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ACCURATE MEASUREMENT



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# Daniel™ Senior™ Orifice Fittings

2" - 8" 150-1500

2" - 12" 2500

10" - 16" 150-1500



**DANIEL™**

  
**EMERSON™**  
Process Management



# IMPORTANT SAFETY INSTRUCTIONS

Daniel Measurement and Control, Inc. (Daniel) designs, manufactures and tests products to function within specific conditions. Because these products are sophisticated technical instruments, it is important that the owner and operation personnel strictly adhere both to the information printed on the product nameplate and to all instructions provided in this manual prior to installation, operation, and maintenance.

## **WARNING**

Installing, operating or maintaining a Daniel Product improperly could lead to serious injury or death from explosion or exposure to dangerous substances. To reduce this risk:

- Comply with all information on the product, in this manual, and in any local and national codes that apply to the product.
- Do not allow untrained personnel to work with this product.

Use Daniel parts and work procedures specified in this manual.

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Daniel also urges you to integrate this manual into your training and safety program.

**BE SURE ALL PERSONNEL READ AND FOLLOW THE INSTRUCTIONS IN THIS MANUAL AND ALL NOTICES AND PRODUCT WARNINGS.**

### **Product owners (Purchasers):**

- Use the correct product for the environment and pressures present. See technical data or product specifications for limitations. If you are unsure, discuss your needs with your Daniel representative.
- Inform and train all personnel in the proper installation, operation, and maintenance of this product.
- To ensure safe and proper performance, only informed and trained personnel should install, operate, repair and maintain this product.
- Verify that this is the correct instruction manual for your Daniel product. If this is not the correct documentation, contact Daniel at 1-713-827-6314. You may also download the correct manual from:

<http://www.daniel.com>

- Save this instruction manual for future reference.
- If you resell or transfer this product, it is your responsibility to forward this instruction manual along with the product to the new owner or transferee.
- ALWAYS READ AND FOLLOW THE INSTALLATION, OPERATIONS, MAINTENANCE AND TROUBLESHOOTING MANUAL(S) AND ALL PRODUCT WARNINGS AND INSTRUCTIONS.

- Do not use this equipment for any purpose other than its intended service. This may result in property damage and/or serious personal injury or death.

**Product Operation Personnel:**

- To prevent personal injury, personnel must follow all instructions of this manual prior to and during operation of the product.
- Follow all warnings, cautions, and notices marked on, and supplied with, this product.
- Verify that this is the correct instruction manual for your Daniel product. If this is not the correct documentation, contact Daniel at 1-713-827-6314. You may also download the correct manual from:

<http://www.daniel.com>

- Read and understand all instructions and operating procedures for this product.
- If you do not understand an instruction, or do not feel comfortable following the instructions, contact your Daniel representative for clarification or assistance.
- Install this product as specified in the INSTALLATION section of this manual per applicable local and national codes.
- Follow all instructions during the installation, operation, and maintenance of this product.
- Connect the product to the proper pressure sources when and where applicable.
- Use only replacement parts specified by Daniel. Unauthorized parts and procedures can affect this product's performance, safety, and invalidate the warranty. "Look-a-like" substitutions may result in deadly fire, explosion, release of toxic substances or improper operation.
- Save this instruction manual for future reference.

## Signal words and symbols used in this manual

Pay special attention to the following signal words, safety alert symbols and statements:

### **DANGER**

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

### **WARNING**

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

### **CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

### **NOTICE**

Used to address practices associated with possible equipment damage and miscellaneous practices not related to personal injury.

### Safety alert symbol

This is a safety alert symbol. It is used to alert you to potential physical injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death

**Daniel Measurement and Control, Inc.**

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# Section 1: Introduction

## 1.1 Purpose of this manual

Daniel Measurement & Control Inc. designed this manual to guide owners and personnel in the installation, operation and maintenance of the Daniel™ Senior™ Orifice Fitting.

To ensure safe and proper installation, operation and maintenance, it is imperative that product owners and operation personnel read and follow the information contained in this manual.

## 1.2 Description

The Daniel Senior Orifice Fitting is an orifice plate holding device that houses, and accurately positions, an orifice plate within a pipe or tube to measure fluid flow. It is just one component of an orifice plate flow measurement system. The Daniel Senior Orifice Fitting (Senior) is designed to:

- Position an orifice plate, concentric to flow moving through a line, within API MPMS Chapter 14.3, Part 2 (AGA-3) or ISO 5167 installation requirements.
- Allow personnel to remove and replace an orifice plate without disturbing flow measurement system piping and with little, or no, interruption in service.

The orifice plate within a Senior restricts the fluid moving through a pipe. This restriction creates a change in static pipe pressure of the fluid. Instruments measure this change in pressure prior to the fluid passing through the orifice plate, and once again after it passes the plate. Instrumentation then combines that information, along with other data gathered from the flowing fluid, and calculates the amount of fluid that passes through the system.

The Daniel Senior Orifice Fitting dual chamber design allows for the inspection and replacement of an orifice plate with little or no interruption in service and without removing the Senior from the system.

The first chamber, or Body (4), properly positions the orifice plate in the flow stream. The second chamber, or Top (14), is a temporary holding place for the orifice plate during removing or installing operations (refer to [Section 4: Orifice plate installation and removal instructions](#)).

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### Important

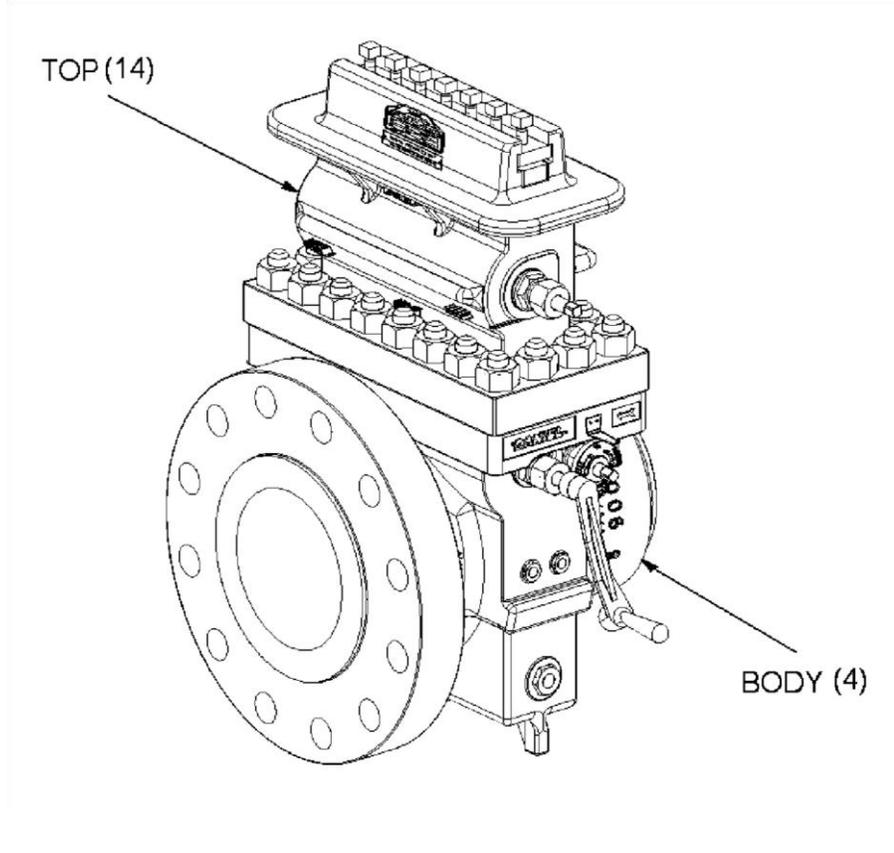
The unit components have part numbers assigned on appropriate drawings and tables. Refer to [Figure 1-2](#) thru [Figure 1-6](#) and [Table 1-1](#) thru [Table 1-5](#) for part numbers. Example: Body (4).

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*Purpose of this manual*

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**Figure 1-1 Daniel Senior Orifice Fitting - Flangenek option**



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Therefore, using a Senior may eliminate the need for bypass piping, valves, and other fittings necessary with conventional orifice fitting installations. Maintenance technicians can replace and repair all parts of the Senior, including the slide valve assembly, without removing the Body (4) from the line (refer to [Section 3: Maintenance](#)).

Daniel designs and manufactures all Senior units to applicable AGA recommendations and in accordance with selected ANSI, ASME and ASTM specifications. As an option, Daniel also designs and manufactures Fittings in compliance with ISO 5167.

Products bearing the “CE” mark are designed and manufactured in compliance with the European Union Pressure Equipment Directive (PED) 97/23/EC. Refer to the “Daniel Orifice Fittings - Installation and Operating Instructions specific to the Pressure Equipment Directive”, Part Number 3-9008-002. Technical References (available on the Daniel website):

- Upp, E.L. “Application of the Orifice Meter for Accurate Gas Flow Measurement”: Daniel Measurement and Control Inc., Houston, Texas USA (1995)
- Upp, E.L. “Development of Orifice Meter Standards”: Daniel Measurement and Control Inc., Houston, Texas USA (1995)
- Daniel Measurement and Control Inc. “Fundamentals of Orifice Meter Measurement”: Daniel Measurement and Control Inc., Houston, Texas USA (1997)
- Kendrick, Ray. Effects of the Latest Revision of ANSI/API 2530/AGA 3 On Orifice Meter Primary Elements” Daniel Measurement and Control Inc., Houston, Texas USA (1997)
- Daniel Measurement and Control Inc. “Getting the Best Value From Daniel Senior Orifice Fittings”: Daniel Measurement and Control Inc., Houston, Texas USA (1997)
- Cotton, Galen M. “Pulsation Effects on Gas Measurement”: Daniel Measurement and Control Inc., Houston, Texas USA (1980)
- Husain, Zaki D. “Theoretical Uncertainty of Orifice Flow Measurement”: Daniel Measurement and Control Inc., Houston, Texas USA (1990)
- Daniel Measurement and Control Inc. “Senior Orifice Fitting Technical Guide: DAN-DIFTG-11-1003 “Daniel Measurement and Control Inc., Houston, Texas USA (2003).

Description

## 1.2.1 Technical data

### NOTICE

Follow all the safety and equipment limits recommended in 1.2.1 Technical data of this manual. It is the owner’s and/or purchaser’s responsibility to comply with these parameters.

### WARNING

#### PERSONAL PROTECTION HAZARD

Follow all parameters for the Senior Orifice Fitting indicated below.

Failure to do so may result in injury or equipment damage.

#### Product parameters and limitations:

- Fluid static pressure: Material of construction dependent. (Refer to ASME codes and ANSI specifications when applicable)\*
- Fluid phases: gas, liquid, vapor
- Fluids measured: most hydrocarbons
- Fluid temperature parameters: Material of construction dependent. (Refer to ASME codes).\*
- Orifice plate seal material limitations: Refer to ASME codes and ANSI specifications for Fitting operating limits. Never exceed temperature operating limits.
  - w/ Nitrile Seal Maximum: 250 F (+121 C) Minimum: -30 F (-34 C)
  - w/ HNBR Seal Maximum: +300 F (+148 C) Minimum: -20 F (-28 C)
  - w/ FKM Seal Maximum: +392 F (+200 C) Minimum: -15 F (-26 C)
  - w/ FFKM Seal Maximum: +620 F (+327 C) Minimum: -4 F (-20 C)
- Differential pressure: See AGA Report #3

#### Space limits:

See “Senior Orifice Fitting Technical Guide: DAN-DIF-TG”

#### Time parameters:

See Orifice Plate changing instructions

*Technical data*

Components:

- Maintenance interval: Exercise components monthly. Examine components during orifice plate changes or at least once a year. Replace components when worn or damaged.
- Seal replacement: Examine seals and gaskets during orifice plate inspections or at least once a year. Replace when worn or damaged.
- Fastener torque verification: Monthly (see [Section 5.3](#) for size /ANSI Class values).
- Corrosion allowances: Fluid / service dependent (Reference: U.S. DOT, CFR Title 49: Part 192.477 Internal corrosion control: Monitoring).

Environmental parameters:

- Application: Surface conditions (no sub-sea applications).
- Confined/open: Designed for outdoor use. May be used in well ventilated spaces (buildings / enclosures - meter houses). Installation at product owner's discretion.
- Site temperature: Material of construction dependent. (Example: WCB maximum: +200 F (+93 C), minimum: -20 F (-28 C)).
- Site humidity: No limit
- Site elevation: No limit
- Proximity to population: For new installations, placement of the Senior shall be at a location that has fewer than 10 buildings intended for human occupancy within an area that extends 220 yards (200 meters) radially from the Orifice Fitting. (Reference: Class 1 Location: U.S. DOT, CFR Title 49: Part 192.5).
- Proximity to traffic: A Senior must be protected from accidental damage by vehicular traffic or other similar causes, either by being placed at a safe distance from the traffic or by installing barricades.
- Proximity to equipment: Install the Senior in a well ventilated place, not less than 3 feet (914 millimeters) from any source of ignition or any source of heat which might damage the unit.

*Technical data*

Interface parameters:

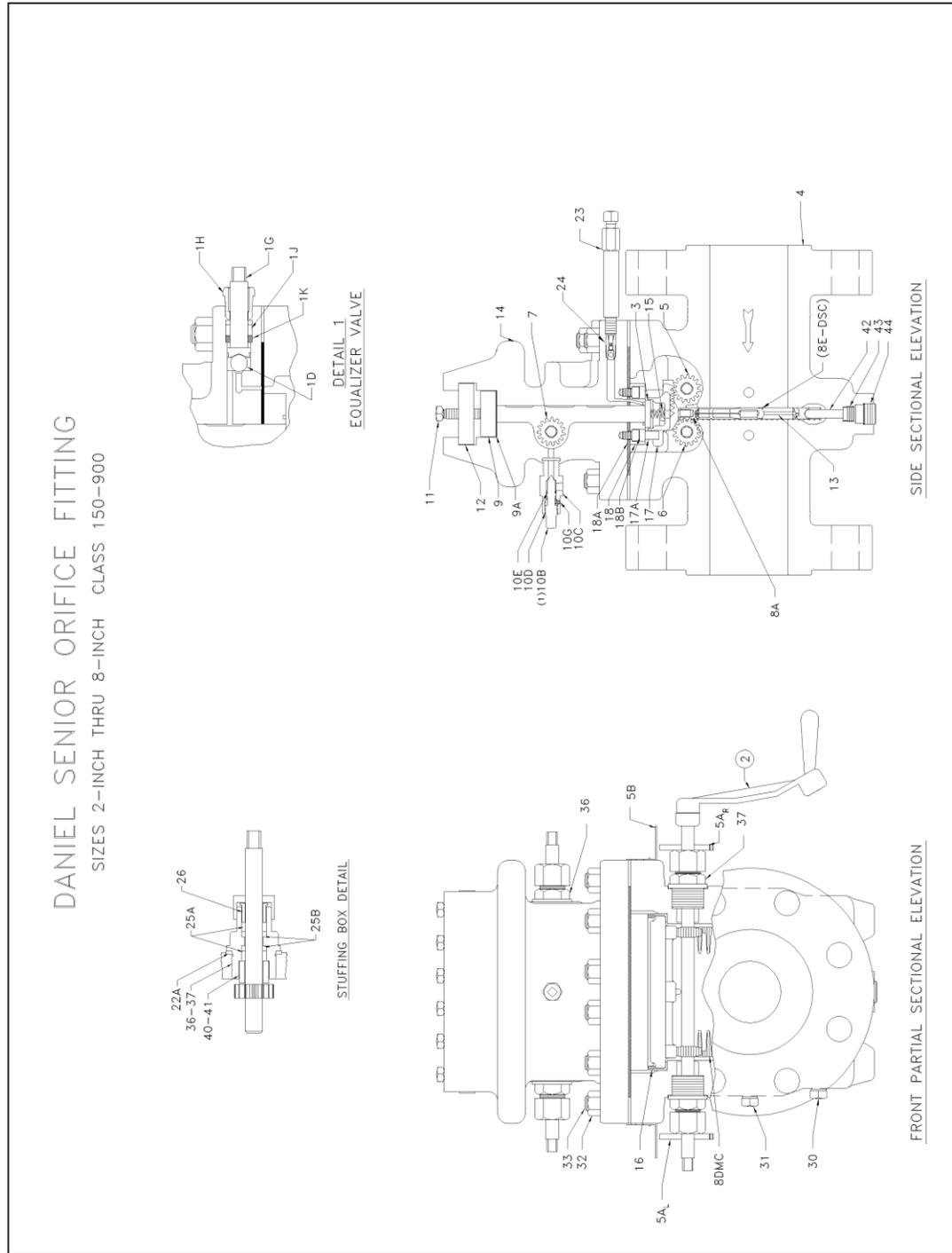
- Replacement parts: Use only replacement parts specified by Daniel. Unauthorized parts and procedures can affect this product's performance and place the safe operation of your process at risk.
  - After market attachments: Use of pressure sensing equipment, drain valves and other accessories (e.g., needle valves, multi-port valves, transmitters, 3- pin recorders...etc.) are permissible. The use of after-market equipment must be installed and operated as directed by the aftermarket equipment manufacturer, and their warranties and replacements are not contained within the scope of this document.
  - Pipe supports: Support the flow measurement system (or meter tube) at regular intervals to prevent bending due to the weight of the system, as well as the weight of the measured fluid. Since all meter tubes are unique, it is important that an engineer design a piping system, which can place support for each tube during regular intervals. Proper support placement can reduce the potential of creating stress at welded joints and flanges, which may lead to leaks and may ultimately lead to failure or rupture of the flow measurement system.
  - Vandalism / Tampering: It is the responsibility of each product owner to protect the Senior from vandalism, tampering or other unauthorized activity.
- \* *Indicates standard "A" Trim product. For applications outside parameters above please consult the factory.*

## 1.3 Specifications

### 1.3.1 Daniel Senior Orifice Fitting sizes 2"-8" 150-900

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Figure 1-2 Daniel Senior Orifice Fitting drawing 2"-8" 150-900



**Specifications**

All Parts on Daniel Senior Orifice Fittings may be replaced or repaired without removing the Senior body from the line.

Table 1-1 Daniel Senior Orifice Fitting sizes 2" thru 8" 150-900

Parts and materials			Number required				
			Size				
Item no.	Description	Material	2"	3"	4"	6"	8"
*1	Equalizer Valve (Complete):						
*1G	Stem	316 Stainless Steel	1	1	1	1	1
*1H	Packing Nut	CS (ZP)	1	1	1	1	1
*1D	Ball	18-8 Stainless Steel	1	1	1	1	1
*1K	Packing Washer	17-4PH Stainless Steel	1	1	1	1	1
*1J	Packing Ring	Teflon	2	2	2	2	2
*2	Operating Wrench	Ductile Iron	1	1	1	1	1
3	Slide Valve Strip	Type 410 Stainless Steel	1	1	1	1	1
4	Body	Cast Carbon Steel	1	1	1	1	1
5	Slide Valve Shaft	316 Stainless Steel	1	1	1	1	1
*5A-LH	Indicator Plate Left-Hand	Cast Aluminum	1	1	1	1	1
*5A-RH	Indicator Plate Right-Hand	Cast Aluminum	1	1	1	1	1
*5B	Indicator Pointer	Stainless Steel	2	2	2	2	2
5C	Drive Screws	18-8 Stainless Steel	4	4	4	4	4
6	Lower Plate Carrier Shaft	316 Stainless Steel	1	1	1	1	1
7	Upper Plate Carrier Shaft	316 Stainless Steel	1	1	1	1	1
*8A	Plate Carrier Spring Pin	18-8 SS	1	1	1	1	1
8DMC	Plate Carrier	316 SS	1	1	1	1	1
8E-DSC	Orifice Plate Sealing Unit 150-600	Nitrile (Removable)	1	1	1	1	1
8TSC	Orifice Plate Sealing Unit 150-900 Alternate Seals Available See Catalog - #500	Teflon (Removable)	1	1	1	1	1
9	Sealing Bar	CS (ZP)	1	1	1	1	1
9A	Sealing Bar Gasket	Composite	1	1	1	1	1
*10B	Bleeder Valve (Complete):						

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*10C	Body	CS (ZP)	1	1	1	1	1	
*10D	Needle	316 Stainless Steel	1	1	1	1	1	
*10E	O-Ring	Synthetic Rubber	1	1	1	1	1	
*10G	Set Screw	Alloy Steel	1	1	1	1	1	
*11	Clamping Bar Screw	Alloy Steel (ZP)	150-600	4	4	5	6	7
			900	4	4	5	6	8
12	Clamping Bar	CS (ZP)	1	1	1	1	1	
13	Orifice Plate	Type 304 or 316 Stainless Steel	1	1	1	1	1	

*Daniel Senior Orifice Fitting sizes 2"-8" 150-900*

**Table 1-1 Daniel Senior Orifice Fitting sizes 2" thru 8" 150-900**

Parts and materials			Number required				
			Size				
Item no.	Description	Material	2"	3"	4"	6"	8"
14	Top	Cast Carbon Steel	1	1	1	1	1
*15	Slide Valve Springs	316 Stainless Steel	4	4	4	6	6
*16	Slide Valve Carrier Guide	316 Stainless Steel	2	2	2	2	2
17	Slide Valve Carrier	Cast Carbon Steel	1	1	1	1	
		Cast Alloy Iron					1
*17A	Slide Valve Carrier Stop Pin	Carbon Steel (ZP)	2	2	2	2	2
18	Slide Valve Seat	Cast Alloy Iron	1	1	1	1	
		Cast Iron					1
18A	Slide Valve Seat /Top Gasket	Composite	1	1	1	1	1
*18B	Slide Valve Seat Screw	Alloy Steel Phosphate Treat	8	10	11	14	16
*22A	Bearing Plug and Stuffing Box Gasket	Stainless Steel	6	6	6	6	6
*23	Grease Gun (Complete)	CS (ZP)	1	1	1	1	1
*24	Grease Seal Double Ball Check Valve	316 Stainless Steel with Chrome-Steel Balls	1	1	1	1	1
*25	Packing Nut	CS (ZP)	6	6	6	6	6

*25A	Packing Rings	Teflon		12	12	12	12	12
*25B	Centering Ring	Teflon		12	12	12	12	12
*26	Stuffing Box Gland	316 SS		6	6	6	6	6
*30(1)	Drain Valve Plug	CS (ZP)		1	1	1	1	1
*31(1)	½" N.P.T. Plug for Pressure Meter Tap	CS (Chemically Treated)		2	2	2	2	2
32	Hex Nut	CS	150-600	14	15	15	18	19
			900	14	15	15	18	20
33	Stud	Alloy Steel	150-600	14	15	15	18	19
			900	14	15	15	18	20
*36	Stuffing Box Body (Upper)	CS (ZP)		2	2	2	2	2
*37	Stuffing Box Body (Lower)	CS (ZP)		4	4	4	4	4
40	Stuffing Box Sleeve (Upper)	CS (ZP)		2	2	2	2	2
41	Stuffing Box Sleeve (Lower)	CS (ZP)		4	4	4	4	4
*42	Plate Carrier Stop Pin	CS (ZP)		1	1	1	1	1
*43	Plate Carrier Stop Pin Lock Screw	CS (ZP)		1	1	1	1	1
*44	Plate Carrier Stop Pin Access Plug	CS (ZP)		1	1	1	1	1
	Slide Valve Lubricant (3)	0.38 in. (9.5mm) diameter by 1.5in (38.1 mm) long						

Daniel Senior Orifice Fitting sizes 2"-8" 150-900

Notes:Table 1-1

1. All Daniel Senior Orifice Fittings are supplied with pipe plugs on one side only. If additional quantities are required, please contact the factory directly.
2. Locations of Equalizer Valve (1), Bleeder Valve (10B), and Grease Gun (23) may differ from diagrams shown in this manual.
3. Slide Valve Lubricant: 0.38in (9.53mm) diameter by 1.5in (38.1mm) long is equivalent to some lubricant manufacturers' "B" size stick. The quantity of lubricant a fitting described in this manual will require is dependent upon the state and condition of the fitting. Daniel recommends having one box of lubricant sticks (24 sticks per box) onhand when performing maintenance and plate inspection/change procedures.

\* Indicates Interchangeable parts for all line sizes of specified pressure rating(s).

General notes:

- Most parts available in other materials upon customer request.

