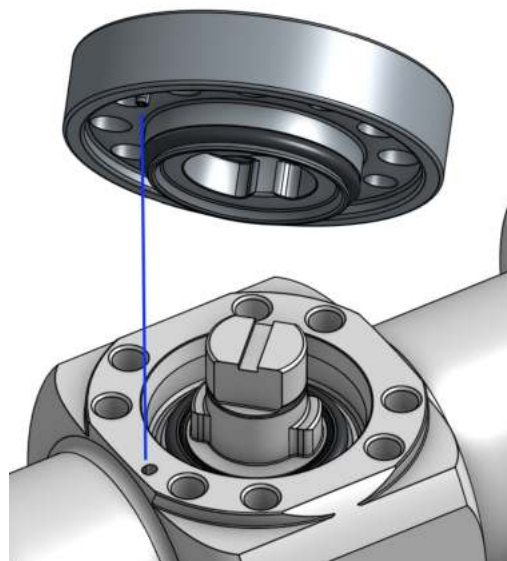


5. Apply a light coat of plug valve grease onto the plug stem seals then snap them onto the backup rings.
6. Press the seals onto each end of the plug being sure they are firmly seated. There should be enough grease present to keep the bottom seal from falling off.
7. Before continuing to the next step verify both seats are fully pressed into the seat pocket and aligned to accept the plug.

8. Set the plug into the valve cavity grease fitting end down and rotated as shown below. It is important for the following steps that the plug be in this approximate orientation.



9. While keeping the plug aligned, firmly push it down until it is fully inserted into the valve cavity. Do not rock the plug back and forth as this may damage the seats and/or plug.
10. Apply a light coat of grease on the cap seal then place it into the seal groove of the cap. Go around the seal with your finger to evenly distribute it in the groove.
11. Place the cap on the valve such that the alignment pin and hole on the valve body are aligned.



12. Apply a light coat of copper anti-seize to the threads of the cap screws.
13. Insert 2 screws into opposing holes on the cap.

14. Using a 5/16” hex wrench or socket, alternate tightening these 2 screws to gradually bring the cap into full level engagement with the valve body. Do not use power tools for this step.
15. Once the cap is fully seated against the valve body, install the remaining 6 screws and tighten with hex key until fully engaged. Then use a torque wrench set to 60 ft-lbs to tighten all 8 screws in a cross pattern.
16. Rotate the valve so that the cap is down then install the handle, snap ring, and grease cap.
17. Rotate the plug to full open and full close a few times to verify movement is smooth and there is no binding or roughness. If the rotation is not smooth, disassemble the valve and inspect for foreign materials.
18. Valve is now ready for greasing [explained in the following section].

NOTE: There is not a removable grease fitting in this model valve. The Giant Button Head and internal flow checks have been integrated into the plug itself. This results in a safer and more efficient design. Internal check parts (ball, spring, retainer) are not serviceable. If the plug fails to retain line pressure it must be replaced. All plugs provided in repair kits have been pre-greased with WETFIT grease prior to packaging.

## SECTION 7 MAINTENANCE

Valves should be greased as part of a regular maintenance program. Regular greasing will increase the service life of the internal valve parts. Routine disassembly and cleaning as part of a maintenance program can prevent unnecessary damage to the valve body. Dixie Iron Works, Ltd. recommends that valves be greased after every job or every 5 actuations, whichever one comes first.

Valves should be greased according to the severity of use. Each operating company should establish guidelines for a greasing and/or disassembly program. These guidelines should be based on the operating conditions. Special consideration should be given for conditions in which the following would be involved:

- abrasives in the fluid stream
- high flow rates
- caustic or acidic fluid streams
- high temperature
- fluid streams that would act as solvents such as condensate
- high number of valve actuations

Valves should not be disassembled for repair while part of an operating arrangement such as a manifold. This should not be attempted even though the valve may be isolated from the fluid stream by other valves.

If the valve is NOT pressurized, MSI recommends greasing the valve to a pressure of 3,000 psig minimum. The valve can safely be greased up to the rated working pressure of the valve. If the valve is pressurized, the greasing pressure needs to be greater than the internal pressure of the valve, but always less than the rated working pressure of the valve. In all cases the maximum greasing pressure will be the difference between the internal pressure and the rated working pressure of the valve. The greasing pump must have pressure measuring capability. **Valves without Greaseal plugs must be greased in the open position, valves with Greaseal plugs may be greased in the open or closed position.**

### Storage

Disassemble the valve completely. See the Disassembly Procedure section for detailed instructions on valve disassembly. Remove old grease and debris from the valve pocket with a solvent and inspect for wear or damage.

- Drain after testing. All equipment should be drained and lubricated after testing and prior to storage or shipment.
- All components and assemblies should be cleaned of dirt, rust, and other contaminants.
- Rust Prevention: Equipment should have exposed metallic surfaces protected with a rust inhibitor which will not become fluid and run at a temperature less than 125°F (52°C).
- Sealing surface protection: Exposed sealing surfaces should be protected from mechanical damage.

## Shelf Life

The following is recommended for maximum equipment shelf life:

Time in Storage	Manufacturer's Recommendation
0-3 months	Nothing required
3-6 months	Re-grease and operate by rotating the plug. Check to see that rotation is smooth without grinding, scraping, or binding.
6+ months	Disassemble, rebuild with all new seals, and retest the valve.

## Greases and Lubrication Requirements

MSI WETFIT plug valve grease is recommended for all applications. It has exceptionally high metal adhesion and resistance to all commonly encountered fluids. WETFIT grease is available in K and V size sticks for use in commercially available stick lube pumps. Approximately 1/4 of a K size stick is needed to lubricate a dry valve.

WETFIT-K-G	GREASE STICK, SIZE K, GEN SVC (-10F TO 400F)
WETFIT-V-G	GREASE STICK, SIZE V, GEN SVC (-10F TO 400F)
WETFIT-K-A	GREASE STICK, SIZE K, ARCTIC SVC (-50F TO 400F)
WETFIT-V-A	GREASE STICK, SIZE V, ARCTIC SVC (-50F TO 400F)

Other plug valve greases may be used after being thoroughly evaluated for performance in the intended service conditions.



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