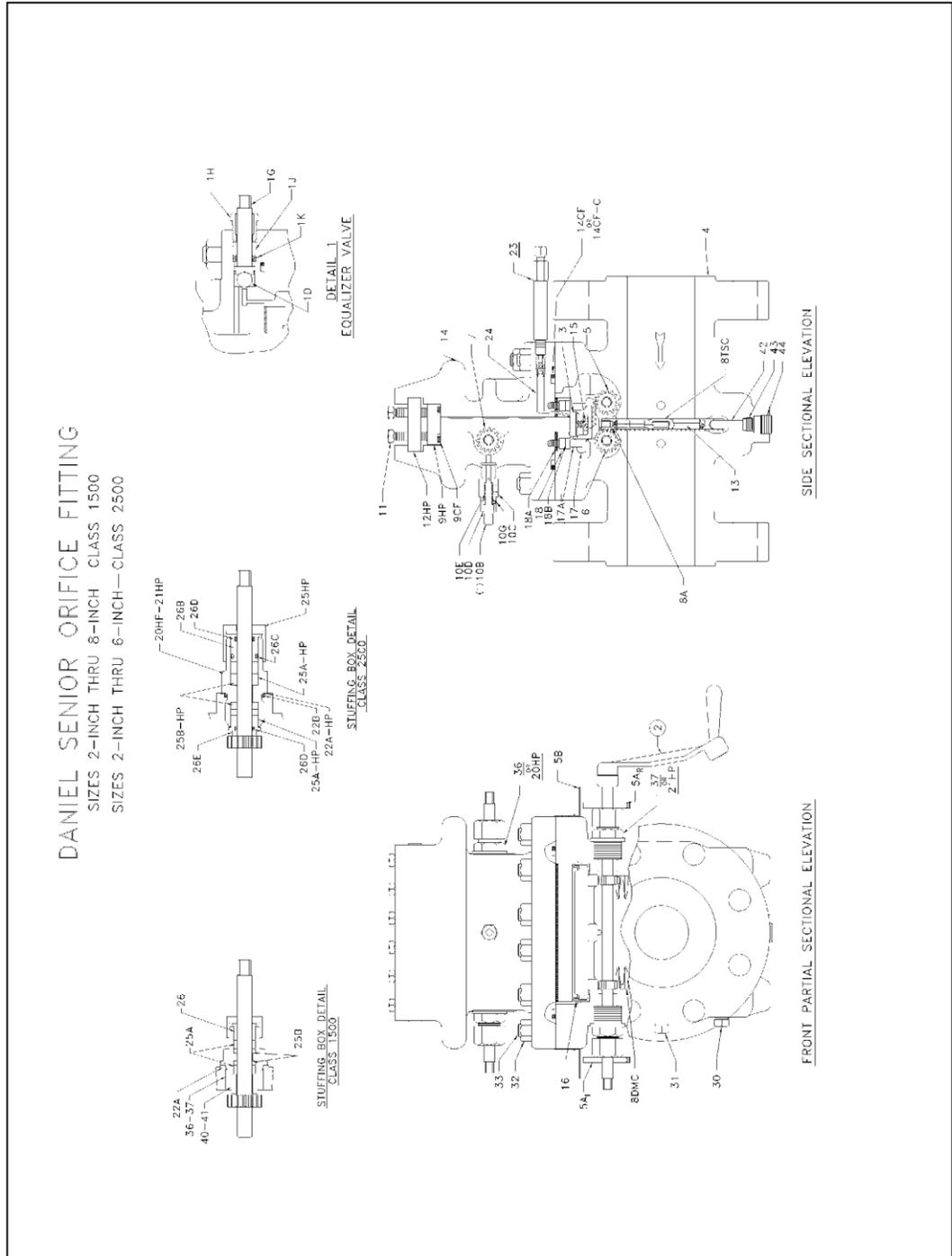
- CS (Carbon Steel), CRS (Cold Rolled Steel), NPT (National Pipe Thread), ZP (Zinc Plated).
- The materials listed above indicate standard "A" trim. Various part materials are changed for "NACE" & "AASG" trim fittings.
- Suffix "SS" added to an item number indicates a "Soft Seat" version. (Refer to [Table 5-7](#) in [Section 5: Supplemental information](#) for item numbers and part descriptions) – NACE MR0175 compliant trims are available upon customer request.
- Other trim options available upon request. Consult factory.
- Shaded part numbers are for items which are fluid media PIC (parts in contact).

When ordering parts, please specify:

- Catalog number
- Size
- Serial number and date of the original purchase
- Part number • Material

### 1.3.2 Daniel Senior Orifice Fitting sizes 2"-8" 1500 and 2" -6" 2500

Figure 1-3 Daniel Senior Orifice Fitting drawing sizes 2"-8" 1500 and 2" -6" 2500



All Parts on Daniel Senior Orifice Fittings may be replaced or repaired without removing the Senior body from the line.

Table 1-2 Daniel Senior Orifice Fittings sizes 2” thru 8” 1500 and 2” thru 6” 2500

Parts and materials				Number required				
				Size				
Item no.	Description	Material		2”	3”	4”	6”	8”
*1	Equalizer Valve (Complete):							
*1G	Stem	316 Stainless Steel		1	1	1	1	1
*1H	Packing Nut	CS (ZP)		1	1	1	1	1
*1D	Ball	18-8 Stainless Steel		1	1	1	1	1
*1K	Packing Washer	17-4PH Stainless Steel		1	1	1	1	1
*1J	Packing Ring	Teflon		2	2	2	2	2
*2	Operating Wrench	Ductile Iron		1	1	1	1	1
3	Slide Valve Strip	Type 410 Stainless Steel		1	1	1	1	1
4	Body	Cast Carbon Steel		1	1	1	1	1
5	Slide Valve Shaft	316 Stainless Steel		1	1	1	1	1
*5A-LH	Indicator Plate Left-Hand	Cast Aluminum		1	1	1	1	1
5A-RH	Indicator Plate Right-Hand	Cast Aluminum		1	1	1	1	1
*5B	Indicator Pointer	Stainless Steel		2	2	2	2	2
5C	Drive Screws	18-8 Stainless Steel		4	4	4	4	4
6	Lower Plate Carrier Shaft	316 Stainless Steel		1	1	1	1	1
7	Upper Plate Carrier Shaft	316 Stainless Steel		1	1	1	1	1
*8A	Plate Carrier Spring Pin	18-8 SS		1	1	1	1	1
8DMC	Plate Carrier	316 SS	1500	1	1	1	1	1
			2500				1	
		CS (ZP)	2500	1	1	1		
8TSC	Orifice Plate Sealing Unit Alternate Seals Available See Catalog - #500	Teflon (Removable)		1	1	1	1	1
9HP	Sealing Bar	CS (ZP)		1	1	1	1	1

9CF	"Compoflex" Sealing Bar Gasket	Synthetic Composition		1	1	1	1	1
*10B	Bleeder Valve (Complete):							
*10C	Body	CS (ZP)		1	1	1	1	1
*10D	Needle	316 Stainless Steel		1	1	1	1	1
*10E	O-Ring	Synthetic Rubber		1	1	1	1	1
*10G	Set Screw	Alloy Steel		1	1	1	1	1
*11	Clamping Bar Screw	Alloy Steel (ZP)	1500	10	10	12	14	16
			2500	10	10	12	14	
12HP	Clamping Bar	CS (ZP)		1	1	1	1	1

*Daniel Senior Orifice Fitting sizes 2"-8" 1500 and 2"-6" 2500*

**Table 1-2 Daniel Senior Orifice Fittings sizes 2" thru 8" 1500 and 2" thru 6" 2500**

Parts and materials				Number required				
				Size				
Item no.	Description	Material		2"	3"	4"	6"	8"
13	Orifice Plate	Type 304 or 316 Stainless Steel		1	1	1	1	1
14	Top	Cast Carbon Steel		1	1	1	1	1
14CF	Body-Top Gasket ("O-ring")	Special Compound	1500	1	1	1	1	1
14CF-C	Body-Top Gasket (Male-Female Joint) Not Illustrated	Parker Seal w/ Synthetic Rubber	2500	1	1	1	1	
*15	Slide Valve Springs	316 Stainless Steel		4	4	4	6	6
*16	Slide Valve Carrier Guide	316 Stainless Steel		2	2	2	2	2
17	Slide Valve Carrier	Cast Carbon Steel		1	1	1	1	
		Cast Alloy Iron						1
*17A	Slide Valve Carrier Stop Pin	Carbon Steel (ZP)		2	2	2	2	2
18	Slide Valve Seat	13% Chrome Stainless Steel		1	1	1	1	1
18A	Slide Valve Seat /Top Gasket	Composite	1500	1	1	1	1	1
			2500	Assembled metal-to-metal				
*18B	Slide Valve Seat Screw	Alloy Steel	1500	8	10	11	14	16

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		Phosphate Treat	2500	10	10	11	14	12
20HP	Stuffing Box (Upper)	CS (ZP)	2500	2	2	2	2	0
21HP	Stuffing Box (Lower)	CS (ZP)	2500	4	4	4	4	0
*22A	Bearing Plug and Stuffing Box Gasket	Stainless Steel	1500	6	6	6	6	6
*22A-HP	Bearing Plug and Stuffing Box Gasket	Stainless Steel	2500	6	6	6	6	
*22B	Bearing Plug and Stuffing Box ORing	Synthetic Rubber	2500	6	6	6	6	
*23	Grease Gun (Complete)	CS (ZP)		1	1	1	1	1
*24	Grease Seal Double Ball Check Valve	316 Stainless Steel with Chrome-Steel Balls		1	1	1	1	1
*25	Packing Nut	CS (ZP)	1500	6	6	6	6	6
*25HP	Packing Nut	CS (ZP)	2500	6	6	6	6	
*25A	Packing Rings	Teflon	1500	12	12	12	12	12
*25A-HP	Packing Rings	Teflon	2500	Varies with fitting size				
*25B	Centering Ring	Teflon	1500	12	12	12	12	12
*25B-HP	Centering Ring	Teflon	2500	12	12	12	12	0

**Table 1-2 Daniel Senior Orifice Fittings sizes 2" thru 8" 1500 and 2" thru 6" 2500**

Parts and materials				Number required				
				Size				
Item no.	Description	Material		2"	3"	4"	6"	8"
*26	Stuffing Box Gland	316 SS	1500	6	6	6	6	6
*26B	External Stuffing Box Gland	316 SS	2500	6	6	6	6	0
*26E	Internal Stuffing Box Gland	316 SS	2500	6	6	6	6	0
*26C	Stuffing Box Gland O-Ring	Synthetic Rubber	2500	6	6	6	6	0
*26D	Stuffing Box Gland O-Ring	Synthetic Rubber	2500	12	12	12	12	
*30(1)	Drain Valve Plug	CS (ZP)		1	1	1	1	1

*31(1)	½" N.P.T. Plug for Pressure Meter Tap	CS (Chemically Treated)		2	2	2	2	2
32	Hex Nut	CS	1500	14	14	16	18	18
			2500	16	16	16	18	
33	Stud	Alloy Steel	1500	14	14	16	18	18
			2500	16	16	16	18	
*36	Stuffing Box (Upper)	CS (ZP)	1500	2	2	2	2	2
*37	Stuffing Box (Lower)	CS (ZP)	1500	4	4	4	4	4
40	Stuffing Box Sleeve (Upper)	CS (ZP)	1500	2	2	2	2	2
41	Stuffing Box Sleeve (Lower)	CS (ZP)	1500	4	4	4	4	4
*42	Plate Carrier Stop Pin	CS (ZP)		1	1	1	1	1
*43	Plate Carrier Stop Pin Lock Screw	CS (ZP)		1	1	1	1	1
*44	Plate Carrier Stop Pin Access Plug	CS (ZP)		1	1	1	1	1
	Slide Valve Lubricant (3)	0.38 in. (9.5mm) diameter by 1.5in (38.1 mm) long						

*Daniel Senior Orifice Fitting sizes 2"-8" 1500 and 2"-6" 2500*

Notes: Table 1-2

1. All Daniel Senior Orifice Fittings are supplied with pipe plugs on one side only. If additional quantities are required, please contact the factory directly.
2. Locations of Equalizer Valve (1), Bleeder Valve (10B), and Grease Gun (23) may differ from diagrams shown in this manual.
3. Slide Valve Lubricant: 0.38in (9.53mm) diameter by 1.5in (38.1mm) long is equivalent to some lubricant manufacturers' "B" size stick. The quantity of lubricant a fitting described in this manual will require is dependent upon the state and condition of the fitting. Daniel recommends having one box of lubricant sticks (24 sticks per box) onhand when performing maintenance and plate inspection/change procedures.

\* Indicates Interchangeable parts for all line sizes of specified pressure rating(s).

General notes:

- Most parts available in other materials upon customer request.
- CS (Carbon Steel), CRS (Cold Rolled Steel), NPT (National Pipe Thread), ZP (Zinc Plated).
- The materials listed above indicate standard "A" trim. Various part materials are changed for "NACE" & "AASG" trim fittings.

- Suffix “SS” added to an item number indicates a “Soft Seat” version. (Refer to [Table 5-7](#) in [Section 5: Supplemental information](#) for item numbers and part descriptions) – NACE MR0175 compliant trims are available upon customer request.
- Other trim options available upon request. Consult factory.
- Shaded part numbers are for items which are fluid media PIC (parts in contact).

When ordering parts, please specify:

- Catalog number
- Size
- Serial number and date of the original purchase
- Part number
- Material

### 1.3.3 Daniel Senior Orifice Fitting sizes 8”-12” 2500

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All parts on Daniel Senior Orifice Fittings may be replaced or repaired without removing the Daniel Senior Orifice Fitting body from the line.

**Table 1-3 Daniel Senior Orifice Fittings sizes 8” thru 12” 2500**

Parts and materials			Number required		
			Size		
Item no.	Description	Material	8”	10”	12”
1D-HP	Equalizer Valve Ball	SS	1	1	1
1G-HP	Equalizer Valve Stem	316 Stainless Steel	1	1	1
1K-HP	Equalizer Valve Washer	316 Stainless Steel	7	7	7
1L-HP	Equalizer Valve Stuffing Box	CS	1	1	1
*2	Operating Wrench - Gear Shafts	Ductile Iron	1	1	1
2A	Operating Wrench - Clamping Bar Screws	Alloy Steel	1	1	1
4	RTJ - FL Body	Cast Steel	1	1	1
*5A-LH	Indicator Plate Left-Hand	Aluminum	1	1	1
*5A-RH	Indicator Plate Right-Hand	Aluminum	1	1	1
5B	Indicator Pointer	CS	2	2	2
5D	Indicator Pointer Attachment Screw	31618-8 Stainless Steel	2	2	2
5, 6,7	gear Shaft	316 Stainless Steel	3	3	3
8DM	Plate Carrier	CS	1	1	1
9B	Sealing Bar Alignment Pin	CS	1	1	1
9C	O-Ring, Sealing Bar Gasket	Nitrile	1	1	1
9-HP	Sealing Bar	CS	1	1	1
10C	Bleeder Valve Body	CS	1	1	1
10D	Bleeder Valve Stem	316 Stainless Steel	1	1	1
10E	O-Ring Bleeder Valve Gasket	Nitrile	1	1	1
10F	SKT HD Set Screw	Alloy Steel	1	1	1

11	Clamping Bar Screw	Alloy Steel (ZP)	28	28	28
12-HP	Clamping Bar	CS	1	1	1
14	Top	Cast Steel	1	1	1
14-HP	Body-Top Ring Gasket	Soft iron	1	1	1
16	Slide Valve Guide	316 Stainless Steel	2	2	2
*16A	Slide Valve Guide Attachment Screw	Alloy Steel	2	2	2
16B	Slide Valve Adjustment Screw	316 Stainless Steel	2	2	2
16C	Slide Valve Adjustment Lock Screw	316 Stainless Steel	2	2	2
17-HP	Slide Valve	11-14. CH SS	1	1	1
17C-HP	Shaft Spacer	316 Stainless Steel	6	6	6

*Daniel Senior Orifice Fitting sizes 8"-12" 2500*

**Table 1-3 Daniel Senior Orifice Fittings sizes 8" thru 12" 2500**

Parts and materials			Number required		
			Size		
Item no.	Description	Material	8"	10"	12"
17E-HP	Stuffing Box Spring Retainer	316 Stainless Steel	6	6	6
17F-HP	Stuffing Box Spring	316 Stainless Steel	6	6	6
17G-HP	Spring Retainer Set Screw	316 Stainless Steel	6	6	6
18	Valve Seat	410 Stainless Steel	1	1	1
18A	O-Ring, Valve Seat Gasket	Nitrile	1	1	1
*18B	Valve Seat Screw	Alloy Steel	12	12	12
18C	O-Ring, Grease Port (Seat) Gasket	Nitrile	1	1	1
20-HP	Stuffing Box Body	CS	6	6	6
20E-HP	Stuffing Box Extension	CS	6	6	6
22A-HP	Bearing Plug and Stuffing Box Gasket	CS	7	7	7
22B-HP	O-Ring, Stuffing Box	Nitrile	7	7	7
23-HP	Grease Fitting with #1 Adapt.	Comm. Item	1	1	1

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25-HP	Packing Nut	CS	7	7	7
25A-HP	Shaft Packing 1/2" LG	Teflon	27	27	27
25B-HP	Shaft Packing 1/4" LG	Teflon	6	6	6
25C-HP	Stuffing Box Bushing	Teflon	6	6	6
26B	External Stuffing Box Gland	316 SS	7	7	7
26C	O-Ring, Stuffing Box Gland	Nitrile	7	7	7
26D	O-Ring, Stuffing Box Gland	Nitrile	7	7	7
30	Drain Plug	CS	1	1	1
31	Meter Tap Plug	CS	2	2	2
32	Hex Nut	2H	20	20	20
33	Body-Top Stud (Long)	B7	16	16	16
33B	Body-Top Stud (Short)	B7	4	4	4
*45	SR ID Plate (Not Shown)	304SS	1	1	1
46-HP	Instruction Plate (Not Shown)	304SS	1	1	1
*47	Warning Plate (Not Shown)	316SS	1	1	1
BNP	Bleeder Valve Plate (Not Shown)	304SS	1	1	1
ENP	Equalizer Valve Plate (Not Shown)	304SS	1	1	1
GNP	Grease Gun Plate (Not Shown)	304SS	1	1	1

*Daniel Senior Orifice Fitting sizes 8" -12" 2500*

**Notes:Table 1-3**

1. All Daniel Senior Orifice Fittings are supplied with pipe plugs on one side only. If additional quantities are required, please contact the factory directly.
2. Locations of Equalizer Valve (1), Bleeder Valve (10B), and Grease Gun (23) may differ from diagrams shown in this manual.
3. Slide Valve Lubricant: 0.38in (9.53mm) diameter by 1.5in (38.1mm) long is equivalent to some lubricant manufacturers' "B" size stick. The quantity of lubricant a fitting described in this manual will require is dependent upon the state and condition of the fitting. Daniel recommends having one box of lubricant sticks (24 sticks per box) onhand when performing maintenance and plate inspection/change procedures.

\* Indicates Interchangeable parts for all line sizes of specified pressure rating(s).

**General notes:**

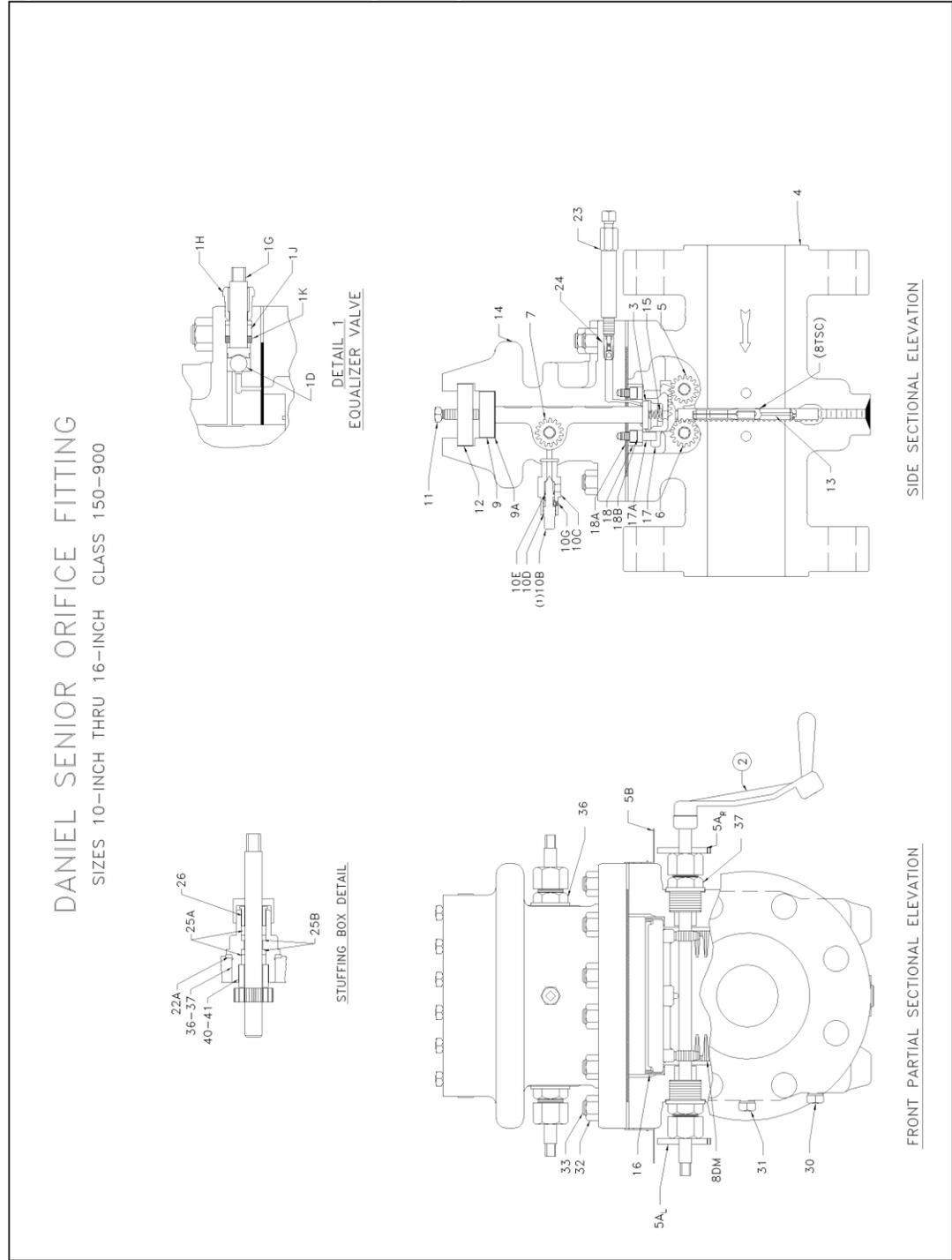
- Most parts available in other materials upon customer request.
- CS (Carbon Steel), CRS (Cold Rolled Steel), NPT (National Pipe Thread), ZP (Zinc Plated).
- The materials listed above indicate standard “A” trim. Various part materials are changed for “NACE” & “AASG” trim fittings.
- Suffix “SS” added to an item number indicates a “Soft Seat” version. (Refer to [Table 5-7](#) in [Section 5: Supplemental information](#) for item numbers and part descriptions) –  
NACE MR0175 compliant trims are available upon customer request.
- Other trim options available upon request. Consult factory.
- Shaded part numbers are for items which are fluid media PIC (parts in contact).

When ordering parts, please specify:

- Catalog number
- Size
- Serial number and date of the original purchase
- Part number
- Material

### 1.3.4 Daniel Senior Orifice Fitting sizes 10”-16” 150-900

Figure 1-5 Daniel Senior Orifice Fitting drawing sizes 10”-16” 150-900



*Daniel Senior Orifice Fitting sizes 10"-16" 150-900*

All Parts on Daniel Senior Orifice Fittings may be replaced or repaired without removing the Daniel Senior Orifice Fitting body from the line.

**Table 1-4 Daniel Senior Orifice Fitting sizes 10" thru 16" 150-900**

Parts and materials			Number required			
			Size			
Item no.	Description	Material	10"	12"	14"	16 "
*1	Equalizer Valve (Complete):					
*1G	Stem	316 Stainless Steel	1	1	1	1
*1H	Packing Nut	CS (ZP)	1	1	1	1
*1D	Ball	18-8 Stainless Steel	1	1	1	1
*1K	Packing Washer	17-4PH Stainless Steel	1	1	1	1
*1J	Packing Ring	Teflon	2	2	2	2
*2	Operating Wrench	Ductile Iron	1	1	1	2
3	Slide Valve Strip	Type 410 Stainless Steel	1	1	1	1
4	Body	Cast Carbon Steel	1	1	1	1
5	Slide Valve Shaft	316 Stainless Steel	1	1	1	1
*5A-LH	Indicator Plate Left-Hand	Cast Aluminum	1	1	1	1
5A-RH	Indicator Plate Right-Hand	Cast Aluminum	1	1	1	1
*5B	Indicator Pointer	Stainless Steel	2	2	2	2
5C	Drive Screws	18-8 Stainless Steel	4	4	4	4
6	Lower Plate Carrier Shaft	316 Stainless Steel	1	1	1	1
7	Upper Plate Carrier Shaft	316 Stainless Steel	1	1	1	1
8DM	Plate Carrier	316 Stainless Steel	1	1	1	1
8E-DS	Orifice Plate Sealing Unit 150-600	Nitrile (Removable)	1	1	1	1
8E-DVS	Orifice Plate Sealing Unit 150-600	Nitrile (Bonded to both faces of the orifice plate)	1	1	1	1

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8TS	Orifice Plate Sealing Unit 150-900 Alternate Seals Available See Catalog - #500	Teflon (Removable)	1	1	1	1
9	Sealing Bar	CS (ZP)	1	1	1	1
9A	Sealing Bar Gasket	Composite	1	1	1	1
*10B	Bleeder Valve (Complete):		1	1	1	-
*10C	Body	CS (ZP)	1	1	1	-
*10D	Needle	316 Stainless Steel	1	1	1	-
*10E	O-Ring	Synthetic Rubber	1	1	1	-
*10G	Set Screw	Alloy Steel	1	1	1	-

*Daniel Senior Orifice Fitting sizes 10"-16" 150-900*

**Table 1-4 Daniel Senior Orifice Fitting sizes 10" thru 16" 150-900**

Parts and materials				Number required			
				Size			
Item no.	Description	Material		10"	12"	14"	16"
10F	Bleeder Valve (complete):	CS (ZP) w/ 410 Stainless Steel		-	-	-	1
10H	Bleeder Valve Nipple			-	-	-	1
*11	Clamping Bar Screw	Alloy Steel (ZP)	150-600	8	10	11	12
			900	8	10	22	28
12	Clamping Bar	CS (ZP)		1	1	1	1
13	Orifice Plate	Type 304 or 316 S tainless Steel		1	1	1	1
14	Top	Cast Carbon Steel		1	1	1	1
*15	Slide Valve Springs	316 Stainless Steel		6	7	8	10
*16	Slide Valve Carrier Guide	316 Stainless Steel		2	2	2	2
17	Slide Valve Carrier	Cast Carbon Steel		1	1	1	1
*17A	Slide Valve Carrier Stop Pin	Carbon Steel (ZP)		2	2	2	2
18	Slide Valve Seat	Cast Alloy Iron	150-600	1	1	1	1
		TY 410 SS	900	1	-	-	-

		17-4PH SS	900	-	1	1	1
18A	Slide Valve Seat /Top Gasket	Composite		1	1	1	1
*18B	Slide Valve Seat Screw	Alloy Steel Phosphate Treat		18	20	24	26
*22A	Bearing Plug and Stuffing Box Gasket	Stainless Steel		6	6	6	6
*23	Grease Gun (Complete)	CS (ZP)		1	1	1	2
*24	Grease Seal Double Ball Check Valve	316 Stainless Steel with Chrome-Steel Balls		1	1	1	2
*25	Packing Nut	CS (ZP)		6	6	6	6
*25A	Packing Rings	Teflon		12	12	12	12
*25B	Centering Ring	Teflon		12	12	12	12
*26	Stuffing Box Gland	316 SS		6	6	6	6
*30(1)	Drain Valve Plug	CS (ZP)		1	1	1	1
*31(1)	"½" N.P.T. Plug for Pressure Meter Tap	CS (Chemically Treated)		2	2	2	2
32	Hex Nut	CS		22	22	24	28
33	Stud	Alloy Steel		22	22	24	28
*36	Stuffing Box Body (Upper)	CS (ZP)		2	2	2	2
*37	Stuffing Box Body (Lower)	CS (ZP)		4	4	4	4
40	Stuffing Box Sleeve (Upper)	CS (ZP)		2	2	2	2
41	Stuffing Box Sleeve (Lower)	CS (ZP)		4	4	4	4
	Slide Valve Lubricant (3)	0.38in. (9.5mm) diameter by 1.5in (38.1 mm) long					

Daniel Senior Orifice Fitting sizes 10"-16" 150-900

Notes:Table 1-4

1. All Daniel Senior Orifice Fittings are supplied with pipe plugs on one side only. If additional quantities are required, please contact the factory directly.
2. Locations of Equalizer Valve (1), Bleeder Valve (10B), and Grease Gun (23) may differ from diagrams shown in this manual.
3. Slide Valve Lubricant: 0.38in (9.53mm) diameter by 1.5in (38.1mm) long is equivalent to some lubricant manufacturers' "B" size stick. The quantity of lubricant a fitting described in this manual will require is dependent upon the state and condition of the fitting. Daniel

recommends having one box of lubricant sticks (24 sticks per box) onhand when performing maintenance and plate inspection/change procedures.

- \* Indicates Interchangeable parts for all line sizes of specified pressure rating(s).

**General notes:**

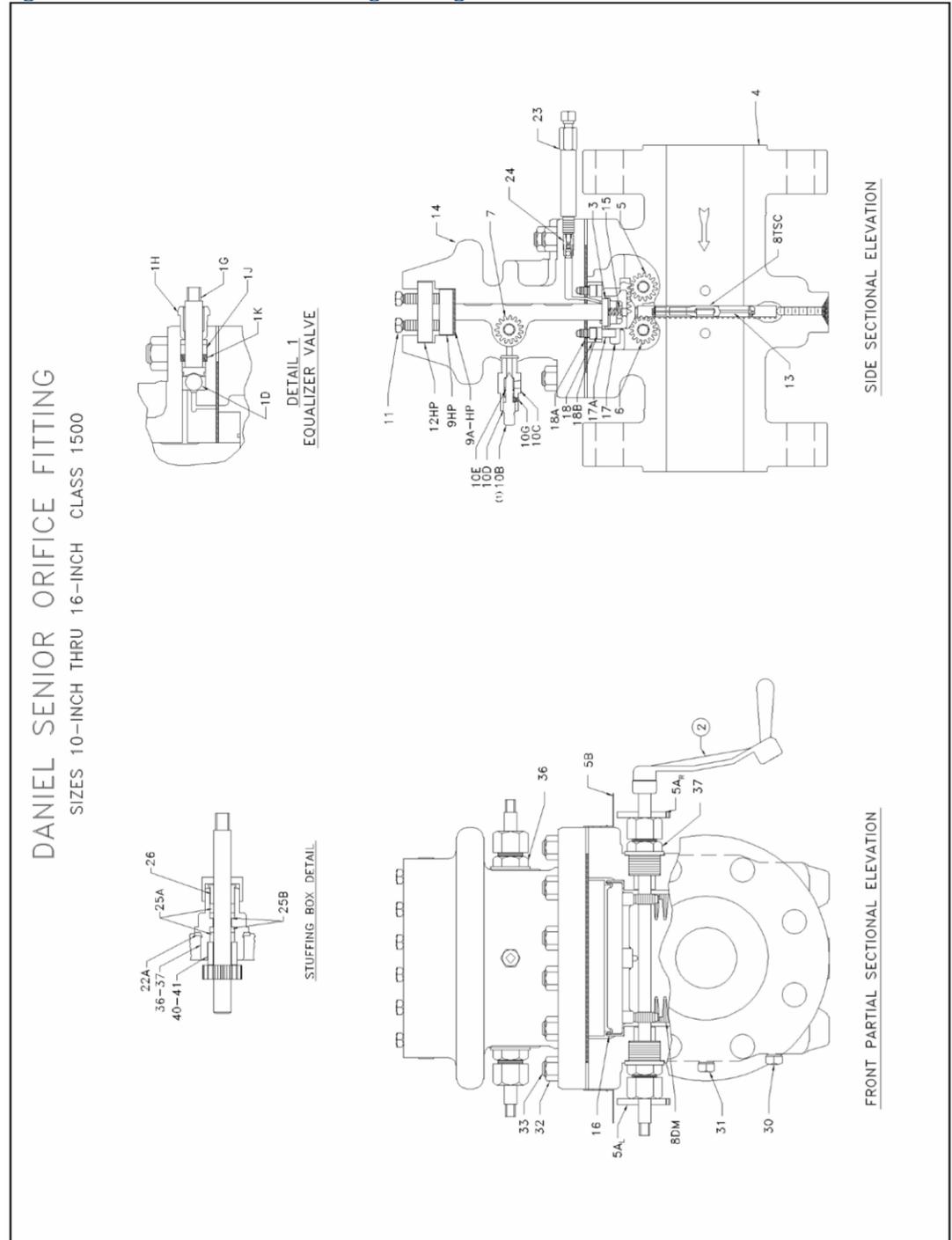
- Most parts available in other materials upon customer request.
- CS (Carbon Steel), CRS (Cold Rolled Steel), NPT (National Pipe Thread), ZP (Zinc Plated).
- The materials listed above indicate standard “A” trim. Various part materials are changed for “NACE” & “AASG” trim fittings.
- Suffix “SS” added to an item number indicates a “Soft Seat” version. (Refer to [Table 5-7](#) in [Section 5: Supplemental information](#) for item numbers and part descriptions) – NACE MR0175 compliant trims are available upon customer request.
- Other trim options available upon request. Consult factory.
- Shaded part numbers are for items which are fluid media PIC (parts in contact).

When ordering parts, please specify:

- Catalog number
- Size
- Serial number and date of the original purchase
- Part number
- Material

### 1.3.5 Daniel Senior Orifice Fitting sizes 10"-16" 1500

Figure 1-6 Daniel Senior Orifice Fitting drawing sizes 10"-16" 1500



All Parts on Daniel Senior Orifice Fittings may be replaced or repaired without removing the Daniel Senior Orifice Fitting body from the line.

Table 1-5 Daniel Senior Orifice Fitting sizes 10” thru 16” 1500

Parts and materials			Number required			
			Size			
Item no.	Description	Material	10”	12”	14”	16 ”
*1	Equalizer Valve (Complete):					
*1G	Stem	316 Stainless Steel	1	1	1	1
*1H	Packing Nut	CS (ZP)	1	1	1	1
*1D	Ball	18-8 Stainless Steel	1	1	1	1
*1K	Packing Washer	17-4PH Stainless Steel	1	1	1	1
*1J	Packing Ring	Teflon	2	2	2	2
*2	Operating Wrench	Ductile Iron	1	1	1	2
3	Slide Valve Strip	Type 410 Stainless Steel	1	1	1	1
4	Body	Cast Carbon Steel	1	1	1	1
5	Slide Valve Shaft	316 Stainless Steel	1	1	1	1
*5A-LH	Indicator Plate Left-Hand	Cast Aluminum	1	1	1	1
5A-RH	Indicator Plate Right-Hand	Cast Aluminum	1	1	1	1
*5B	Indicator Pointer	Stainless Steel	2	2	2	2
5C	Drive Screws	18-8 Stainless Steel	4	4	4	4
6	Lower Plate Carrier Shaft	316 Stainless Steel	1	1	1	1
7	Upper Plate Carrier Shaft	316 Stainless Steel	1	1	1	1
8DM	Plate Carrier	CS (ZP)	1	1	1	1
8TS	Orifice Plate Sealing Unit Alternate Seals Available See Catalog - #500	Teflon (Removable)	1	1	1	1
9HP	Sealing Bar	CS (ZP)	1	1	1	1
9A-HP	Sealing Bar Gasket	Composite	1	1	1	1
*10B	Bleeder Valve (Complete):		1	1	1	-
*10C	Body	CS (ZP)	1	1	1	-

*10D	Needle	316 Stainless Steel	1	1	1	-
*10E	O-Ring	Synthetic Rubber	1	1	1	-
*10G	Set Screw	Alloy Steel	1	1	1	-
10F	Bleeder Valve (complete):	CS (ZP) w/ 410 Stainless Steel	-	-	-	1
10H	Bleeder Valve Nipple	CS (ZP)	-	-	-	1
*11	Clamping Bar Screw	Alloy Steel (ZP)	16	20	22	28
12HP	Clamping Bar	CS (ZP)	1	1	1	1
13	Orifice Plate	Type 304 or 316 Stainless Steel	1	1	1	1
14	Top	Cast Carbon Steel	1	1	1	1

Daniel Senior Orifice Fitting sizes 10"-16" 1500

Table 1-5 Daniel Senior Orifice Fitting sizes 10" thru 16" 1500

Parts and materials			Number required			
			Size			
Item no.	Description	Material	10"	12"	14"	16 "
*15	Slide Valve Springs	316 Stainless Steel	6	7	8	10
*16	Slide Valve Carrier Guide	316 Stainless Steel	2	2	2	2
17	Slide Valve Carrier	Cast Alloy Iron	1	1	1	1
*17A	Slide Valve Carrier Stop Pin	Carbon Steel (ZP)	2	2	2	2
18	Slide Valve Seat	Type 410 Stainless Steel	1	-	-	-
		17-4PH Stainless Steel	-	1	1	-
		Duplex Stainless (UNS S31803)	-	-	-	1
18A	Slide Valve Seat /Top Gasket	Composite	1	1		
18VSG	Slide Valve Seat Gasket	Composite (not shown)			1	1
18BTG	Body/Top Gasket	Composite (not shown)			1	1
*18B	Slide Valve Seat Screw	Alloy Steel Phosphate Treat	18	20	24	26
*22A	Bearing Plug and Stuffing Box Gasket	Stainless Steel	6	6	6	6
*23	Grease Gun (Complete)	CS (ZP)	1	1	1	2

*24	Grease Seal Double Ball Check Valve	316 Stainless Steel with ChromeSteel Balls	1	1	1	2
*25	Packing Nut	CS (ZP)	6	6	6	6
*25A	Packing Rings	Teflon	12	12	12	12
*25B	Centering Ring	Teflon	12	12	12	12
*26	Stuffing Box Gland	316 SS	6	6	6	6
*30(1)	Drain Valve Plug	CS (ZP)	1	1	1	1
*31(1)	"½" N.P.T. Plug for Pressure Meter Tap	CS (Chemically Treated)	2	2	2	2
32	Hex Nut	CS	22	22	28	32
33	Stud	Alloy Steel	22	22	28	32
*36	Stuffing Box Body (Upper)	CS (ZP)	2	2	2	2
*37	Stuffing Box Body (Lower)	CS (ZP)	4	4	4	4
40	Stuffing Box Sleeve (Upper)	CS (ZP)	2	2	2	2
41	Stuffing Box Sleeve (Lower)	CS (ZP)	4	4	4	4
	Slide Valve Lubricant (3)	0.38in. (9.5mm) diameter by 1.5 in (38.1mm) long				

Notes:Table 1-5

1. All Daniel Senior Orifice Fittings are supplied with pipe plugs on one side only. If additional quantities are required, please contact the factory directly.
2. Locations of Equalizer Valve (1), Bleeder Valve (10B), and Grease Gun (23) may differ from diagrams shown in this manual.
3. Slide Valve Lubricant: 0.38in (9.53mm) diameter by 1.5in (38.1mm) long is equivalent to some lubricant manufacturers' "B" size stick. The quantity of lubricant a fitting described in this manual will require is dependent upon the state and condition of the fitting. Daniel recommends having one box of lubricant sticks (24 sticks per box) onhand when performing maintenance and plate inspection/change procedures.

\* Indicates Interchangeable parts for all line sizes of specified pressure rating(s).

#### General notes:

- Most parts available in other materials upon customer request.
- CS (Carbon Steel), CRS (Cold Rolled Steel), NPT (National Pipe Thread), ZP (Zinc Plated).
- The materials listed above indicate standard "A" trim. Various part materials are changed for "NACE" & "AASG" trim fittings.

- Suffix “SS” added to an item number indicates a “Soft Seat” version. (Refer to [Table 5-7](#) in [Section 5: Supplemental information](#) for item numbers and part descriptions) – NACE MR0175 compliant trims are available upon customer request.
- Other trim options available upon request. Consult factory.
- Shaded part numbers are for items which are fluid media PIC (parts in contact).

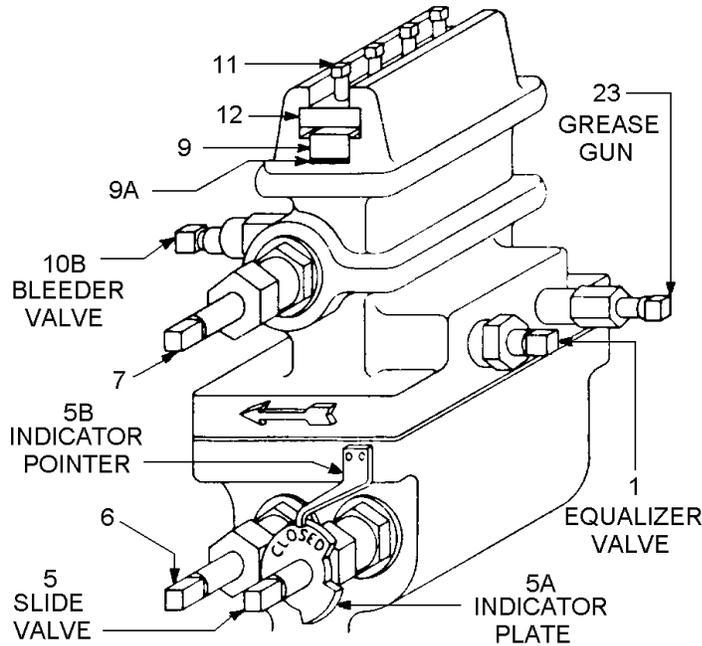
When ordering parts, please specify:

- Catalog number
- Size
- Serial number and date of the original purchase
- Part number
- Material



## Section 2: Installation

Figure 2-1 Daniel Senior Orifice Fitting component identification



### 2.1 General information

The Daniel Senior Orifice Fitting is an essential element in an orifice plate flow measurement system. Other elements in the system usually include, but are not limited to, a meter tube, a flow conditioner, and various data recording devices. Purchasers have the option of acquiring only a Daniel Senior Orifice Fitting unit from Daniel for later installation in a flow measurement system, purchasing a Senior Orifice Fitting with a meter tube, or purchasing a complete orifice plate flow measurement system containing a Senior Orifice Fitting.

Daniel hydrostatically tests every Senior unit for fluid retention, under factory controlled conditions, to a minimum pressure of 1.5 times its rated maximum allowable operating pressure.

#### Important

When purchasing a Daniel Senior Orifice Fitting for installation within a meter tube at a later date, the hydrostatic testing of the Senior/meter tube assembly is the responsibility of the product owners and product operating personnel only.

*General information*

When assembling a flow measurement system that will contain a Daniel Senior Orifice Fitting, particular attention should be paid to the requirements for permanent joining of components. This will be to ensure optimal measurement performance and successful pressure test results. Referencing an appropriate measurement code (AGA-3, ISO 5167, etc.) will aid in this assembly.

## NOTICE

Follow all the safety and equipment limits recommended in [Section 1.2.1: Technical data](#) of this manual. It is the owner's and/or purchaser's responsibility to comply with these parameters.

---

## NOTICE

On installations which require compliance with the European Union Pressure Equipment Directive (PED) 97/23/EC, it is the responsibility of the end user to ensure that all essential safety requirements of the directive are met.

Particular attention should be paid to the requirements for permanent joining and nondestructive testing. Refer to the "Daniel Orifice Fittings - Installation and Operating Instructions specific to the Pressure Equipment Directive", Part Number 3-9008-002.

---

## 2.2 Storage

Follow your company's equipment procedures when storing measurement equipment. A light spray of rust inhibitor applied to the inside bore of a Senior and to the bore of the meter tube may aid in protecting its surface finish during storage.

## 2.3 Preliminary steps

## NOTICE

Follow all the safety and equipment limits recommended on [Section 1.2.1: Technical data](#) of this manual. It is the owner's and/or purchaser's responsibility to comply with these parameters.

---

The Senior may arrive at your site in one of two ways, as a component in a meter tube assembly or as a loose fitting. If it is received without a meter tube attached, see the appropriate code (AGA-3, etc.) for meter tube requirements.

It is the responsibility of the product operators to clean the Senior and all piping components of foreign matter such as welding debris, scale, oil, grease, and dirt before commissioning.

Record the serial plate data on the Senior for future reference. Always provide the serial number and model number when ordering spare parts. The factory packages orifice plates and seal rings separately from the Senior.

*Storage*

## 2.4 Severe service conditions

If product owners or personnel expect that the Senior will encounter severe conditions (environment where there is likely to be an accumulation of sediment for any cause), then Daniel recommends the removal of the Drain Valve Plug (30) near the bottom of the Senior and the installation of a blow down valve in its place (refer to [Section 3: Maintenance](#)).

## 2.5 Corrosive service

Corrosive environments may affect both the external and internal surfaces of the Senior. Daniel defines external corrosive environments as those conditions that affect the outer surfaces of the Senior, while an internal corrosive environment is a condition that affects the surface inside the Senior. Read, understand, and follow instructions in the sections below if an internal or external corrosive environment exists.

### 2.5.1 External corrosive environments

For Seniors located in external corrosive environments (offshore platforms, marine terminals, etc), Daniel recommends replacing the standard carbon steel Equalizer Valve (Complete) (1), Bleeder Valve (Complete) (10B), Grease Gun (Complete) (23) and Drain Valve Plug (30) with the stainless steel versions listed in the "Corrosive Service" column (refer to [Table 2-1](#)). **Table 2-1 Daniel alternate components**

Part No.	Description	Standard Service	Stainless Steel Corrosive Service	Low Temp Service
1	Equalizer Valve ( Complete )	1-504-01-011	1-504-01-004	1-504-01-016
10B	Bleeder Valve ( Complete )	1-504-01-026	1-504-01-040	1-504-01-040
23	Grease Gun (Complete)	1-504-01-051	1-504-01-050	1-504-01-071
30	Drain Plug (2"/3")	1-507-01-103	1-507-01-143	1-507-01-170
30	Drain Plug (4"/14")	1-507-01-104	1-507-01-144	1-507-01-171

*Severe service conditions*

## 2.5.2 Internal corrosive environments

For Daniel Senior Orifice Fittings located in internal corrosive environments, Daniel recommends that product owners purchase a Senior appropriate for the intended service. Daniel offers the Daniel Senior Orifice Fitting in a number of trims (Refer to [Table 1-1](#) thru [Table 1-5](#) for part and material lists).

A Senior is a flow measurement device built to exact inside diameter specifications. Daniel does not provide an allowance for corrosion on the inside diameter.

## 2.6 Low temperature service

Daniel designed the Senior to function within the temperature/pressure ranges, per material, designated in ASME/ANSI B16.5. However, the grease viscosity will increase at low temperatures. This will hamper proper slide valve lubrication. Increased viscosity impedes the flow of grease through channels within the Senior and may allow leakage to occur during subsequent plate change operations. Refer to [Section 5.2: Lubricant information](#) to determine lubricant operation ranges for the available grease types prior to making an orifice plate change.

## 2.7 Design considerations

Measurement personnel can select a Senior for use in a variety of flow measurement systems around the world. Each application has its own unique set of service and environmental condition limitations (Refer to [Section 1.2.1: Technical data](#)).

---

### Important

Product owners and operating personnel must evaluate both the service, and environmental conditions prior to installing a Senior Orifice Fitting. Therefore, it is the responsibility of the end user to install the Senior in a well designed piping system.

---

Some conditions to consider:

- Service operating pressure
- Service testing pressures
- Service process temperature and ambient site temperatures
- Mass of fluid in process and test conditions
- Chemical composition and toxicity of fluid in operating conditions
- Traffic, wind and earthquake at loading site
- Reaction forces and moments which result from supports, attachments, piping, etc.
- Corrosion, erosion, fatigue, etc.

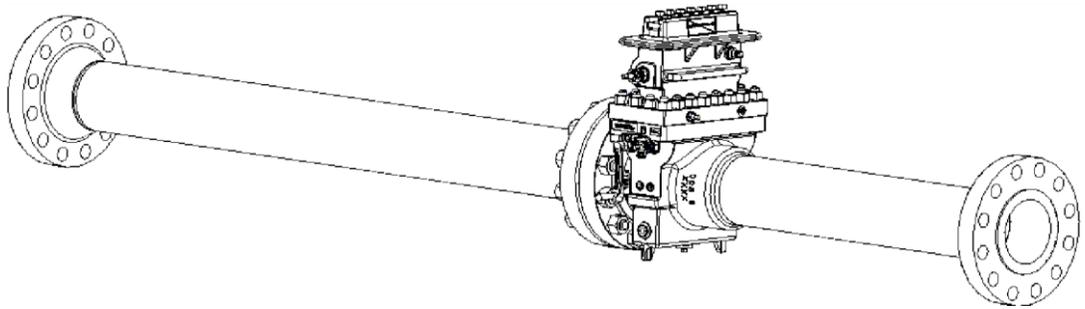
- Decomposition of unstable fluids in operating and test conditions
- Possible damage from external fire

*Internal corrosive environments*

Install the Senior in any horizontal line with the plate access opening in a vertical up position or with the Senior rotated left or right to give a horizontal opening position. Daniel Senior Orifice Fittings to 12" size may be installed in a vertical down flow direction.

---

**Figure 2-2 Daniel Senior Flangenek Fitting with meter tube**



---

## 2.8 Commissioning Daniel Senior Orifice Fitting installation

Commissioning is the process of verifying that a system performs in accordance with the user's intended operational, maintenance, and measurement requirements. Daniel provides the following procedures to guide personnel in verifying that the Senior performs in accordance with the user's intended requirements.

### Pre-Commissioning

Make sure that the following checklist is met prior to commissioning the Senior:

- Senior is at atmospheric pressure.
- Confirm that the flow directional indicator (arrow or "INLET" / "OUTLET" tags) positioned on the Senior Body (4) corresponds with the intended fluid flow direction of the measurement system.
- Confirm the proper operating clearance around the Senior per information contained in the Daniel technical guide "DAN-DIF-TG-11-1003".
- Check accessibility and Operating Wrench (2) clearance at the following Senior locations:
  1. Lower Plate Carrier Shaft (6)
  2. Upper Plate Carrier Shaft (7)

3.      Bleeder Valve (10B)
4.      Equalizer Valve (1)
5.      Slide Valve Shaft (5)

**Commissioning Daniel Senior Orifice Fitting installation**

- Confirm the Operating Wrench (2) operational clearances for the Plate Carrier (8DM or 8DMC) extraction, and meter tap equipment draw clearance.
- Check shipment to verify that the shipping kit contains an Operating Wrench (2), Grease Gun (23), Indicator Plate (5A-marked “LH” for left-hand side operation) and Indicator Pointer (5B).
- Install the Grease Gun(s) (23) into holes in the base of the Top (14) as stated below:
  - Remove the plastic shipping plugs,
  - Put thread sealer on the end threads of the Grease Gun Body (23) and tighten securely.
  - Check the accessibility to the Grease Gun(s) (23) after installation.
  - Adjust the Senior’s position if required.
- Install the Indicator Pointer (5B) on to the Body (4) by tapping the two drive screws into the holes located above the Slide Valve Shaft (5).
- Install the Indicator Plate (5A) on the Slide Valve Shaft (5), directly below the Indicator Pointer (5B).
- Orient the Indicator Plate (5A-LH or 5A-RH), as stated below, depending on the shaft’s left or right side location (The right hand and left hand Indicator Plates (5A-LH and 5ARH) are different and not interchangeable):
  - Shaft on the left hand side facing with the flow (standard position): when the shaft is rotated clockwise until it stops, the Indicator Plate (5A-LH) word OPEN should appear below the Indicator Pointer (5B). Install the Indicator Plate (5ALH) on the shaft in this position and tighten the Set Screw (10G) securely.
  - Shaft on the right hand side facing with the flow (reverse shafts): When the shaft is rotated counterclockwise until it stops, the Indicator Plate (5A-RH) word OPEN should appear below the Indicator Pointer (5B). Install the Indicator Plate (5A-RH) on the shaft in this position and tighten the Set Screw (10G) securely.
  - After installation, rotate the Slide Valve Shaft (5) until it stops. The word CLOSED should appear below the Indicator Pointer (5B).
- Plate Carrier shipment verification

The Seniors leave the factory with the Plate Carriers (8DM or 8 DMC) in the Body (4) to prevent the damage of the Plate Carrier (8DM or 8DMC) or the slide valve assembly during transit. Whether or not the Senior arrives directly from the factory, installation personnel must open the Top (14) and the Slide Valve Shaft (5) to ensure that the Plate Carrier (8DM or 8DMC) is inside. The Plate Carrier (8DM or 8DMC) should be removed before performing any tests.

*Commissioning Daniel Senior Orifice Fitting installation*

With the slide valve in the fully opened position, follow these instructions:

- Rotate the Lower Plate Carrier Shaft (6) first.
- Rotate the Upper Plate Carrier Shaft (7) to remove the Plate Carrier (8DM or 8DMC).
- Put the Plate Carrier (8DM or 8DMC) in a safe, protected area for use later in the installation process.
- Replace the Sealing Bar (9 or 9HP), the Sealing Bar Gasket (9A, 9A-HP or 9CF) and the Clamping Bar (12 or 12HP)
- Tighten the Clamping Bar Screws (11) to the required torque.

**⚠ CAUTION**

**LOOSE CLAMPING BAR SCREW HAZARD**

The factory assembled and shipped this product with loose clamping bar screws. Tighten all clamping bar screws before applying pressure to this product.

Failure to do so may result in injury or equipment damage.

## 2.9 Commissioning line pressure test

After installing the Daniel Senior Orifice Fitting, personnel must perform a pressure test for the service line that includes, but is not limited to, the meter tube and Senior.

Commissioning line pressure test start checklist:

- Senior is at atmospheric pressure
- The Slide Valve Shaft (5) must be in the “OPEN” position
- The Equalizer Valve (1) must be in the “OPEN” position
- The Bleeder Valve (10B) must be in the “CLOSED” position

*Commissioning line pressure test*

**⚠ WARNING**

FLUID EXPLOSION HAZARD

Never pressurize a unit above the limits recommended in [Section 1.2.1: Technical data](#) of this manual. Before pressurizing the Daniel Senior Orifice Fitting, confirm the maximum allowable operating pressure (MAOP) of each item in the system.

Over-pressurizing the Senior could lead to an explosive release of fluid resulting in serious injury or death.

---

1. Install a pressure gauge in a location on the Senior or the piping system that will indicate the pressure contained in the Fitting. The gauge should have a maximum pressure, rating slightly above the maximum pressure to be applied during the test.
- 

**Important**

Daniel hydrostatically tests every Senior unit for fluid retention, under factory controlled conditions, to a minimum pressure of 1.5 times its rated maximum allowable operating pressure. If purchased alone, without a meter tube, any hydrostatic testing of the meter tube assembly is the responsibility of the product owners or product operating personnel.

---

2. Slowly pressurize the system containing the Senior at a rate of 1 psig per second (0.07 bars per second) until the pressure inside the Senior reaches 20 psig (1.4 bar) then stop and hold that pressure for five minutes.
- 

**Important**

During the five-minute hold period, apply a leak detection solution to all joint and connector areas of the Senior and line connections. No leakage should be visibly detectable or audibly detectable during the hold period.

---

3. If a leak is detected, mark the leak area with a marker and reduce the pressure inside the Senior to 0 psig (0 bar). Tighten any fastener or connector adjacent to the leak area and repeat the leak test again.
  4. If after several attempts to contain the leakage, the leakage persists, call Daniel Customer Service for assistance. Contact information is found in the back of this manual.
  5. Once the 20 psig (1.4 bar) leak test is complete, and no leaks are detected, slowly raise the pressure inside the Senior at a rate of 10 psig per second (0.7 bars per second) to the maximum operating pressure of the lowest rated item in the system. However, it should not to exceed 1.5 times the noted rated working pressure of the Senior. Hold the maximum operating pressure on the system for a period of ten minutes.
-

### Important

During the ten-minute hold period, apply a leak detection solution to all joint and connector areas of the Senior and line connections. No leakage should be visibly detectable or audibly detectable during the hold period.

---

#### *Commissioning line pressure test*

6. If a leak is detected, mark the leak area with a marker and reduce the pressure inside the Senior to 0 psig (0 bar). Tighten any fastener or connector adjacent to the leak area and repeat the leak test again.
7. If after several attempts to contain the leakage, the leakage persists, call Daniel Customer Service for assistance.

### **⚠ WARNING**

#### PRESSURIZED FLUID HAZARD

When opening the bleeder valve (10B) or venting the Top (14) thru the bleeder valve (10B), direct the released pressurized fluid and/or gas to safe area away from any individual in accordance with local environment regulations.

The bleeder valve (10B) releases pressurized fluid that may cause contamination and/or accumulation of volatile gas mixtures. Failure to do so may cause serious injury or death.

8. Slowly release the pressure from the Senior until the pressure gauge reads zero (0) psig by venting the Top (14) through the bleeder valve (10B).
9. Close the slide valve by rotating the Slide Valve Shaft (5). Close the Equalizer Valve (1). Open the Bleeder Valve (10B).

Steps 10 and 11 are for the Seniors equipped with lubricated slide valves only. For Soft Seat equipped Seniors, skip these steps.

10. Once the valves are in position as described in step 9, remove the stem from the Grease Gun (23) and insert a Daniel lubricant stick into the Grease Gun (23).

### **⚠ WARNING**

#### PRESSURIZED FLUID HAZARD

Using the Grease Gun (23), inject grease into the slide valve seat channels at a rate of 4 to 6 turns per minute and only under the following conditions:

- Bleeder Valve is open.
- Sealing bar/Clamping bar is in place and tight.

Injection of the grease at a faster rate will lead to the separation of the valve strip from the valve seat, resulting in release of pressurized fluid which may cause serious injury or death.

- 
11.      Return the stem to the Grease Gun (23) and begin turning the stem by hand into the Grease Gun (23) until resistance is felt.

*Commissioning line pressure test*

## 2.10 Orifice Plate Installation

After completion of the commissioning line pressure test in [Section 2.9](#), install and lower the Plate Carrier (8DM or 8DMC) and Orifice Plate Assembly (13) into the Body (4) to begin measurement operations.

### **⚠ WARNING**

#### EXPLOSION HAZARD

Ensure that the Daniel Senior Orifice Fitting is at atmospheric pressure.

Performing the Orifice Plate (13) installation with the Senior above atmospheric pressure may lead to an explosive release resulting in serious injury or death.

---

Orifice Plate (13) installation start checklist:

- Senior is at atmospheric pressure
  - The Slide Valve Shaft (5) must be in the “OPEN” position
  - The Equalizer Valve (1) must be in the “OPEN” position
  - The Bleeder Valve (10B) must be in the “OPEN” position
1. Remove the Clamping Bar (12 or 12HP) by loosening all the Clamping Bar Screws (11), two turns maximum, and by sliding the bar from the slot.
  2. Remove the Sealing Bar (9 or 9HP) and the Sealing Bar Gasket (9A, 9A-HP or 9CF).
  3. The three basic components of all Daniel Plate Carrier (8DM or 8DMC) assemblies are:
    - Plate Carrier (8DM or 8DMC)
    - Orifice Plate Seal Ring (8E-DS/8E-DSC, 8TS/8TSC, or 8E-DVS) -  
Orifice Plate (13)

Assemble the Orifice Plate (13), with the appropriate seal ring, into the Plate Carrier (8DM or 8DMC). If a DSC or DS seal is used, lubricate both seal faces with a safe-for-service light oil or grease. Refer to “Senior Orifice Fitting Technical Guide: DAN-DIF-TG11-1003 “.

4. All 2”-8” Daniel Senior Orifice Fitting Plate Carriers (8DMC) designed for AGA #3 - API 14.3 have two important features that will help field technicians properly align it prior to installation. The first feature is a NOTCH, and the second feature is a BOSS or SPRING PLUNGER. (Refer to [Figure 2-3](#)).

In order to ensure correct measurement and to optimize metering performance, field service technicians must properly install the 2”-8” Plate Carrier (8DMC) assembly into the Senior.

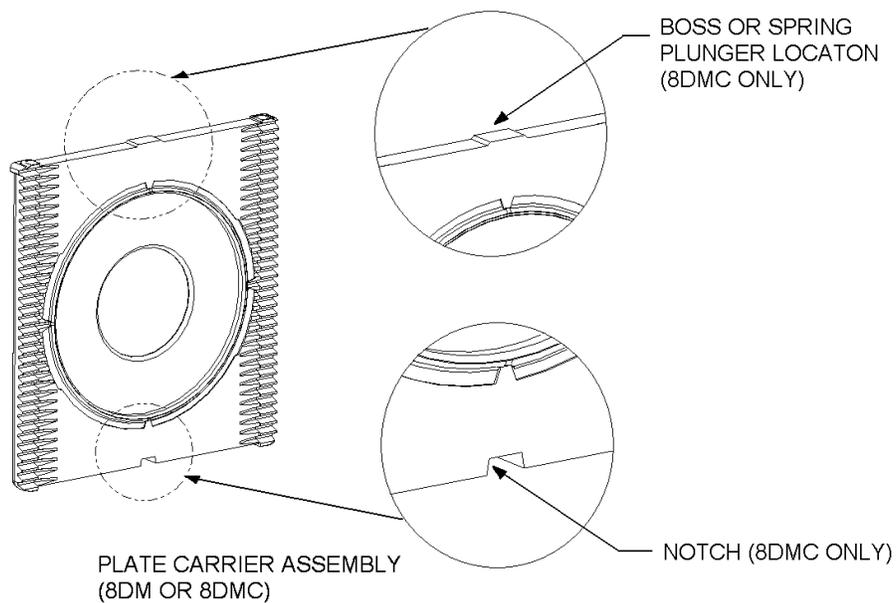
5. Orient the 2”-8” Plate Carrier (8DMC) assembly with the notch down. The notch end of the 2”-8” Plate Carrier (8DMC) assembly must enter the Senior first.

**Important**

Install the Plate Carrier (8DM or 8DMC) assembly into the Senior with the gear rack facing downstream and the notched end down (refer to [Figure 2-3](#) and [Figure 2-4](#)). Failure to align and install Plate Carrier (8DM or 8DMC) assembly as instructed will cause erroneous measurement results.

- 
6. Align the plate carrier gear rack teeth to the Plate Carrier (8DM or 8DMC) shaft pinion on the Senior when installing the Plate Carrier (8DM or 8DMC) assembly.
- 

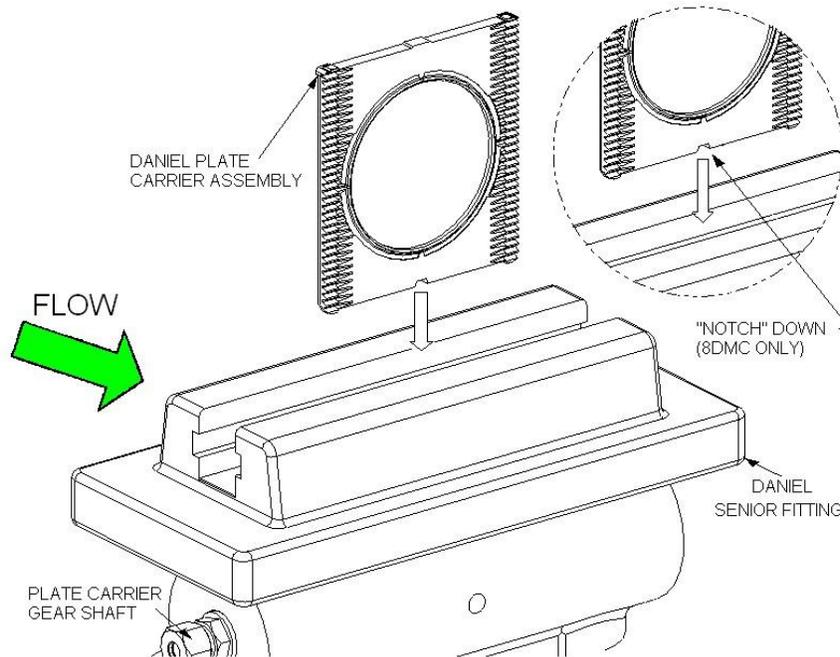
**Figure 2-3 Plate Carrier (8DM or 8DMC) plunger and notch location**



**Orifice Plate Installation**

The diagram below depicts the proper orientation of the Plate Carrier (8DM or 8DMC) assembly prior to lowering it into the measurement position in the Senior.

**Figure 2-4 Orientation of Plate Carrier (8DM or 8DMC) Prior to Installation**



**NOTES:**

1. The gear rack side of the Plate Carrier (8DM or 8DMC) assembly must face the downstream direction of flow.
2. If the Orifice Plate (13) bore has a bevel, the bevel shall face the downstream direction of flow.

7. Rotate the Upper Plate Carrier Shaft (7) a minimum of 1/4 turns OPPOSITE of the direction used to lower the Plate Carrier (8DM or 8DMC) assembly. This will allow it to “align” itself with the Top (14) shaft gear teeth.
8. Once the Plate Carrier (8DM or 8DMC) assembly is aligned, rotate the Upper Plate Carrier Shaft (7) in the direction to lower it from the Top (14) to the Body (4).
9. Once the Plate Carrier (8DM or 8DMC) assembly is clear of the Upper Plate Carrier Shaft (7), rotate the Lower Plate Carrier Shaft (6) until the Plate Carrier (8DM or 8DMC) assembly is completely inserted into the Body (4).
10. Install the Sealing Bar (9 or 9HP), the Sealing Bar Gasket (9A, 9A-HP or 9CF), and the Clamping Bar (12 or 12HP) in position on the Top (14) and tighten the Clamping Bar Screws (11). Refer to [Section 5.3: Torque information](#) for actual torque values to use.

**CAUTION**

#### LOOSE CLAMPING BAR SCREW HAZARD

The factory assembled and shipped this product with loose clamping bar screws. Tighten all clamping bar screws before applying pressure to this product.

Failure to do so may result in injury or equipment damage.

- 
11. Rotate the Slide Valve Shaft (5) to the CLOSED position. This closes the slide valve, separating the Body (4) from the Top (14).

Steps 11 and 12 are for Seniors equipped with lubricated slide valves only. For Soft Seat equipped Seniors, skip to step 13.

12. Once the Slide Valve Shaft (5) is in the CLOSED position, remove the stem from the Grease Gun (23) and insert a Daniel lubricant stick (refer to [Section 5.2: Lubricant information](#)) into the Grease Gun (23).

### WARNING

#### PRESSURIZED FLUID HAZARD

Using the Grease Gun (23), inject grease into the slide valve seat channels at a rate of 4 to 6 turns per minute and only under the following conditions:

- Bleeder Valve is open.
- Sealing bar/Clamping bar is in place and tight.

Injection of the grease at a faster rate will lead to the separation of the valve strip from the valve seat, resulting in release of pressurized fluid which may cause serious injury or death.

- 
13. Return the stem to the Grease Gun (23) and begin turning the stem by hand into the Grease Gun (23) until resistance is felt. Once resistance is felt, use the supplied Daniel Operating Wrench (2) to continue to turn the stem at a rate of 4 to 6 turns per minute.
  14. Close both the Equalizer (1) and the Bleeder Valves (10B).
  15. Remove any commissioning equipment (flanges, tubing, etc.) from the system.
  16. The Senior is now ready for final pressurization and operation.



## Section 3: Maintenance

### 3.1 Normal conditions

Under normal measurement conditions, Daniel recommends lubricating the slide valve and exercising several key components of the Daniel Senior Orifice Fitting every thirty days (refer to [Section 3.1.2: Component Exercise](#)). If the plate changing operations are performed within this period, omit this operation.

#### 3.1.1 Lubrication

---

##### Important

The information in this section, “3.1.1 Lubrication”, DOES NOT apply to Seniors equipped with Soft Seat slide valves.

---

In order to perform the maintenance operation described in this section, the following maintenance check list must be met first:

- The slide valve must be in the “CLOSED” position.

#### WARNING

##### PRESSURIZED FLUID HAZARD

When opening the bleeder valve (10B) or venting the Top (14) thru the bleeder valve (10B), direct the released pressurized fluid and/or gas to safe area away from any individual in accordance with local environment regulations.

The bleeder valve (10B) releases pressurized fluid that may cause contamination and/or accumulation of volatile gas mixtures. Failure to do so may cause serious injury or death.

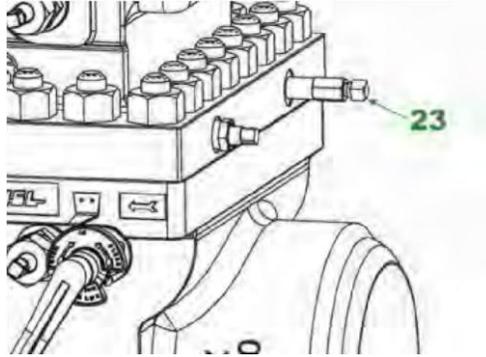
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- The Bleeder Valve (10B) must be in the “OPEN” position.
- The Equalizer Valve (1) must be in the “CLOSED” position.
- The Senior must contain 100 psig minimum line pressure.

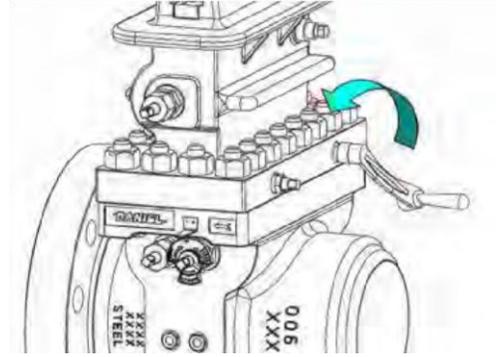
*Normal conditions*

1. Remove the stem from the Grease Gun (23) and insert a Daniel lubricant stick into the Grease Gun (23).

Step 1



Step 1A



**⚠ WARNING**

PRESSURIZED FLUID HAZARD

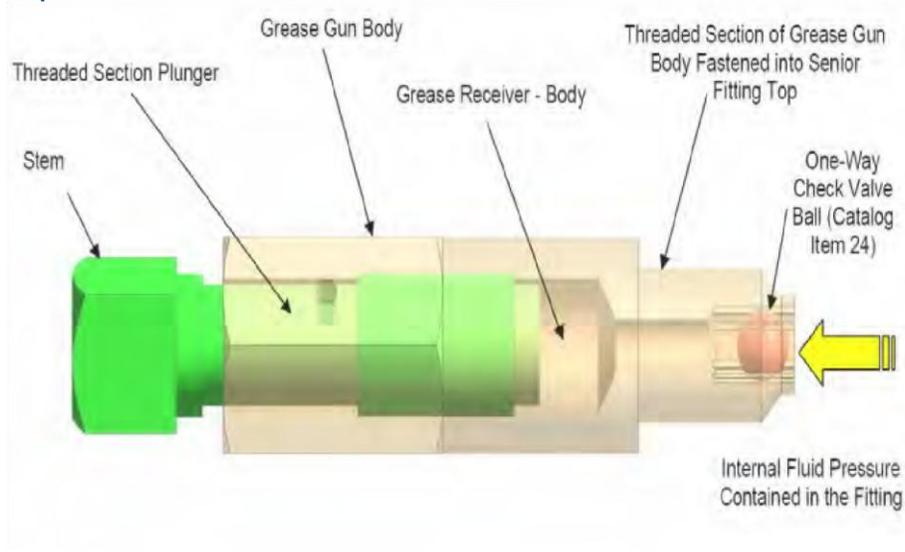
Using the Grease Gun (23), inject grease into the slide valve seat channels at a rate of 4 to 6 turns per minute and only under the following conditions:

- Bleeder Valve is open.
- Sealing bar/Clamping bar is in place and tight.

Injection of the grease at a faster rate will lead to the separation of the valve strip from the valve seat, resulting in release of pressurized fluid which may cause serious injury or death.

2. Return the stem to the Grease Gun (23) and begin turning it clockwise by hand into the Grease Gun (23) until resistance is felt. Once this is done, use the supplied Operating Wrench (2) to continue to turn the stem at a rate of 4 to 6 turns per minute.

**Step 2**



**Important**

By turning the stem of the Grease Gun (23) at a rate of 4 to 6 turns per minute, the lubricant is forced through the Slide Valve Seat (18) channels at a rate that allows the lubricant to travel freely, yet not separate the valve strip from the valve seat. This method will keep fresh grease in the lubrication passages.

3. Close Bleeder Valve (10B).

### 3.1.2 Component Exercise

In order to perform the maintenance operation described in this section, the following component excise start check list must be met:

- The slide valve must be in the “CLOSED” position, • The Bleeder Valve (10B) must be in the “CLOSED” position.
- The Equalizer Valve (1) must be in the “OPEN” position.

At this point the fluid pressure in the Top (14) will equal the fluid pressure in the Body (4).

1. If the differential pressure is greater than 200 inches of H O, reduce the differential pressure across the meter to a maximum of (200 inches of H O) 7.2 psig.

2. Rotate the Upper Plate Carrier Shaft (7) located in the Top (14) several times in both directions. The Shaft (7) should turn freely.
3. Rotate the Slide Valve Shaft (5) in one direction until it stops. Then rotate the Slide Valve Shaft (5) in the opposite direction until it stops. Repeat this sequence several times. The

**Component Exercise**

slide valve should travel freely in both directions with light resistance. Leave the slide valve in the OPEN position.

---

**Important**

The following operation will affect the flowing differential and will be shown on any chart or instrument, keep records of differential, unless these instruments are isolated.

---

4. Rotate the Lower Plate Carrier Shaft (6), located in the Body (4), one turn to raise the Plate Carrier (8DM or 8DMC).
5. Rotate the Lower Plate Carrier Shaft (6) one turn in the opposite direction to lower the Plate Carrier (8DM or 8DMC).

This operation raises and lowers the Plate Carrier (8DM or 8DMC) in and out of the flow stream. An initially high resistance to turning will be encountered when the Orifice Plate (13) seal (see "Senior Orifice Fitting Technical Guide: DAN-DIF-TG-11-1003") is loosened from the Senior seal surface. Resistance to turning will also be present when the Plate Carrier (8DM or 8DMC) is lowered into its measurement position again.

6. Return the Plate Carrier (8DM or 8DMC) to the fully seated position in the Body (4).
7. Close the slide valve and close the Equalizer Valve (1).

**▲WARNING****PRESSURIZED FLUID HAZARD**

When opening the bleeder valve (10B) or venting the Top (14) thru the bleeder valve (10B), direct the released pressurized fluid and/or gas to safe area away from any individual in accordance with local environment regulations.

The bleeder valve (10B) releases pressurized fluid that may cause contamination and/or accumulation of volatile gas mixtures. Failure to do so may cause serious injury or death.

---

8. Open the Bleeder Valve (10B) to vent the Top (14).

Steps 9 and 10 are ONLY required for the Seniors equipped with grease assisted, metal-to-metal slide valves. Personnel operating the Seniors equipped with O-Ring seal "soft seat" design slide valves, skip to step 11.

*Component Exercise*

9. Remove the stem from the Grease Gun (23) with the Operating Wrench (2) and insert a Daniel lubricant stick into the Grease Gun (23).

**⚠ WARNING**

PRESSURIZED FLUID HAZARD

Using the Grease Gun (23), inject grease into the slide valve seat channels at a rate of 4 to 6 turns per minute and only under the following conditions:

- Bleeder Valve is open.
- Sealing bar/Clamping bar is in place and tight.

Injection of the grease at a faster rate will lead to the separation of the valve strip from the valve seat, resulting in release of pressurized fluid which may cause serious injury or death.

---

10. Return the stem to the Grease Gun (23) and begin turning the stem by hand into the Grease Gun (23) until resistance is felt. When resistance is felt, apply the Operating Wrench (2) to the Grease Gun (23) and continue to turn the stem into the Grease Gun (23) at a rate of 4 to 6 turns per minute.
- 

**Important**

By turning the stem of the Grease Gun (23) at a rate of 4 to 6 turns per minute, the lubricant is forced through the Slide Valve Seat (18) channels at a rate that allows the lubricant to travel freely, yet not separate the valve strip from the valve seat. This method will keep fresh grease in the lubrication passages.

---

If the addition of grease does not reduce the flow from the open Bleeder Valve (10B) to zero, follow these steps:

- Close the Bleeder Valve (10B),
- Open the Equalizer Valve (1), and move the Slide Valve Shaft (5) from the CLOSED to the OPEN position, and back to the CLOSED position, repeating this action several times.
- Return the Slide Valve Shaft (5) back to the CLOSED position.
- Close the Equalizer Valve (1) and repeat the lubrication process.
- Open the Bleeder Valve (10B).

If leakage is still present, close the Bleeder Valve (10B) and leave the Slide Valve Shaft (5) in the CLOSED position and schedule maintenance on the Senior.

11. Close the Bleeder Valve (10B).

*Component Exercise*

12. If at any point during the exercise of the components, the resistance encountered when turning a shaft is greater than the torque applied by hand using the Wrench (2), further inspection of the Senior is required.

*Component Exercise*

## Section 4: Orifice plate installation and removal instructions

### 4.1 Plate change procedure

Follow these instructions during every plate change.

#### **⚠ DANGER**

##### FLUID EXPLOSION HAZARD

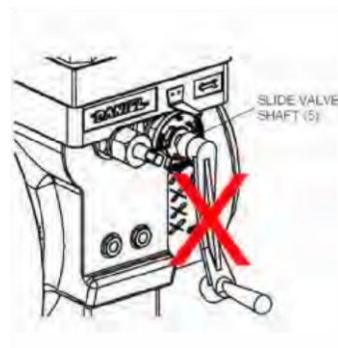
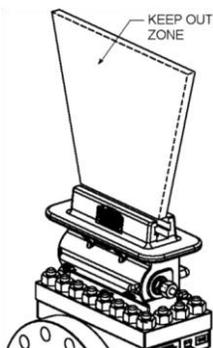
Follow the instructions below to avoid inadvertent or accidental opening of the slide valve and the propulsion of fluid or internal components from the Top (4).

Failure to do so will result in serious injury or death.

Never place any part of your body over the plate carrier slot opening (refer to [Figure 4-1](#)) of the Top (14) when the Sealing Bar Gasket (9A, 9A-HP or 9CF), the Sealing Bar (9 or 9HP) and the Clamping Bar (12 or 12HP) are removed from the Daniel Senior Orifice Fitting and the line is under pressure.

Never place the Operating Wrench (2) on the Slide Valve Shaft (5) (refer to [Figure 4-2](#)) when the Sealing Bar Gasket (9A, 9A-HP or 9CF), the Sealing Bar (9 or 9HP) and the Clamping Bar (12 or 12HP) are removed from the Senior and the line is under pressure.

**Figure 4-1 Top (14) KEEP OUT ZONE\***      **Figure 4-2 Improper Location of Operating Wrench (2) During an Orifice Plate Change Operation**



- \* Daniel Senior Orifice Fitting shown in vertical position. The KEEP OUT ZONE includes the plate carrier slot opening of the Top (4) even when the Senior is positioned horizontally (laying on its side).

*Plate change procedure*

## 4.2 Selecting an appropriate plate change procedure

### **⚠ WARNING**

#### **EXPLOSION HAZARD**

The Daniel Senior Orifice Fitting contains fluid at elevated pressure. Make sure to follow the instructions below for proper installation and removal of the plate.

Failure to do so can cause an explosive release and may result in serious injury or death.

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#### **Important**

In order to perform a safe and efficient plate change operation with a Senior, the on-site personnel must evaluate both the service and environmental conditions prior to beginning this operation. These conditions may have a dramatic effect on the time required for an operator's ability to return the Senior to its measurement condition.

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As stated in the product description section of this manual, the Seniors utilize a "dual chamber" design. A slide valve contains the line pressure in the Body (4) during the plate extraction from the Senior and plate installation into the Senior. Daniel offers both an O-Ring seal "soft-seat" slide valve design, and a grease assisted, metal-to-metal slide valve design. Both designs ensure the optimum seal performance during this stage in the Orifice Plate (13) change. Under some service conditions, the grease used in the metal-to-metal slide valve design may migrate into the Top (14). If this was to occur, then the grease assisted metal-to-metal slide valve may not perform optimally and leakage will occur.

There are some services where, based on the characteristics of the fluid within and an intimate knowledge of the system, an operator and owner may allow some leakage past the slide valve during a plate change operation. This decision to allow leakage should be made on a case by case basis and be properly documented, communicated to, and acknowledged by, all personnel involved in the plate change operation. The sole responsibility for a decision to allow leakage lies with both the product owner and product operator. Daniel recommends that owners and operators use either the "Quick Change" or "Extended Time" methods described in this section.

Therefore, when performing an Orifice Plate (13) change on a Senior equipped with a grease assisted, metal-to-metal slide valve, Daniel recommends that at no time shall an operator leave the Sealing Bar (9 or 9HP), the Sealing Bar Gasket (9A, 9A-HP or 9CF), and the Clamping Bar (12 or 12HP) unfastened from the Top (14) except to remove and replace the Orifice Plate Carrier (8DM or 8DMC) from the Senior.

Finally, the operator should never leave any Senior, O-Ring seal “soft-seat” slide valve design, or a grease assisted, metal-to-metal slide valve design, unattended while the Sealing Bar (9 or 9HP), the Sealing Bar Gasket (9A, 9A-HP or 9CF), and the Clamping Bar (12 or 12HP) are unfastened and removed from the Top (14).

*Selecting an appropriate plate change procedure*

In order to assist the operator in determining the safest and most efficient means to perform the Orifice Plate (13) change on a Senior equipped with a grease assisted slide valve, Daniel prepared two plate change procedures that an operator may select from.

The operator must select the appropriate procedure based upon their intimate knowledge of both the service and environmental conditions of that particular flow measurement system. The two Orifice Plate (13) change procedures described below are the “Quick Change” process, and the “Extended Time” process. If the Senior is equipped with a “soft-seat” slide valve design, then the operator may use either procedure.

An operator can select the “Quick Change” process, based upon their determination that it will take LESS THAN 15 MINUTES from the time the Top (14) fluid is evacuated to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) after the plate change.

The “Extended Time” process is a procedure selected when the operator determines that the time beginning with the evacuation of Top (14) fluid to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) after plate change is GREATER THAN 15 MINUTES.

If the operator does not know the time required to perform the Orifice Plate (13) change operation, then the operator must use the “Extended Time” procedure. The table below describes the conditions along with the suitable procedure.

**Table 4-1 Plate change procedure selection for grease assisted slide valves and soft seat slide valves**

Operator’s evaluation of plate change conditions	Procedure	Type of valve
The estimated time period from the Top (14) fluid evacuation to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) after plate change is: LESS THAN 15 MINUTES	“Quick Change”	Grease assisted slide valve Soft seat slide valve

<p>The estimated time period from the Top (14) fluid evacuation to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) after plate change is: GREATER THAN 15 MINUTES</p>	<p>“Extended Time”</p>	<p>Grease assisted slide valve Soft seat slide valve</p>
<p>The estimated time period from the Top (14) fluid evacuation to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) after plate change is: UNKNOWN</p>	<p>“Extended Time”</p>	<p>Grease assisted slide valve Soft seat slide valve</p>

Selecting an appropriate plate change procedure

### 4.3 Orifice plate (13) change operation

**Important**

In order to perform a safe and efficient plate change operation with a Senior, the on-site personnel must evaluate both the service and environmental conditions prior to beginning this operation. These conditions may have a dramatic effect on the time required for an operator’s ability to return the Senior to its measurement condition.

The Daniel Senior Orifice Fitting’s Top (14) is designed to temporarily hold the Plate Carrier (8DM or 8DMC) during plate change operations.

An operator controlled, grease assisted, slide valve separates the Top (14) from the line pressure to ensure optimum sealing performance. The slide valve grease used to achieve this performance may migrate into the Top (14) during the plate change operation. If this was to occur, the slide valve may not perform optimally and may leak.

The grease migration process is both time and environmental condition dependent. Therefore, Daniel offers two plate change procedures that an operator may choose from in order to perform this process in the safest and most efficient manner. The two procedures that Daniel offers are the “Quick Change” process and the “Extended Time” process.

The “Quick Change” process is a procedure based upon the operator’s knowledge that the entire Orifice Plate (13) installation and removal, the time spent from the Top (14) fluid evacuation to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) is under fifteen (15) minutes. The “Extended Time” process is a procedure based upon the operator’s knowledge that the entire Orifice Plate (13) installation and removal, the time spent from the Top (14) fluid evacuation to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) is over fifteen (15) minutes.

The procedural differences between these two processes are that, once the Plate Carrier (8DM or 8DMC) is extracted from the Senior, the “Extended Time” process requires the operator to place a new Sealing Bar Gasket (9A, 9A-HP or 9CF) along with replacing the Sealing Bar (9 or 9HP)/Clamping Bar (12 or 12HP) on the Top (14). Additionally, the operator is required to add grease to the Senior prior to removing the Sealing Bar (9 or 9HP)/Clamping Bar (12 or 12HP) in order to reinsert the Plate Carrier (8DM or 8DMC) assembly.

For “Soft Seat” equipped Seniors the operator may use either the “Quick Change” or the “Extended Time” plate removal procedures based upon the immediate service and environmental conditions encountered.

Daniel recommends either the “Quick Change” or the “Extended Time” plate orientation process for users of Seniors equipped with lubricated slide valves. Both the “Quick Change” and the “Extended Time” plate removal processes are provided for users of the Daniel Senior Orifice Fittings with lubricated slide valves.

*Orifice plate (13) change operation*

### 4.3.1 “Quick change” procedure

You may use the Quick change procedure for Daniel Senior Orifice Fittings equipped with an ORing (10E) soft seated valve and for Seniors equipped with a grease-assisted slide valve.

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#### Important

Do not use this procedure if it cannot be finished in less than 15 minutes.

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### **⚠ WARNING**

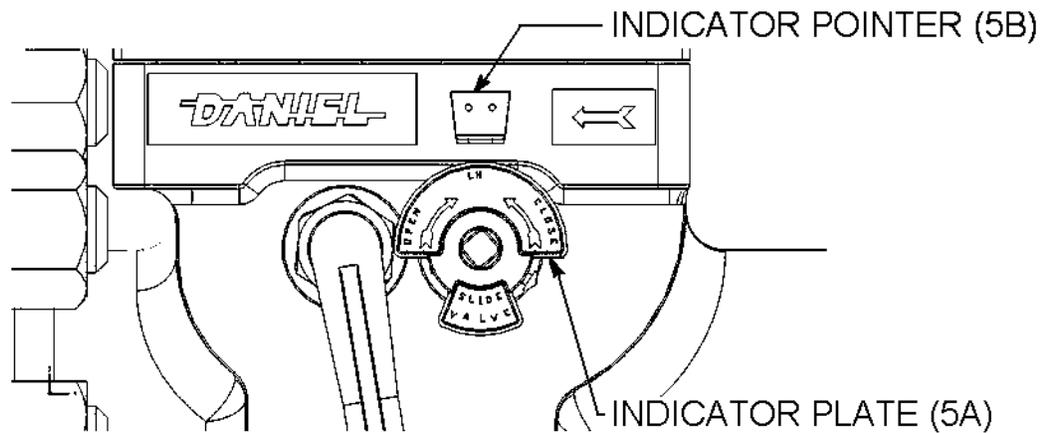
#### **TOXIC EXPLOSION HAZARD**

Do not perform any of the following steps if the Indicator Plate, the Indicator Pointer, or both are not assembled on the Senior. Call Daniel Customer Service for assistance in obtaining replacement components, and follow the instructions provided in [Section 2.8: Commissioning Daniel Senior Orifice Fitting installation](#).

Improper installation, maintenance or removal could result in explosive or toxic conditions resulting in serious injury or death.

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Figure 4-3 Indicator Plate (5A) and Pointer (5B)



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### **NOTICE**

Prior to performing any maintenance or Orifice Plate (13) installation and removal operations on the Senior, personnel must visually confirm the presence of the Indicator Plate (5A) on the Slide Valve Shaft (5) and the Indicator Pointer (5B) on the Body (4). Both the Indicator Plate and the Indicator Pointer must be installed to operate this equipment safely.

---

In preparation for the plate removal and installation process, the operator must evaluate the meter system to determine the amount of time between the Top (14) fluid evacuation and the plate change to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) back on the Top (14).

If the operator determines that the time between the Top (14) fluid evacuation and plate change to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) back on the Top (14) is less than 15 minutes, then the operator may use the “QUICK CHANGE” procedure.

If the operator determines that the time between the Top (14) fluid evacuation and the plate change to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) back on the Top (14) is greater than 15 minutes, then the operator must use the “EXTENDED TIME” procedure.

If, for any reason, the operator cannot determine the total time between the Top (14) fluid evacuation and the plate change to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) back on the Top (14), then the operator must use the “EXTENDED TIME” procedure.

## **DANGER**

### FLUID EXPLOSION HAZARD

Follow the instructions below to avoid inadvertent or accidental opening of the slide valve and the propulsion of fluid or internal components from the Top (4).

Failure to do so will result in serious injury or death.

---

The following are the conditions required to start the removal procedure of the orifice plate:

- The Senior is operating at line pressure
- The Plate Carrier (8DM or 8DMC) is located in the measurement position within the Body (4)
- The Indicator Pointer (5B) and the Indicator Plate (5A) are installed on the Senior.
- The Slide Valve Shaft (5) is in the CLOSED position
- The Equalizer Valve (1) is in the CLOSED position
- The Bleeder Valve (10B) is in the CLOSED position
- The Sealing Bar Gasket (9A, 9A-HP or 9CF), the Sealing Bar (9 or 9HP), and the Clamping Bar (12 or 12HP) are fastened to the Top (14)
- Process temperature and ambient temperature values are within range of grease charts Process pressure values are within the range of grease charts.

## Section 4: Orifice plate installation and removal instructions Owner and Operator Manual

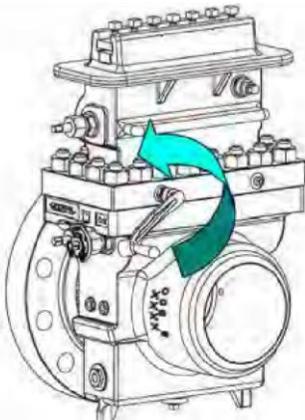
October 2012 3-9008-001 Rev K

Procedure:

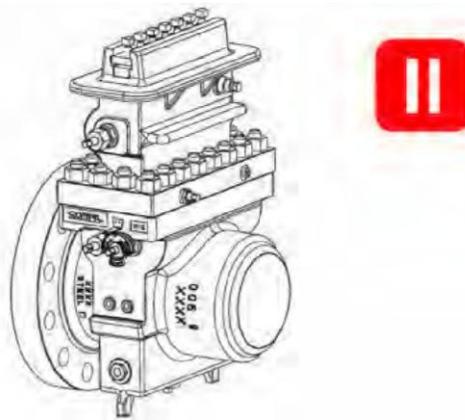
To remove the Orifice Plate (13) from the Senior, the operator must first balance the pressure between the Top (14) and the Body (4).

1. Open the Equalizer Valve (1) one half to two full turns using the Operating Wrench (2).

### Step 1

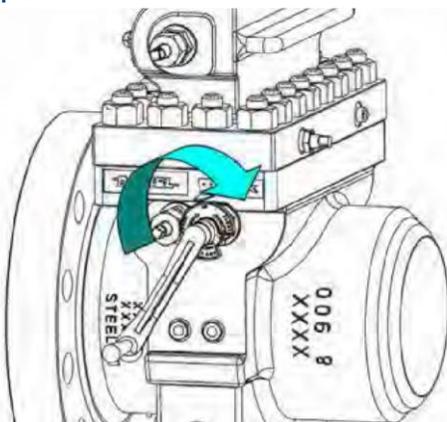


### Step 2

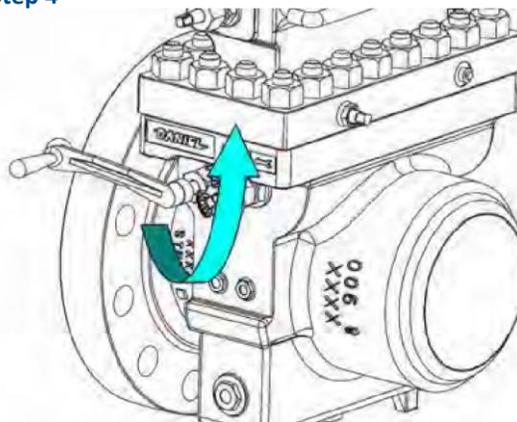


2. Wait several seconds while the pressure in the Top (14) equalizes to that of the Body (4).
3. Using the Operating Wrench (2) rotate the Slide Valve Shaft (5) until it stops and the OPEN position specified on the Indicator Plate (5A) is in line with the Indicator Pointer (5B).

### Step 3



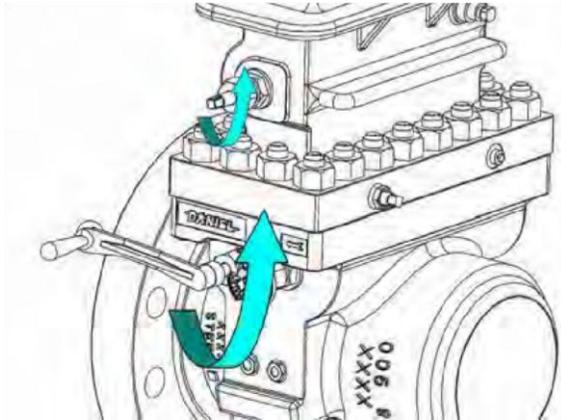
### Step 4



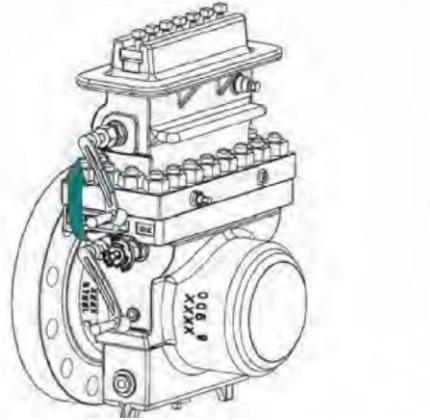
4. Rotate the Lower Plate Carrier Shaft (6), located on the Body (4), using the Operating Wrench (2) in a direction that will move the Plate Carrier (8DM or 8DMC) out of the Body (4) into the Top (14).

- Continue to rotate the Lower Plate Carrier Shaft (6) located on the Body (4) until the Upper Plate Carrier Shaft (7) located in the Top (14) begins to rotate

Step 5

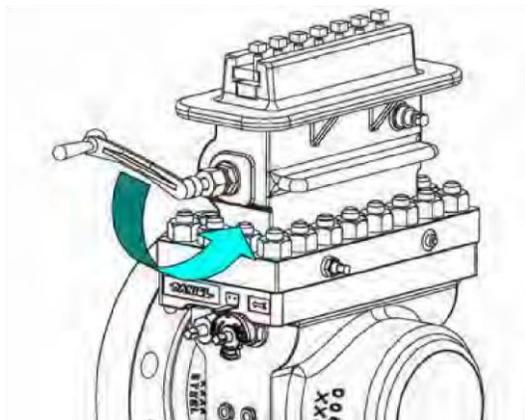


Step 6

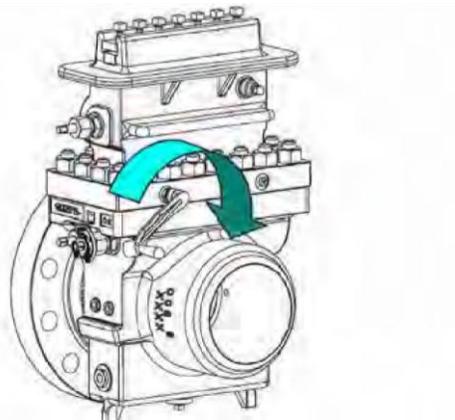


- Move the Operating Wrench (2) from the Lower Plate Carrier Shaft (6) located in the Body (4) on the Upper Plate Carrier Shaft (7) located in the Top (14).
- Rotate the Upper Plate Carrier Shaft (7) located in the Top (14) until the Plate Carrier (8DM or 8DMC) stops against the Sealing Bar (9, 9HP).

Step 7

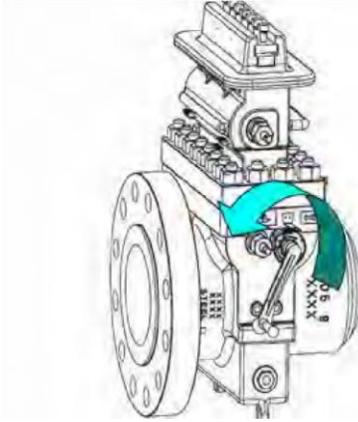


Step 8

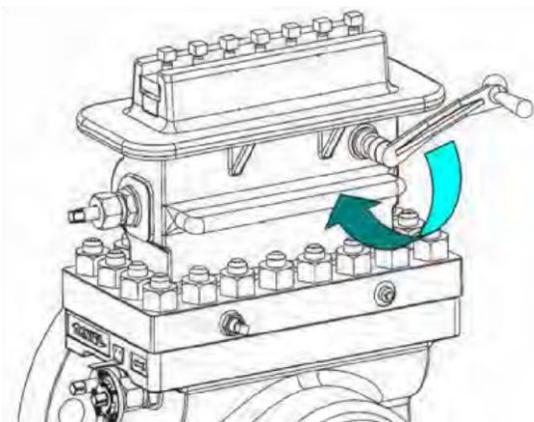


- Close the Equalizer Valve (1) with the Operating Wrench (2).
- Using the Operating Wrench (2) rotate the Slide Valve Shaft (5) until it stops and the CLOSED position specified on the Indicator Plate (5A) is in line with the Indicator Pointer (5 B ).

Step 9



Step 10



- 
10. Open the Bleeder Valve (10B) with the Operating Wrench (2).

**WARNING**

PRESSURIZED FLUID HAZARD

When opening the bleeder valve (10B) or venting the Top (14) thru the bleeder valve (10B), direct the released pressurized fluid and/or gas to safe area away from any individual in accordance with local environment regulations.

The bleeder valve (10B) releases pressurized fluid that may cause contamination and/or accumulation of volatile gas mixtures. Failure to do so may cause serious injury or death.

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**NOTICE**

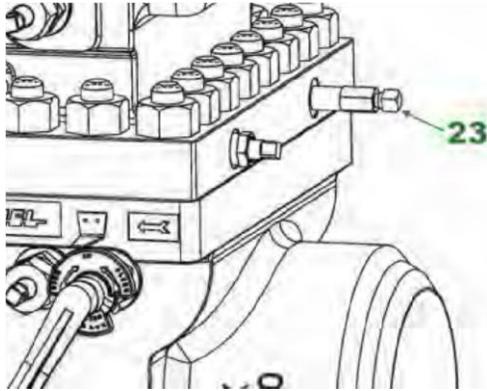
The pressure contained in the Top (14) must be lowered to ambient pressure in order to begin any Orifice Plate (13) procedures. When lowering the pressure in the Top (14), the operator must direct fluid or gas escaping from the Top (14) to a safe area away from the operator, and in accordance with local environmental regulations.

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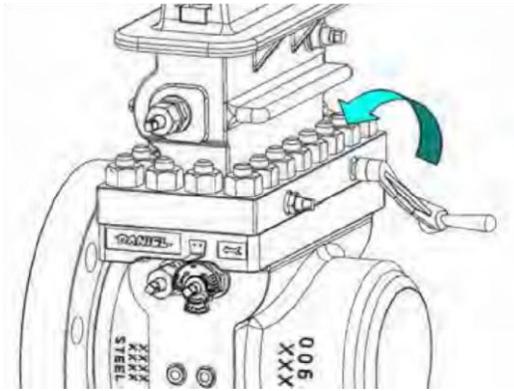
Steps 11 and 12 are ONLY required for the Seniors equipped with grease assisted, metal-to-metal slide valves. Personnel operating the Senior equipped with O-Ring seal “soft seat” design slide valves skip to step 13.

11. Remove the stem from the Grease Gun (23) with the Operating Wrench (2) and insert a Daniel lubricant stick into the Grease Gun (23).
-

Step 11



Step 11A



**⚠ WARNING**

PRESSURIZED FLUID HAZARD

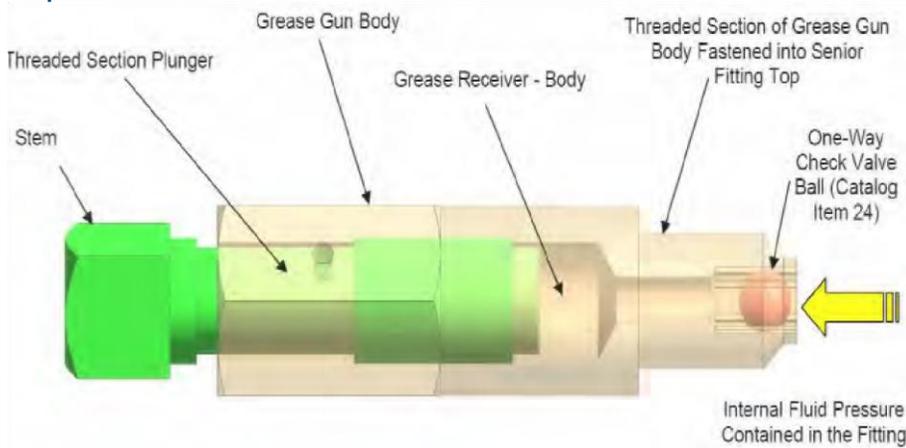
Using the Grease Gun (23), inject grease into the slide valve seat channels at a rate of 4 to 6 turns per minute and only under the following conditions:

- Bleeder Valve is open.
- Sealing bar/Clamping bar is in place and tight.

Injection of the grease at a faster rate will lead to the separation of the valve strip from the valve seat, resulting in release of pressurized fluid which may cause serious injury or death.

12. Return the stem to the Grease Gun (23) and begin turning it clockwise by hand into the Grease Gun (23) until resistance is felt. Once this is done, use the supplied Operating Wrench (2) to continue to turn the stem clockwise, at a rate of 4 to 6 turns per minute.

**Step 12**



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**Important**

By turning the stem of the Grease Gun (23) at a rate of 4 to 6 turns per minute, the lubricant is forced through the Slide Valve Seat (18) channels at a rate that allows the lubricant to travel freely, yet not separate the valve strip from the valve seat. This method will keep fresh grease in the lubrication passages.

---

If the addition of grease does not reduce the flow from the open Bleeder Valve (10B) to zero, follow these steps:

- Close the Bleeder Valve (10B),
- Open the Equalizer Valve (1), and move the Slide Valve Shaft (5) from the CLOSED to the OPEN position, and back to the CLOSED position, repeating this action several times.
- Return the Slide Valve Shaft (5) back to the CLOSED position.
- Close the Equalizer Valve (1) and repeat the lubrication process.
- Open the Bleeder Valve (10B).

If leakage is still present, close the Bleeder Valve (10B) and leave the Slide Valve Shaft (5) in the CLOSED position and schedule maintenance on the Senior.

13. Monitor the fluid/gas pressure in the Top (14) until it is equal to ambient conditions.

---

**Important**

Once the Top (14) is equal to ambient conditions, the 15 minute countdown to remove and install the Orifice Plate Carrier (8DM or 8DMC) begins.

Although the fluid pressure contained in the Top (14) is reduced to ambient conditions in the following operations, there still remain remnants of the fluid in that chamber. The operator must employ a system to address the remaining fluid based upon the fluids' chemical composition and toxicity.

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## **⚠ WARNING**

### RELEASE OF FLUIDS OR COMPONENTS HAZARD

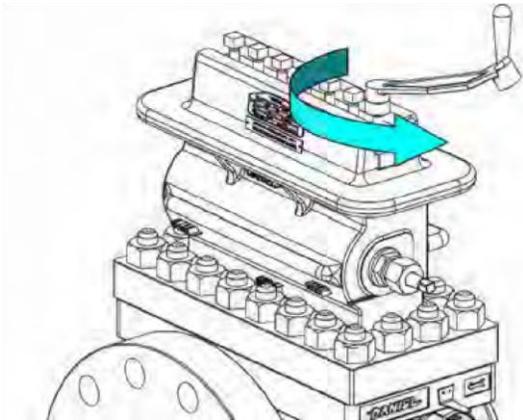
The Clamping Bar (12 or 12HP) may not be securely in place. Sudden release of fluid or internal components may occur. Never place the Operating Wrench (2) on the Slide Valve Shaft (5), or any body part in front of the top opening in the Top (14).

Failure to do so may cause serious injury or death.

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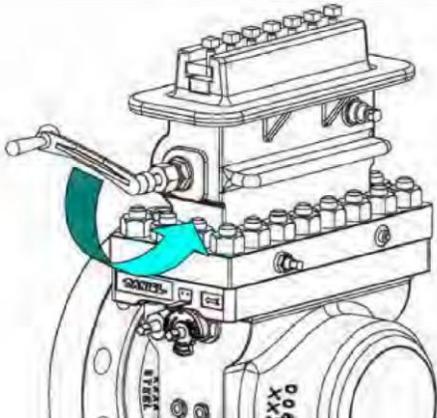
14. Loosen each Clamping Bar Screw (11) located on the Clamping Bar (12 or 12HP) approximately two turns with the Operating Wrench (2).
- 

### Step 14



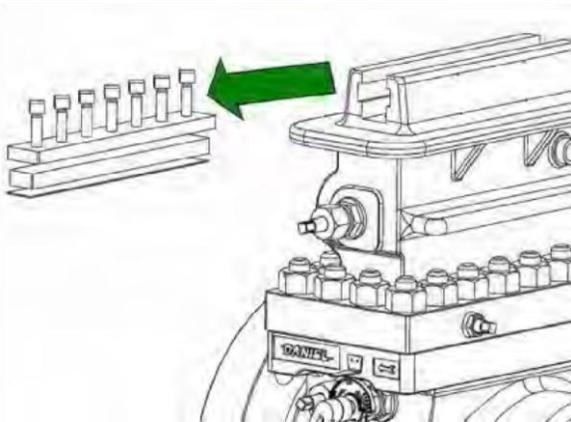
15. Once the Clamping Bar Screws (11) are loose, rotate the Upper Plate Carrier Shaft (7) located in the Top (14) with the Operating Wrench (2), until the Plate Carrier (8DM or 8DMC) taps against the Sealing Bar (9 or 9HP) freeing it from the Top (14).
-

**Step 15**



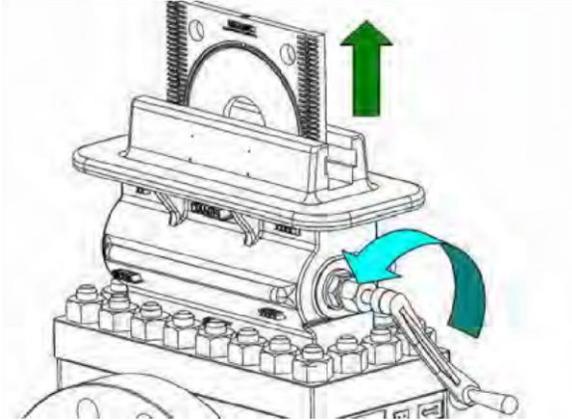
- 
16. Slide the Clamping Bar (12 or 12HP) containing the Clamping Bar Screws (11), the Sealing Bar (9 or 9HP) from the Top (14).
- 

**Step 16-17**



- 
17. Remove the Sealing Bar Gasket (9A, 9A-HP or 9CF) from the Top (14).
18. Rotate the Upper Plate Carrier Shaft (7), located in the Top (14) with the Operating Wrench (2), until the Plate Carrier (8DM or 8DMC) extends outside of the Top (14) and continue to rotate the Upper Plate Carrier Shaft (7) until the Upper Plate Carrier Shaft (7) gears and the Plate Carrier (8DM or 8DMC) gear rack ratchet.
-

**Step 18**



- 
19. Remove the Orifice Plate Carrier (8DM or 8DMC) from the Top (14) and perform the scheduled work on the Orifice Plate (13) and Orifice Plate Carrier (8DM or 8DMC).
  20. Insert the Orifice Plate Carrier (8DM or 8DMC) into the Top (14) until the Upper Plate Carrier Shaft (7) gears and the plate carrier gear rack mesh.
  21. With the Operating Wrench (2), rotate the Upper Plate Carrier Shaft (7), located in the Top (14), a minimum of one quarter turns OPPOSITE of the direction required to lower the Orifice Plate Carrier (8DM or 8DMC) into the Top (14). This action allows the Orifice Plate Carrier (8DM or 8DMC) to properly “align” the Orifice Plate Carrier (8DM or 8DMC) with the plate carrier shaft.
- 

**Important**

Align the Orifice Plate Carrier (8DM or 8DMC) with the Upper Plate Carrier Shaft (7). Failure to do so may damage the Senior.

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**⚠ WARNING**

**PRESSURIZED FLUID HAZARD**

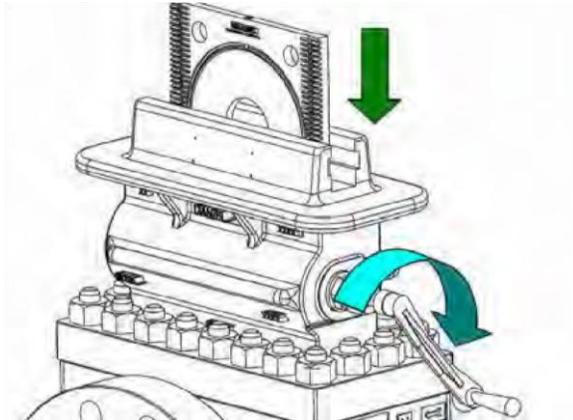
Do not lower the Plate Carrier (8DM or 8DMC) directly onto the slide valve as it may damage the sealing features and release pressurized fluid.

Damaging the sealing features may cause contamination and/or accumulation of volatile gas mixtures, resulting in serious injury or death and equipment damage.

---

22. Once the Orifice Plate Carrier (8DM or 8DMC) is aligned, rotate the Upper Plate Carrier Shaft (7) with the Operating Wrench (2), in a direction to lower the Orifice Plate Carrier (8DM or 8DMC) into the Top (14) until all of the Orifice Plate Carrier (8DM or 8DMC) is below the Sealing Bar Gasket (9A, 9A-HP or 9CF) surface.

Step 22



**⚠ WARNING**

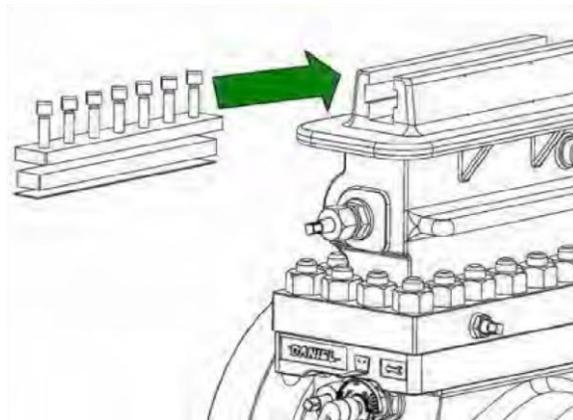
EXPLOSION HAZARD

Make sure that the Sealing Bar Gasket (9A, 9A-HP or 9CF), the Sealing Bar (9 or 9HP) and the Clamping Bar (12 or 12HP) provide a pressure barrier between the line pressure and the atmosphere.

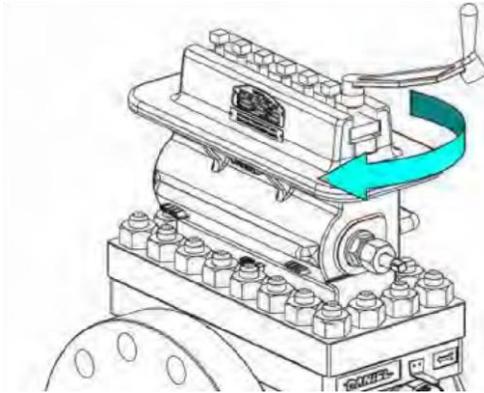
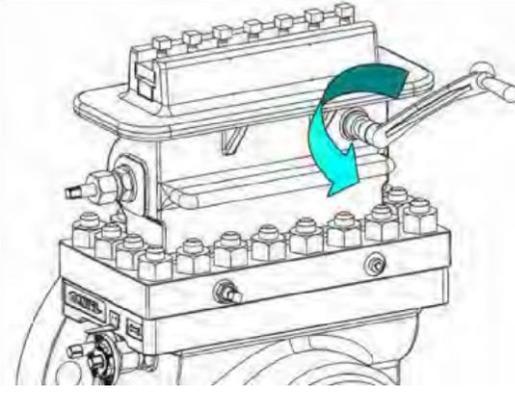
Failure to properly install these parts may result in explosive separation of components resulting in serious injury or death.

23. Install a new Sealing Bar Gasket (9A, 9A-HP or 9CF) on to the Top (14).

Step 23-24



24. Install the Sealing Bar (9 or 9HP) and the Clamping Bar (12 or 12HP) on to the Top (14).
  25. Tighten each Clamping Bar Screw (11), located on the Clamping Bar (12 or 12HP), to the torque recommended in this manual (refer to [Section 5.3: Torque information](#)).
- 

**Step 25****Step 26**

26. Close the Bleeder Valve (10B).
- 

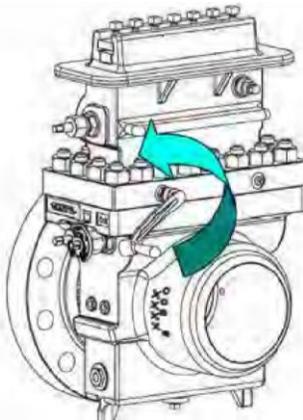
**Important**

After closing the Bleeder Valve (10B), the 15 minute countdown to remove and install the Orifice Plate Carrier (8DM or 8DMC) ends.

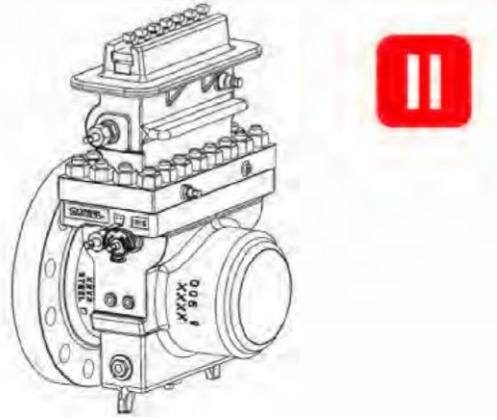
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27. Open the Equalizer Valve (1) one-half to two turns with the Operating Wrench (2).
-

Step 27

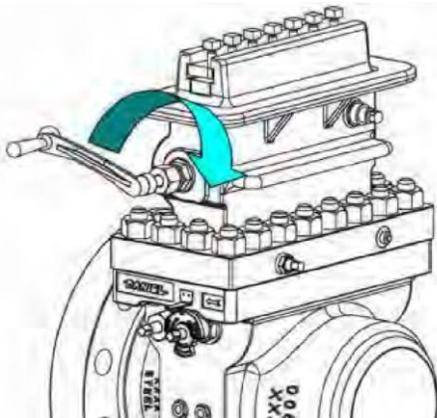


Step 28

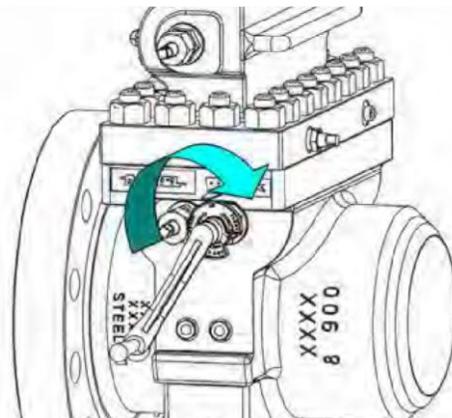


- 
- 28. Wait several seconds for the Top (14) to reach pressure equilibrium with the line pressure contained in the Body (4).
  - 29. Using the Operating Wrench (2), rotate the Slide Valve Shaft (5) to the OPEN position.
- 

Step 29

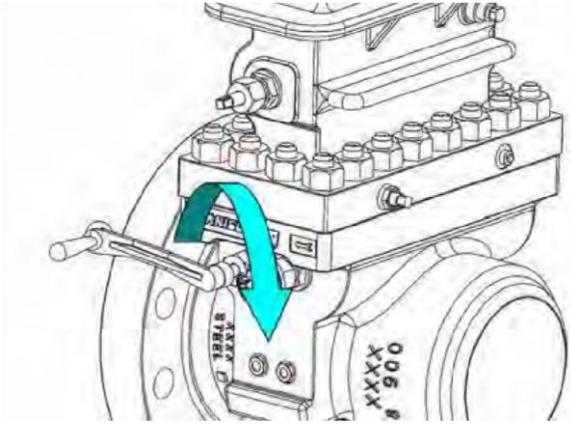


Step 30



- 
- 30. Rotate the Upper Plate Carrier Shaft (7) with the Operating Wrench (2) in the direction to lower the Orifice Plate Carrier (8DM or 8DMC) into the Body (4).
  - 31. Rotate the Lower Plate Carrier Shaft (6) with the Operating Wrench (2) until the Orifice Plate Carrier (8DM or 8DMC) cannot be lowered further.
-

**Step 31**

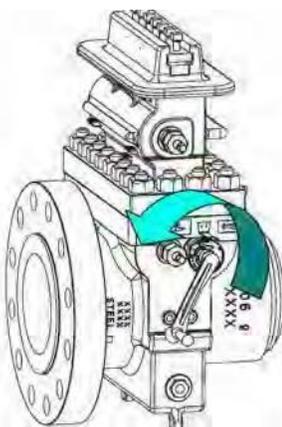


**Important**

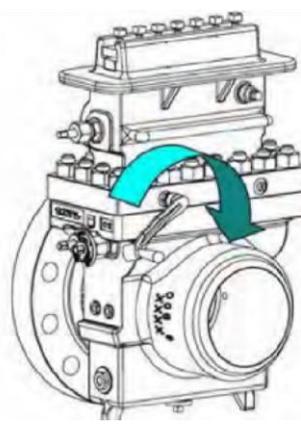
Resistance to turning will be present when the Orifice Plate Carrier (8DM or 8DMC) is approaching its proper measurement position due to friction between the Senior Body (4) and the Orifice Plate (13) seal.

32. Once the Orifice Plate Carrier (8DM or 8DMC) is positioned in the Body (4), turn the Slide Valve Shaft (5) using the Operating Wrench (2) into the CLOSED position.

**Step 32**



**Step 33**



33. Close the Equalizer Valve (1).

## **⚠ WARNING**

### PRESSURIZED FLUID HAZARD

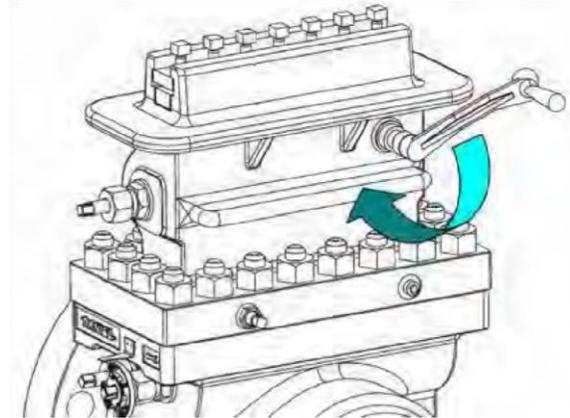
When opening the bleeder valve (10B) or venting the Top (14) thru the bleeder valve (10B), direct the released pressurized fluid and/or gas to safe area away from any individual in accordance with local environment regulations.

The bleeder valve (10B) releases pressurized fluid that may cause contamination and/or accumulation of volatile gas mixtures. Failure to do so may cause serious injury or death.

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34. Open the Bleeder Valve (10B) to vent the Top (14).

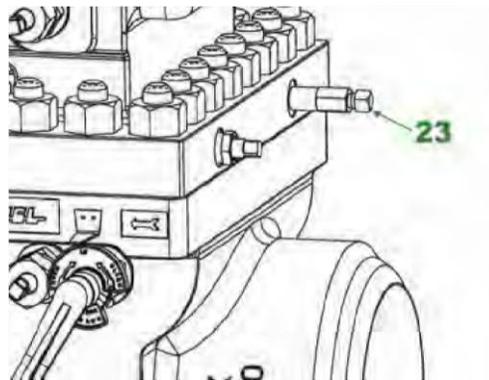
**Step 34**



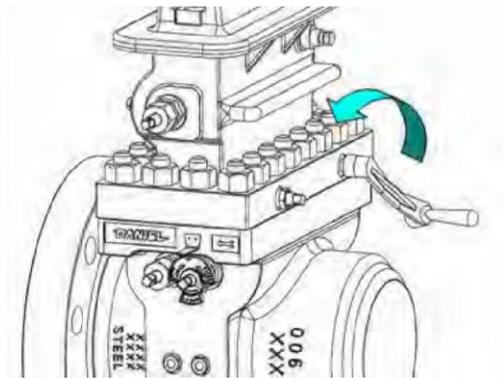
Steps 35 and 36 are ONLY required for Seniors equipped with grease assisted, metal-to-metal slide valves. Personnel operating the Daniel Senior Orifice Fittings equipped with O-Ring seal “soft seat” design slide valves skip to step 37.

35. Remove the stem from the Grease Gun (23) with the Operating Wrench (2) and insert a Daniel lubricant stick into the Grease Gun (23).

**Step 35**



**Step 35A**



**⚠ WARNING**

**PRESSURIZED FLUID HAZARD**

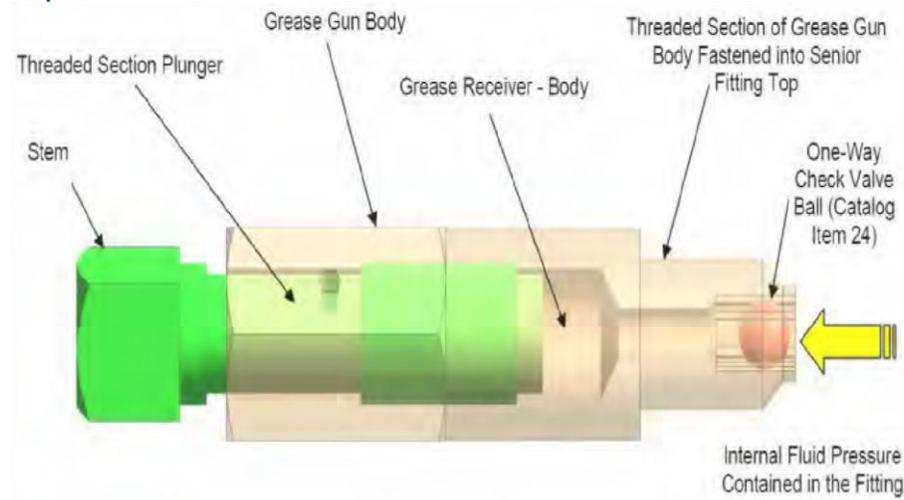
Using the Grease Gun (23), inject the grease into the slide valve seat channels at a rate of 4 to 6 turns per minute and only under the following conditions:

- Bleeder Valve is open.
- Sealing bar/Clamping bar is in place and tight.

Injection of the grease at a faster rate will lead to the separation of the valve strip from the valve seat, resulting in release of pressurized fluid which may cause serious injury or death.

36. Return the stem to the Grease Gun (23) and begin turning it clockwise by hand into the Grease Gun (23) until resistance is felt. Once this is done, use the supplied Operating Wrench (2) to continue to turn the stem at a rate of 4 to 6 turns per minute.

**Step 36**



**Important**

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By turning the stem of the Grease Gun (23) at a rate of 4 to 6 turns per minute, the lubricant is forced through the Slide Valve Seat (18) channels at a rate that allows the lubricant to travel freely, yet not separate the valve strip from the valve seat. This method will keep fresh grease in the lubrication passages.

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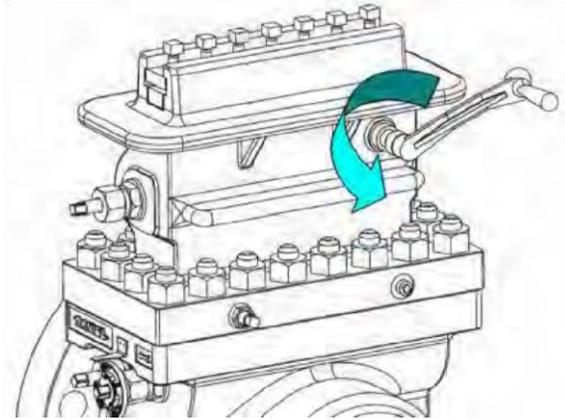
If the addition of grease does not reduce the flow from the open Bleeder Valve (10B) to zero, follow these steps:

- Close the Bleeder Valve (10B),
- Open the Equalizer Valve (1), and move the Slide Valve Shaft (5) from the CLOSED to the OPEN position, and back to the CLOSED position, repeating this action several times.
- Return the Slide Valve Shaft (5) back to the CLOSED position.
- Close the Equalizer Valve (1) and repeat the lubrication process.
- Open the Bleeder Valve (10B).

If leakage is still present, close the Bleeder Valve (10B) and leave the Slide Valve Shaft (5) in the CLOSED position and schedule maintenance on the Senior.

37. Close the Bleeder Valve (10B).

**Step 37**



The Daniel Senior Orifice Fitting is now ready for measurement.

### 4.3.2 “Extended time” procedure

This procedure is for the grease-assisted slide valves when the procedure takes over 15 minutes. However, it is acceptable for soft-seated valves. For Seniors equipped with an O-Ring (10E) soft seated valve, the operator may employ either the “QUICK CHANGE” procedure or the “EXTENDED TIME” procedure. However, for the Seniors equipped with a grease-assisted slide valve, the “QUICK CHANGE” procedure may be used only if it can be finished in less than 15 minutes.

#### **⚠ WARNING**

#### **TOXIC EXPLOSION HAZARD**

Do not perform any of the following steps if the Indicator Plate, the Indicator Pointer, or both are not assembled on the Senior. Call Daniel Customer Service for assistance in obtaining replacement components, and follow the instructions provided in [Section 2.8: Commissioning Daniel Senior Orifice Fitting installation](#).

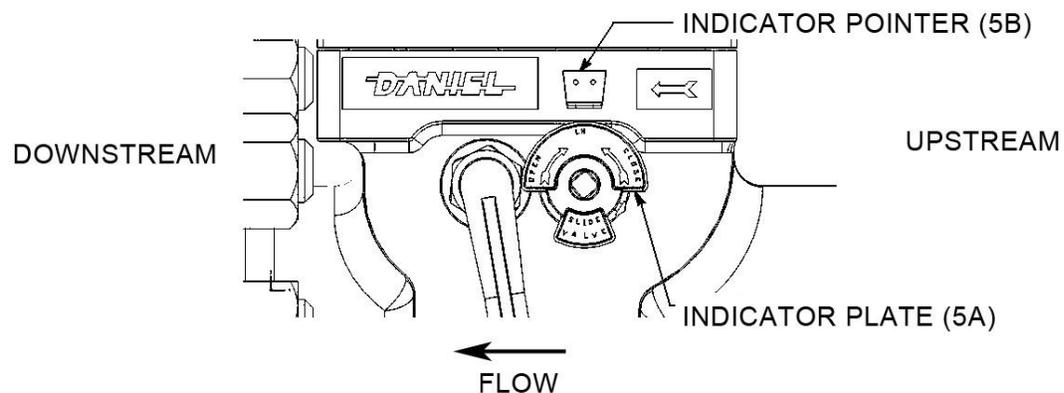
Improper installation, maintenance or removal could result in explosive or toxic conditions resulting in serious injury or death.

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#### **NOTICE**

Prior to performing any maintenance or Orifice Plate (13) installation and removal operations on the Senior, personnel must visually confirm the presence of the Indicator Plate (5A) on the Slide Valve Shaft (5) and the Indicator Pointer (5B) on the Body (4). Both the Indicator Plate and the Indicator Pointer must be installed to operate this equipment safely

Figure 4-4 Indicator plate (5A) and pointer (5B)



In preparation for the plate removal and installation process, the operator must evaluate the meter system to determine the amount of time between the Top (14) fluid evacuation and the plate change to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) back on the Top (14).

If the operator determines that the time between the Top (14) fluid evacuation and plate change to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) back on the Top (14) is less than 15 minutes, then the operator may use the "QUICK CHANGE" procedure.

If the operator determines that the time between the Top (14) fluid evacuation and the plate change to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) back on the Top (14) is greater than 15 minutes, then the operator must use the "EXTENDED TIME" procedure.

If, for any reason, the operator cannot determine the total time between the Top (14) fluid evacuation and the plate change to the full replacement of the Clamping Bar (12 or 12HP), the Sealing Bar (9 or 9HP), and the Sealing Bar Gasket (9A, 9A-HP or 9CF) back on the Top (14), then the operator must use the "EXTENDED TIME" procedure.

The following are the conditions required to start the removal procedure of the orifice plate:

- The Senior is operating at line pressure
- The Plate Carrier (8DM or 8DMC) is located in the measurement position within the Body (4)
- The Indicator Pointer (5B) and the Indicator Plate (5A) are installed on the Senior.

## Section 4: Orifice plate installation and removal instructions Owner and Operator Manual

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- The Slide Valve Shaft (5) is in the CLOSED position
- The Equalizer Valve (1) is in the CLOSED position
- The Bleeder Valve (10B) is in the CLOSED position
- The Sealing Bar Gasket (9A, 9A-HP or 9CF), the Sealing Bar (9 or 9HP), and the Clamping Bar (12 or 12HP) are fastened to the Top (14)
- Process temperature and ambient temperature values are within range of grease charts
- Process pressure values are within the range of grease charts.

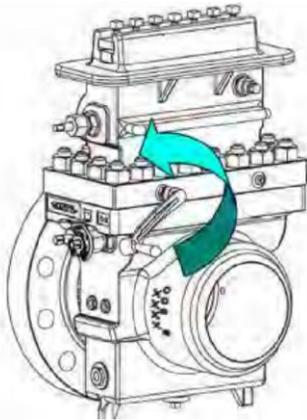
Procedure:

To remove the Orifice Plate (13) from the Daniel Senior Orifice Fitting, the operator must first balance the pressure between the Top (14) and the Body (4).

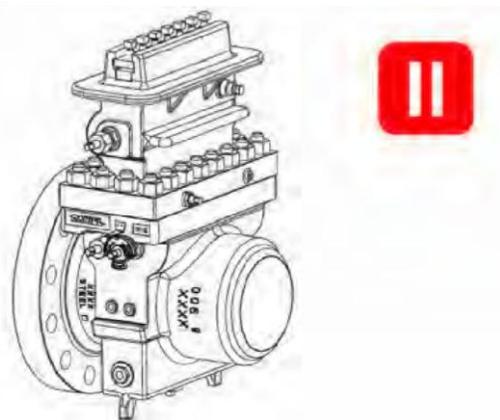
1. Open the Equalizer Valve (1) one half to two full turns using the Operating Wrench (2).

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### Step 1

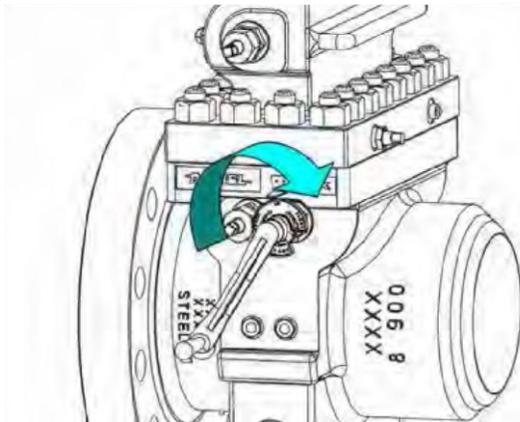


### Step 2

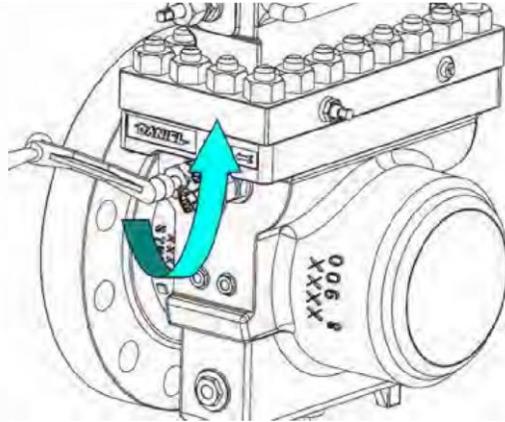


2. Wait several seconds while the pressure in the Top (14) equalizes to that of the Body (4).
  3. Using the Operating Wrench (2) rotate the Slide Valve Shaft (5) until it stops and the OPEN position is specified on the Indicator Plate (5A) with the Indicator Pointer (5B).
-

Step 3

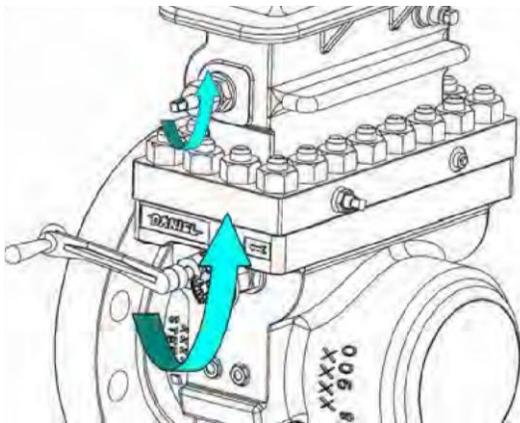


Step 4

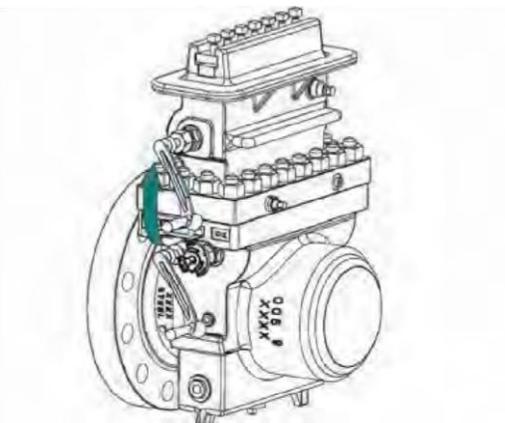


4. Rotate the Lower Plate Carrier Shaft (6), located on the Body (4), using the Operating Wrench (2) in a direction that will move the Plate Carrier (8DM or 8DMC) out of the Body (4) into the Top (14).
5. Continue to rotate the Lower Plate Carrier Shaft (6) located on the Body (4) until the Upper Plate Carrier Shaft (7) located in the Top (14) begins to rotate.

Step 5

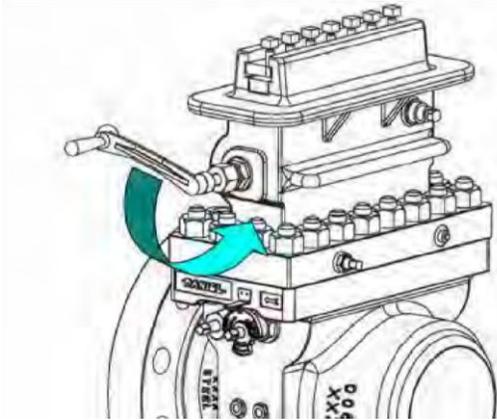


Step 6

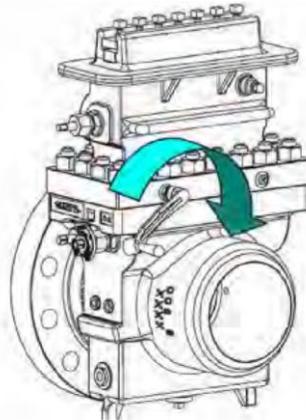


6. Move the Operating Wrench (2) from the Lower Plate Carrier Shaft (6) located in the Body (4) on the Upper Plate Carrier Shaft (7) located in the Top (14).
7. Rotate the Upper Plate Carrier Shaft (7) located in the Top (14) until the Plate Carrier (8DM or 8DMC) stops against the Sealing Bar (9 or 9HP).

Step 7

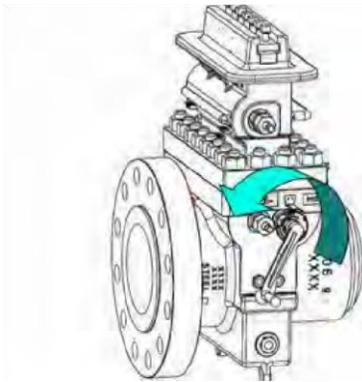


Step 8

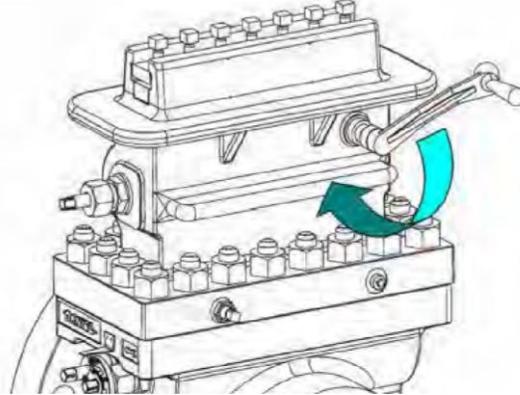


8. Close the Equalizer Valve (1) with the Operating Wrench (2).
9. Using the Operating Wrench (2) rotate the Slide Valve Shaft (5) until it stops and the CLOSED position specified on the Indicator Plate (5A) is in line with the Indicator Pointer (5 B).

Step 9



Step 10



10. Open the Bleeder Valve (10B) with the Operating Wrench (2).

**WARNING**

PRESSURIZED FLUID HAZARD

When opening the bleeder valve (10B) or venting the Top (14) thru the bleeder valve (10B), direct the released pressurized fluid and/or gas to safe area away from any individual in accordance with local environment regulations.

The bleeder valve (10B) releases pressurized fluid that may cause contamination and/or accumulation of volatile gas mixtures. The bleeder valve should remain closed after orifice plate insertion in order to prevent toxic gas from being emitted into the atmosphere. Failure to do so may cause serious injury or death.

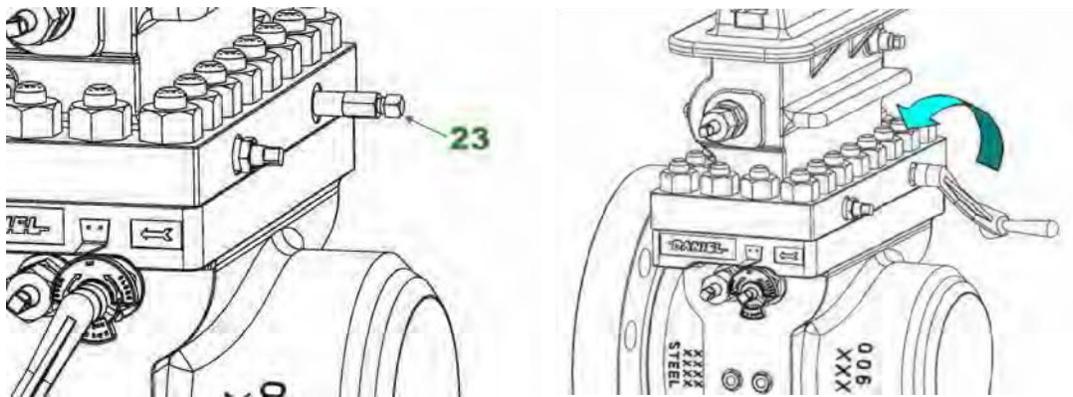
## NOTICE

The pressure contained in the Top (14) must be lowered to ambient pressure in order to begin any Orifice Plate (13) procedures. When lowering the pressure in the Top (14) the operator must direct fluid or gas escaping from the Body (4) to a safe area away from the operator and in accordance with local environmental regulations.

Steps 11 and 12 are ONLY required for the Seniors equipped with grease assisted, metal-to-metal slide valves. Personnel operating the Senior equipped with O-Ring seal “soft seat” design slide valves skip to step 12.

11. Remove the stem from the Grease Gun (23) with the Operating Wrench (2) and insert a Daniel lubricant stick into the Grease Gun (23).

### Step 11 Step 11A



## WARNING

### PRESSURIZED FLUID HAZARD

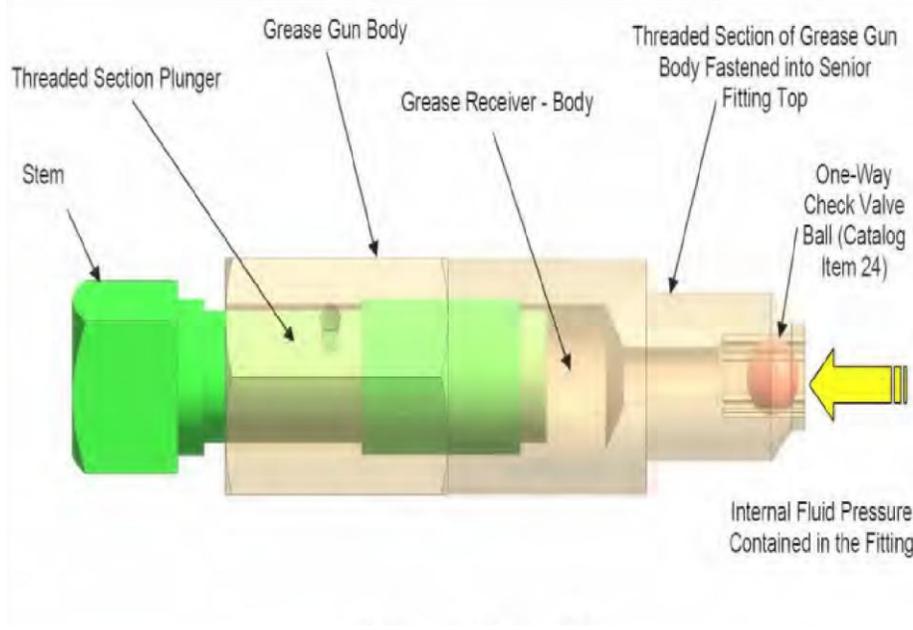
Using the Grease Gun (23), Inject the grease into the slide valve seat channels at a rate of 4 to 6 turns per minute and only under the following conditions:

- Bleeder Valve is open.
- Sealing Bar/Clamping bar is in place and tight.

Injection of the grease at a faster rate will lead to the separation of the valve strip from the valve seat, resulting in release of pressurized fluid which may cause serious injury or death.

12. Return the stem to the Grease Gun (23) and begin turning it clockwise by hand into the Grease Gun (23) until resistance is felt. Once this is done, use the supplied Operating Wrench (2) to continue to turn the stem clockwise, at a rate of 4 to 6 turns per minute.

**Step 12**



**Important**

By turning the stem of the Grease Gun (23) at a rate of 4 to 6 turns per minute, the lubricant is forced through the Slide Valve Seat (18) channels at a rate that allows the lubricant to travel freely, yet not separate the valve strip from the valve seat. This method will keep fresh grease in the lubrication passages.

Although the fluid pressure contained in the Top (14) is reduced to ambient conditions in the following operations, remnants of the fluid still remain in that chamber. The operator must employ a system to address the remaining fluid based upon the fluids' chemical composition and toxicity.

13. Monitor the fluid/gas pressure in the Top (14) until it is equal to ambient conditions.

## ⚠ WARNING

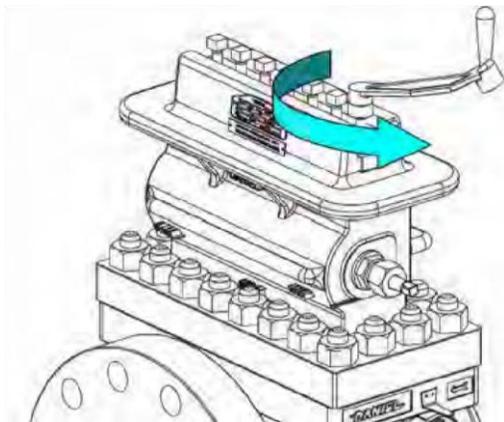
### RELEASE OF FLUIDS OR COMPONENTS HAZARD

The Clamping Bar (12 or 12HP) may not be securely in place. Sudden release of fluid or internal components may occur. Never place the Operating Wrench (2) on the Slide Valve Shaft (5), or any body part in front of the top opening in the Top (14).

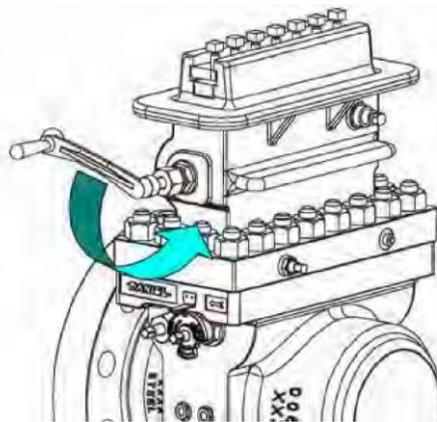
Failure to do so may cause serious injury or death.

14. Loosen each Clamping Bar Screw (11) located on the Clamping Bar (12 or 12HP) approximately two turns with the Operating Wrench (2).

#### Step 14

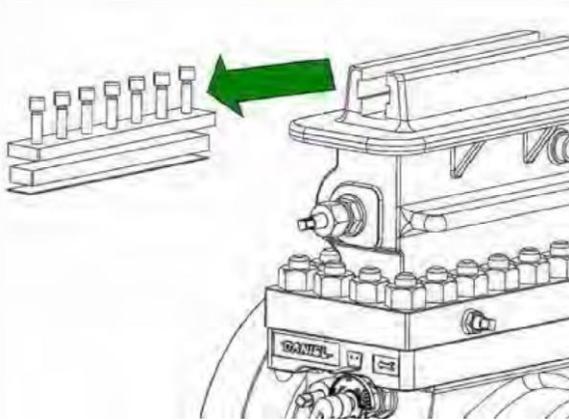


#### Step 15



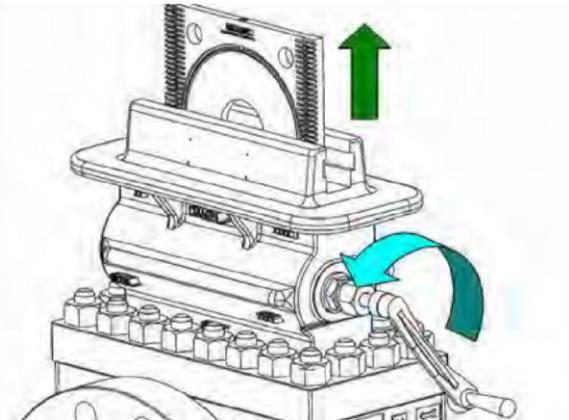
15. Once the Clamping Bar Screws (11) are loose, rotate the Upper Plate Carrier Shaft (7) located in the Top (14) with the Operating Wrench (2), until the Plate Carrier (8DM or 8DMC) taps against the Sealing Bar (9 or 9HP) freeing it from the Top (14).
16. Slide the Clamping Bar (12 or 12HP) containing the Clamping Bar Screws (11), the Sealing Bar (9 or 9HP) from the Top (14).

**Step 16-17**



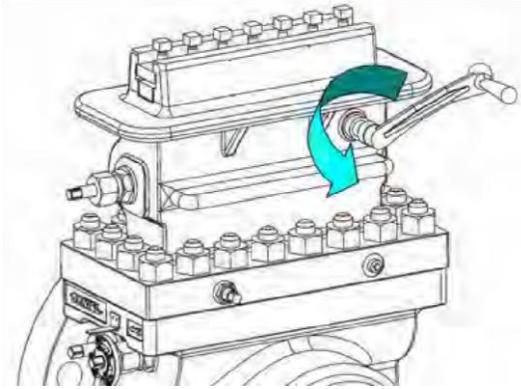
17. Remove the Sealing Bar Gasket (9A, 9A-HP or 9CF) from the Top (14).
  18. Rotate the Upper Plate Carrier Shaft (7), located in the Top (14) with the Operating Wrench (2), until the Plate Carrier (8DM or 8DMC) extends outside of the Top (14) and continue to rotate the Upper Plate Carrier Shaft (7) until the Upper Plate Carrier Shaft (7) gears and the Plate Carrier (8DM or 8DMC) gear rack ratchet.
- 

**Step 18**

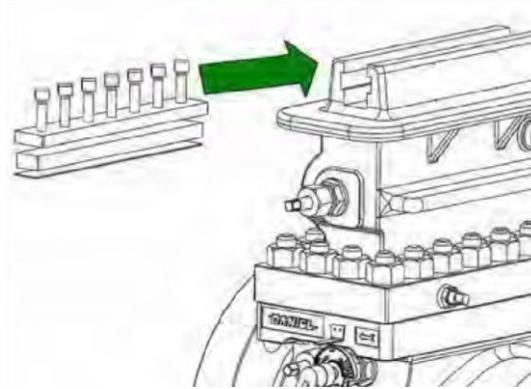


19. Remove the Orifice Plate Carrier (8DM or 8DMC) from the Top (14) and perform the scheduled work on the Orifice Plate (13) and Orifice Plate Carrier (8DM or 8DMC).
  20. Close the Bleeder Valve (10B) using the Operating Wrench (2).
-

Step 20



Step 21



**⚠ WARNING**

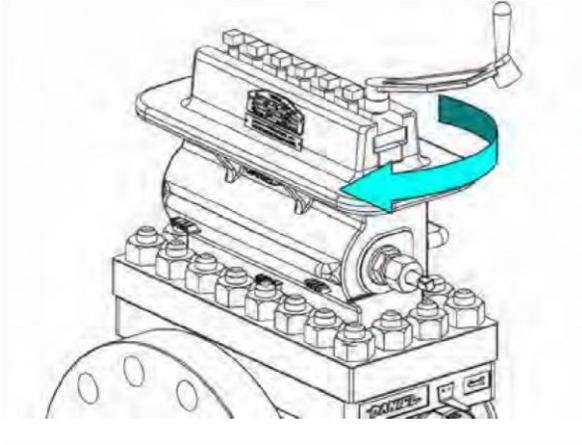
EXPLOSION HAZARD

Follow the instructions in this manual to assure that the Sealing Bar Gasket (9A, 9A-HP or 9CF), the Sealing Bar (9 or 9HP) and the Clamping Bar (12 or 12HP) provide a pressure barrier between the line pressure and the atmosphere.

Failure to properly install these parts may result in explosive separation of components resulting in serious injury or death.

21. Immediately install a new Sealing Bar Gasket (9A, 9A-HP or 9CF) on the Top (14) along with the Sealing Bar (9 or 9HP) and the Clamping Bar (12 or 12HP).
22. Tighten each Clamping Bar Screw (11) located on the Clamping Bar (12 or 12HP) to the torque recommended in this manual (refer to [Section 5.3: Torque information](#)).

**Step 22**



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**Important**

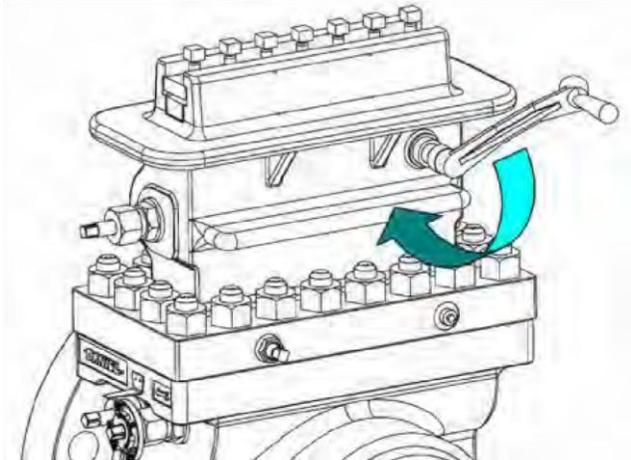
At this stage in the operational procedure, the Senior is at the following conditions:

- a) The Equalizer Valve (1) is closed.
- b) The Bleeder Valve (10B) closed.
- c) The Slide Valve is closed.
- d) The Sealing Bar (9 or 9HP), the Clamping Bar (12 or 12HP), and a new Sealing Bar Gasket (9A, 9A-HP or 9CF are installed on the Top (14).

Therefore, the operator may now perform the scheduled work on the Orifice Plate (13) and the Orifice Plate Carrier (8DM or 8DMC) without time restriction.

- 
- 23. Complete work on the Orifice Plate Carrier (8DM or 8DMC) and prepare the Senior for insertion of the Orifice Plate Carrier (8DM or 8DMC).
  - 24. Open the Bleeder Valve (10B) with the Operating Wrench (2)
-

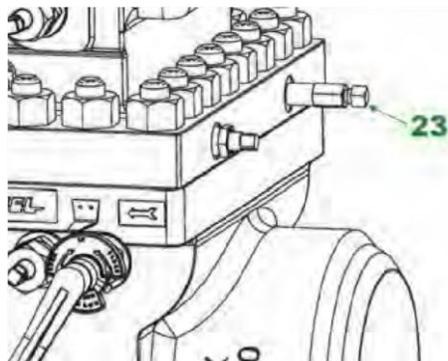
Step 24



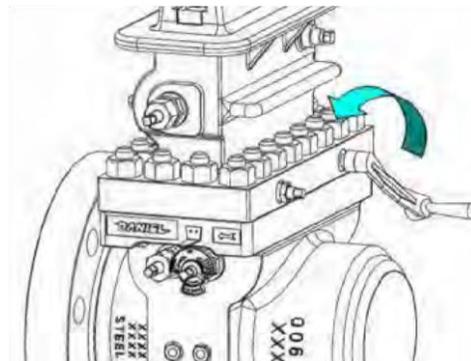
Steps 25 and 26 are ONLY required for the Seniors equipped with grease assisted, metal-to-metal slide valves. Personnel operating Seniors equipped with O-Ring seal “soft seat” design slide valves skip to step 27.

25. Remove the stem from the Grease Gun (23) with the Operating Wrench (2) and insert a Daniel lubricant stick into the Grease Gun (23).

Step 25



Step 25A



26. Return the stem to the Grease Gun (23) and begin turning it clockwise by hand into the Grease Gun (23) until resistance is felt. Once this is done, use the supplied Operating Wrench (2) to continue to turn the stem at a rate of 4 to 6 turns per minute.

**WARNING**

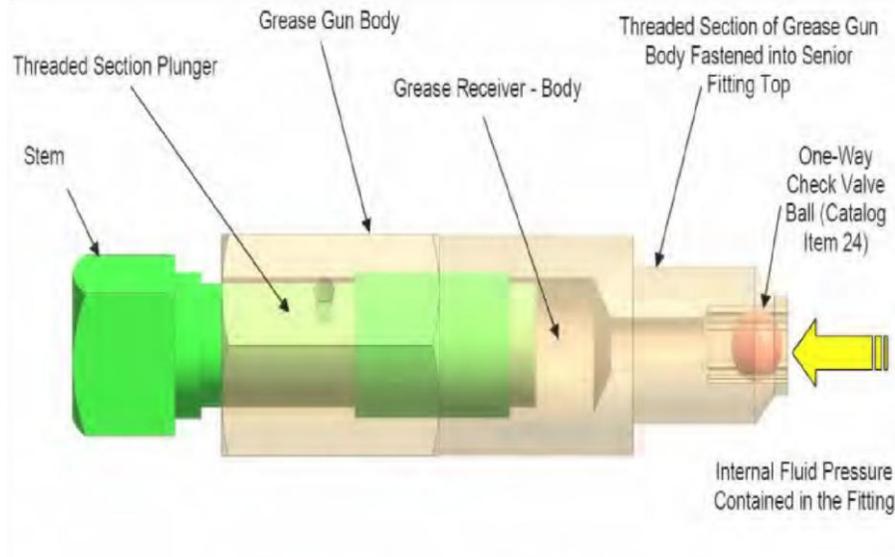
PRESSURIZED FLUID HAZARD

Using the Grease Gun (23), inject the grease into the slide valve seat channels at a rate of 4 to 6 turns per minute and only under the following conditions:

- Bleeder Valve is open.
- Sealing Bar/Clamping bar is in place and tight.

Injection of the grease at a faster rate will lead to the separation of the valve strip from the valve seat, resulting in release of pressurized fluid which may cause serious injury or death.

**Step 26**



**Important**

By turning the stem of the Grease Gun (23) at a rate of 4 to 6 turns per minute, the lubricant is forced through the Slide Valve Seat (18) channels at a rate that allows the lubricant to travel freely, yet not separate the valve strip from the valve seat. This method will keep fresh grease in the lubrication passages.

**⚠ WARNING**

PRESSURIZED FLUID HAZARD

When opening the bleeder valve (10B) or venting the Top (14) thru the bleeder valve (10B), direct the released pressurized fluid and/or gas to safe area away from any individual in accordance with local environment regulations.

The bleeder valve (10B) releases pressurized fluid that may cause contamination and/or accumulation of volatile gas mixtures. Failure to do so may cause serious injury or death.

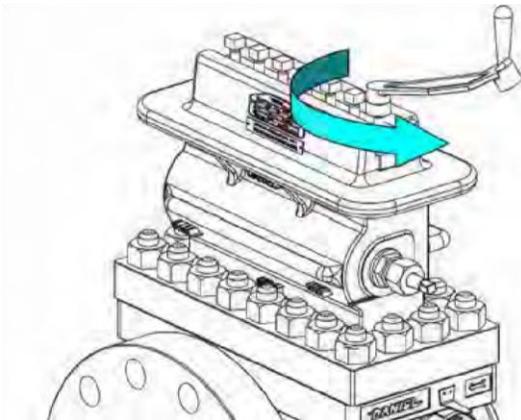
## NOTICE

The pressure contained in the Top (14) must be lowered to ambient pressure in order to begin any Orifice Plate (13) procedures. When lowering the pressure in the Top (14) the operator must direct fluid or gas escaping from the Body (4) to a safe area away from the operator and in accordance with local environmental regulations.

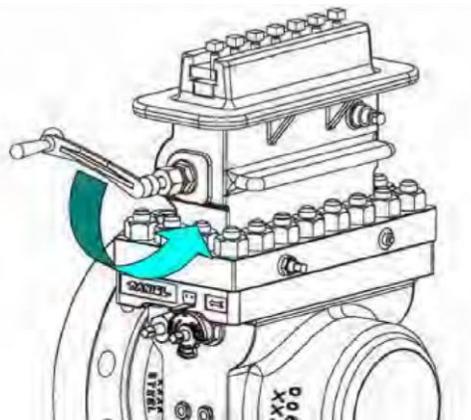
Although the fluid pressure contained in the Top (14) is reduced to ambient conditions in the following operations, remnants of the fluid still remain in that chamber. The operator must employ a system to address the remaining fluid based upon the fluids' chemical composition and toxicity.

27. Monitor the fluid/gas pressure in the Top (14) to ensure that it is equal to ambient conditions.
28. Loosen each Clamping Bar Screw (11) located on the Clamping Bar (12 or 12HP) approximately two turns with the Operating Wrench (2).

Step 28



Step 29

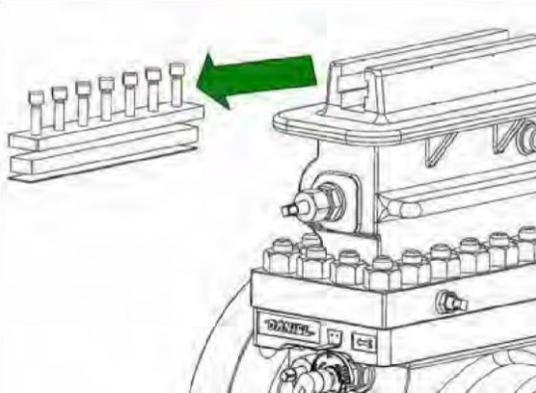


29. Once the Clamping Bar Screws (11) are loose, it may be necessary to use the Operating Wrench (2) to tap against the Sealing Bar (9 or 9HP) freeing it from the Top (14).

30. Slide the Clamping Bar (12 or 12HP) containing the Clamping Bar Screws (11), the Sealing Bar (9) from the Top (14).

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**Step 30-31**



- 
31. Remove the Sealing Bar Gasket (9A, 9A-HP or 9CF) from the Top (14).  
32. Insert the Orifice Plate Carrier (8DM or 8DMC) into the Top (14) until the Upper Plate Carrier Shaft (7) gears and plate carrier gear rack mesh.  
33. With the Operating Wrench (2), rotate the Upper Plate Carrier Shaft (7), located in the Top (14), a minimum of one quarter turns OPPOSITE of the direction required to lower the Orifice Plate Carrier (8DM or 8DMC) into the Top (14). This action allows the Orifice Plate Carrier (8DM or 8DMC) to properly “align” the Orifice Plate Carrier (8DM or 8DMC) with the plate carrier shaft.

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**Important**

Align the Orifice Plate Carrier (8DM or 8DMC) with the Upper Plate Carrier Shaft (7). Failure to do so may damage the Senior.

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**⚠ WARNING**

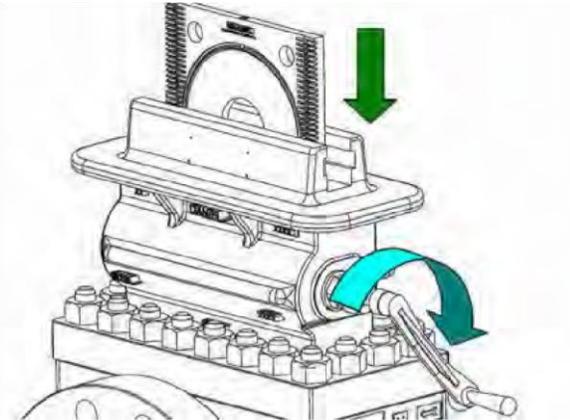
**PRESSURIZED FLUID HAZARD**

Do not lower the Plate Carrier (8DM or 8DMC) directly onto the slide valve as it may damage the sealing features and release pressurized fluid.

Damaging the sealing features may cause contamination and/or accumulation of volatile gas mixtures, resulting in serious injury or death and equipment damage.

34. Once the Orifice Plate Carrier (8DM or 8DMC) is aligned, rotate the Upper Plate Carrier Shaft (7) with the Operating Wrench (2), in a direction to lower the Orifice Plate Carrier (8DM or 8DMC) into the Top (14) until all of the Orifice Plate Carrier (8DM or 8DMC) is below the Sealing Bar Gasket (9A, 9A-HP or 9CF) surface.
- 

**Step 34**



**▲WARNING**

**EXPLOSION HAZARD**

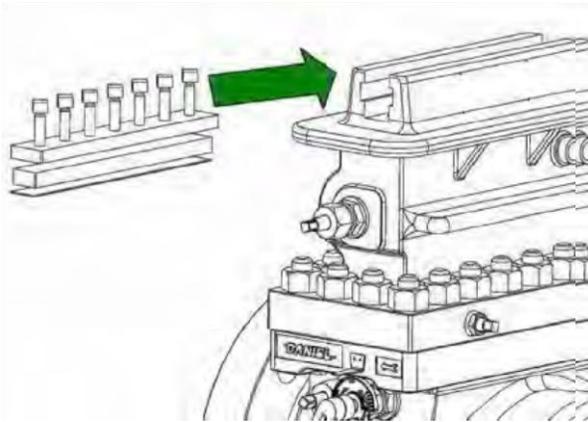
Follow the instructions in this manual to assure that the Sealing Bar Gasket (9A, 9A-HP or 9CF), the Sealing Bar (9 or 9HP) and the Clamping Bar (12 or 12HP) provide a pressure barrier between the line pressure and the atmosphere.

Failure to properly install these parts may result in explosive separation of components resulting in serious injury or death.

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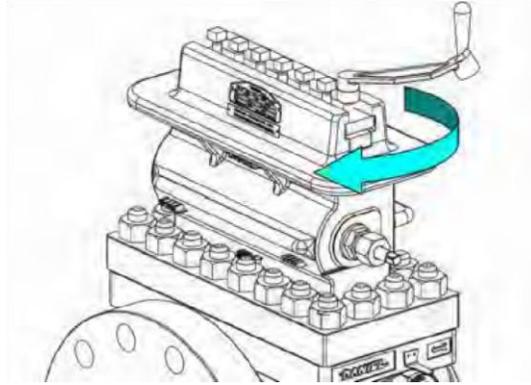
35. Install a new Sealing Bar Gasket (9A, 9A-HP or 9CF) on to the Top (14).
-

**Step 35-36**

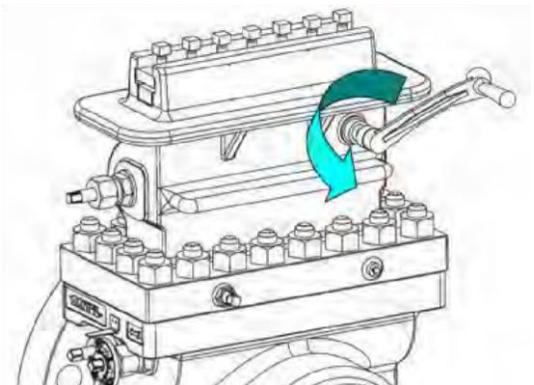


- 
36. Install the Sealing Bar (9 or 9HP) and the Clamping Bar (12 or 12HP) on to the Top (14).
  37. Tighten each Clamping Bar Screw (11), located on the Clamping Bar (12 or 12HP), to the torque recommended in this manual (refer to [Section 5.3: Torque information](#)).

Step 37



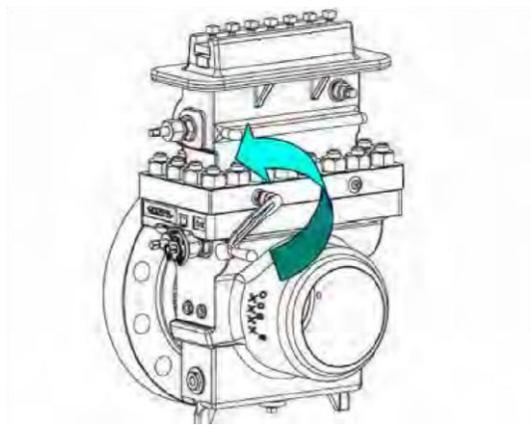
Step 38



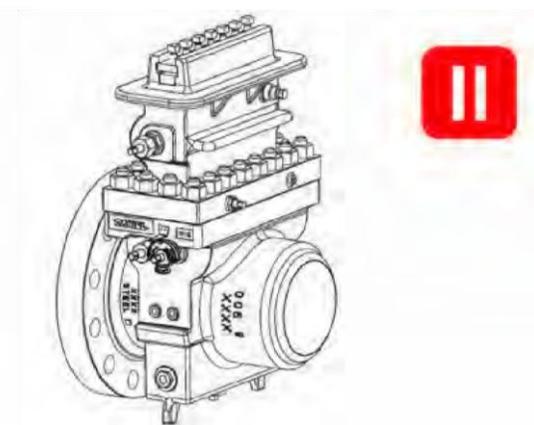
38. Close the Bleeder Valve (10B).

39. Open the Equalizer Valve (1) one-half to two turns with the Operating Wrench (2).

Step 39



Step 40



## Section 4: Orifice plate installation and removal instructions Owner and Operator Manual

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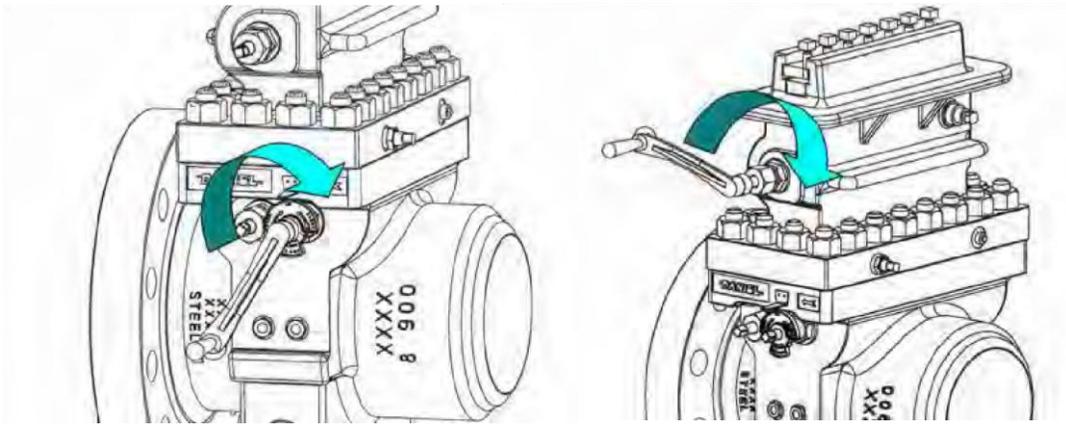
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40. Wait several seconds for the Top (14) to reach pressure equilibrium with the line pressure contained in the Body (4).

41. Using the Operating Wrench (2), rotate the Slide Valve Shaft (5) to the OPEN position.

### Step 41

### Step 42



42. Rotate the Upper Plate Carrier Shaft (7) located in the Top (14) with the Operating Wrench (2) in the direction to lower the Orifice Plate Carrier (8DM or 8DMC) into the Body (4).

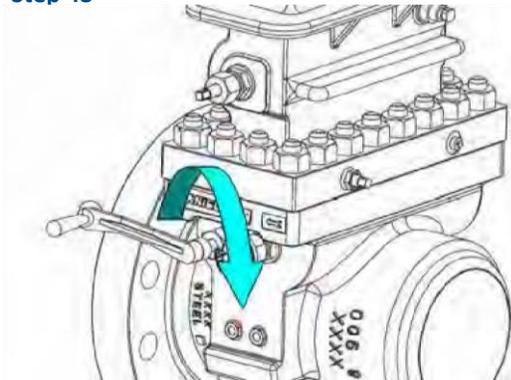
43. Rotate the Lower Plate Carrier Shaft (6) with the Operating Wrench (2) until the Orifice

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Plate Carrier (8DM or 8DMC) cannot be lowered further.

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**Step 43**



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**Important**

Resistance to turning will be present when the Orifice Plate Carrier (8DM or 8DMC) is approaching its proper measurement position due to friction between the Senior Body (4) and the Orifice Plate (13) seal.

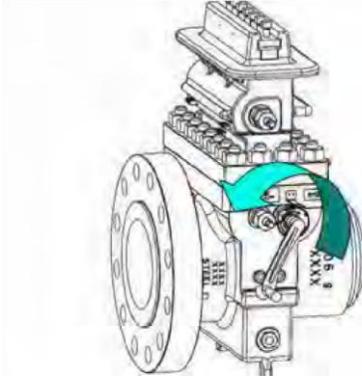
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44. Once the Orifice Plate Carrier (8DM or 8DMC) is positioned in the Body (4), turn the

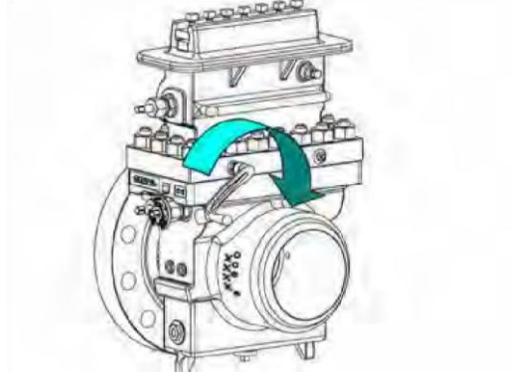
Slide Valve Shaft (5) using the Operating Wrench (2) into the CLOSED position.

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Step 44



Step 45



45. Close the Equalizer Valve (1).

### **⚠ WARNING**

#### PRESSURIZED FLUID HAZARD

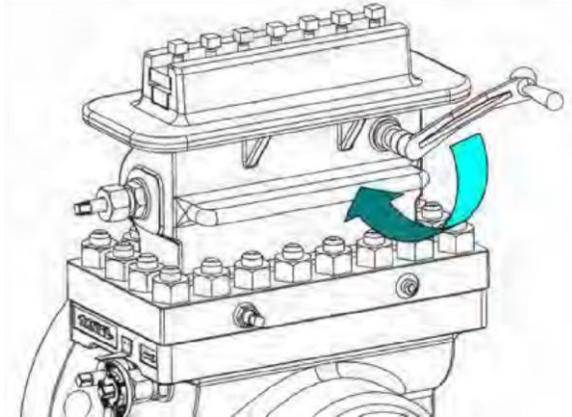
When opening the bleeder valve (10B) or venting the Top (14) thru the bleeder valve (10B), direct the released pressurized fluid and/or gas to safe area away from any individual in accordance with local environment regulations.

The bleeder valve (10B) releases pressurized fluid that may cause contamination and/or accumulation of volatile gas mixtures. Failure to do so may cause serious injury or death.

- 
46. Open the Bleeder Valve (10B) to vent the Top (14).

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**Step 46**

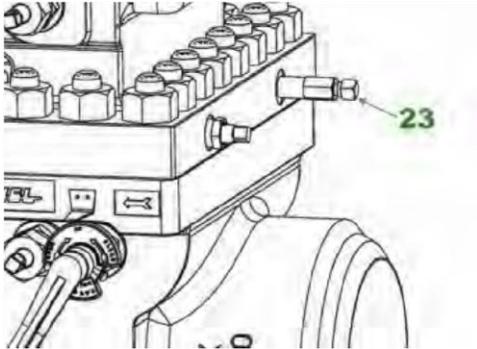


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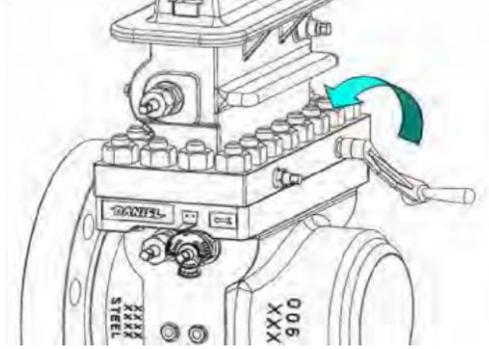
Step 47 and 48 are ONLY required for Seniors equipped with grease assisted, metal-to-metal slide valves. Personnel operating the Daniel Senior Orifice Fitting equipped with O-Ring seal “soft seat” design slide valves skip to step 49.

47. Remove the stem from the Grease Gun (23) with the Operating Wrench (2) and insert a Daniel lubricant stick into the Grease Gun (23).

Step 47



Step 47A



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**⚠ WARNING**

**PRESSURIZED FLUID HAZARD**

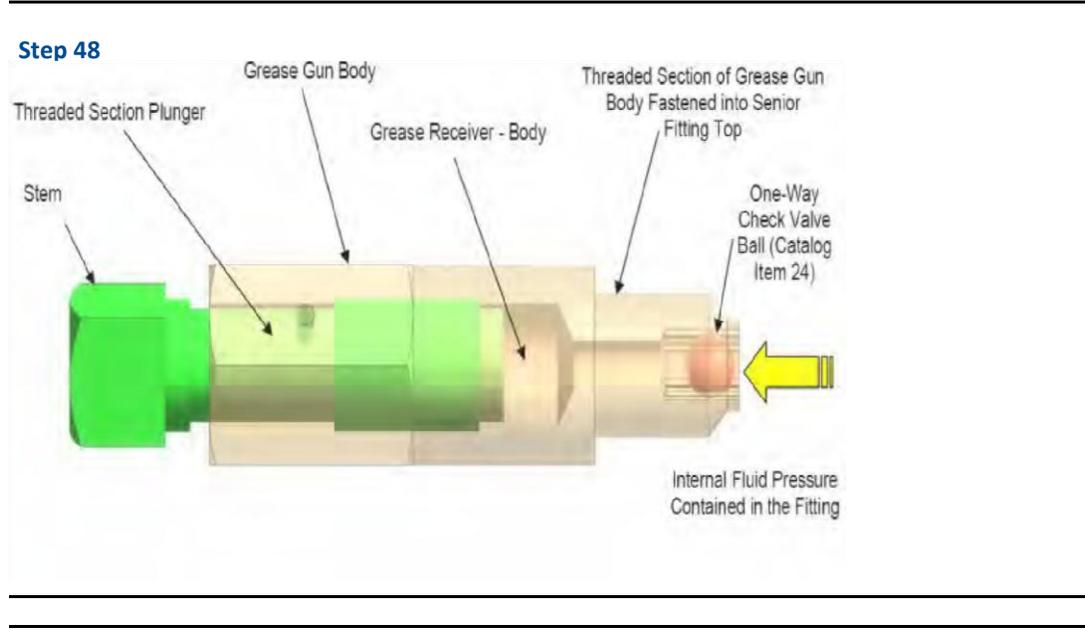
Using the Grease Gun (23), inject the grease into the slide valve seat channels at a rate of 4 to 6 turns per minute and only under the following conditions:

- Bleeder Valve is open.
- Sealing Bar/Clamping bar is in place and tight.

Injection of the grease at a faster rate will lead to the separation of the valve strip from the valve seat, resulting in release of pressurized fluid which may cause serious injury or death.

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48. Return the stem to the Grease Gun (23) and begin turning it clockwise by hand into the Grease Gun (23) until resistance is felt. Once this is done, use the supplied Operating Wrench (2) to continue to turn the stem at a rate of 4 to 6 turns per minute.



**Important**

By turning the stem of the Grease Gun (23) at a rate of 4 to 6 turns per minute, the lubricant is forced through the Slide Valve Seat (18) channels at a rate that allows the lubricant to travel freely, yet not separate the valve strip from the valve seat. This method will keep fresh grease in the lubrication passages.

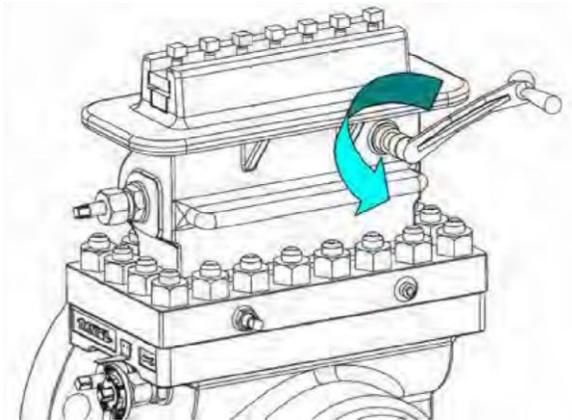
If the addition of grease does not reduce the flow from the open Bleeder Valve (10B) to zero, follow these steps:

- Close the Bleeder Valve (10B),
- Open the Equalizer Valve (1), and move the Slide Valve Shaft (5) from the CLOSED to the OPEN position, and back to the CLOSED position, repeating this action several times.
- Return the Slide Valve Shaft (5) back to the CLOSED position.
- Close the Equalizer Valve (1) and repeat the lubrication process.
- Open the Bleeder Valve (10B).

If leakage is still present, close the Bleeder Valve (10B) and leave the Slide Valve Shaft (5) in the CLOSED position and schedule maintenance on the Senior.

49. Close the Bleeder Valve (10B).

**Step 49**



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The Daniel Senior Orifice Fitting is now ready for measurement.

## Section 5: Supplemental information

### 5.1 Recommended spare parts for one-year operation

Table 5-1 Recommended spare parts

Item No.	Weight	Description	Material	Quantity
5	150-2500	Shaft	CS (ZP)	1
8E	150-600	Orifice Plate Sealing Unit	Nitrile	5
8TS	900-2500	Orifice Plate Sealing Unit	Teflon	3
9A	150-900	Sealing Bar Gasket	Composition	5
9CF	1500-2500	Sealing Bar Gasket	Synthetic Composition	3
11	150-2500	Clamping Bar Screws	Alloy Steel, (ZP)	2
18A	150-900	Slide Valve Seat/Top Gasket	Composition	1
18A	1500	Slide Valve Seat/Top Gasket	Composition	1
14CF	1500	Body/Top Gasket (o-ring)	Special Compound	1
14CF-A	2500	Body/Top Gasket	Parker Seal	1
22A	150-1500	Stuffing Box/Bearing Plug Gasket	Stainless Steel	2
22A	2500	Stuffing Box/Bearing Plug Gasket	Stainless Steel	2
22B	2500	Stuffing Box/Bearing Plug O-Ring	Nitrile	2
25A	150-1500	Packing Rings	Teflon	1- SET
25A-HP	2500	Packing Rings	Teflon	1- SET
25B	150-1500	Centering Rings	Teflon	1- SET
25B-HP	2500	Centering Rings	Teflon	1- SET
26C	2500	External Gland Outer O-Ring	Nitrile	1
26D	2500	External Gland Inner O-Ring	Nitrile	1
26D	2500	Internal Gland O-Ring	Nitrile	1
	150-2500	Slide Valve Lubricant		3 BOXES

Materials listed above are for standard "A" trim assemblies. For other trim options, consult with a Daniel representative for materials of components which are different.

#### Important

See ordering information in [Section 1: Introduction](#).

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*Recommended spare parts for one-year operation*

## 5.2 Lubricant information

Product owners and operating personnel select the Daniel Senior Orifice Fitting for use in a wide variety of flow measurement services around the world. Information and experience gathered indicate that measurement service conditions do have a profound effect on the metal-to-metal slide valve sealing performance.

Each application presents its own unique set of service and environmental conditions. Therefore, Daniel offers four lubricant greases for use on the grease assisted, metal-to-metal Senior slide valve. These lubricants are:

**Table 5-2 Daniel Senior Slide Valve grease assisted metal-to-metal lubricants**

Lubricant types
Type 1 - Standard: Daniel Part Number:1-213-04-001
Type 2 - Sour Gas: Daniel Part Number:1-213-04-102
Type 3 - Carbon Dioxide: Daniel Part Number:1-213-04-101
Type 4 - High Temperature: Daniel Part Number:1-213-04-103

The information contained in the following charts below are the result of sealing tests using a 3" ANSI 600 Senior Orifice Fitting. Daniel performed these tests under various laboratory conditions using nitrogen gas as the fluid. All sealing parts and grease were new. Test technicians also cleaned the grease delivery system prior to every test. Each chart represents one of the Daniel greases listed above.

In this test every filled grid indicates optimum seal performance at a corresponding temperature and pressure coordinate. The criteria for determining optimum sealing performance under test conditions was that, an electronic pressure transducer mounted on the Top (14) detected no leakage across the slide valve thirty (30) minutes after grease insertion. Every grid NOT filled indicates that some leakage occurred within the 30 minutes.

In order to perform a safe and efficient plate change operation, Daniel emphasizes that the onsite operator evaluate both the service and environmental conditions prior to selecting a lubricant. Additionally, Daniel realizes that some operators do allow leakage during a plate change operation for metal to metal valve seats based upon their experience and the service conditions under which they are operating and have performed successful and safe plate changes.

### **⚠ WARNING**

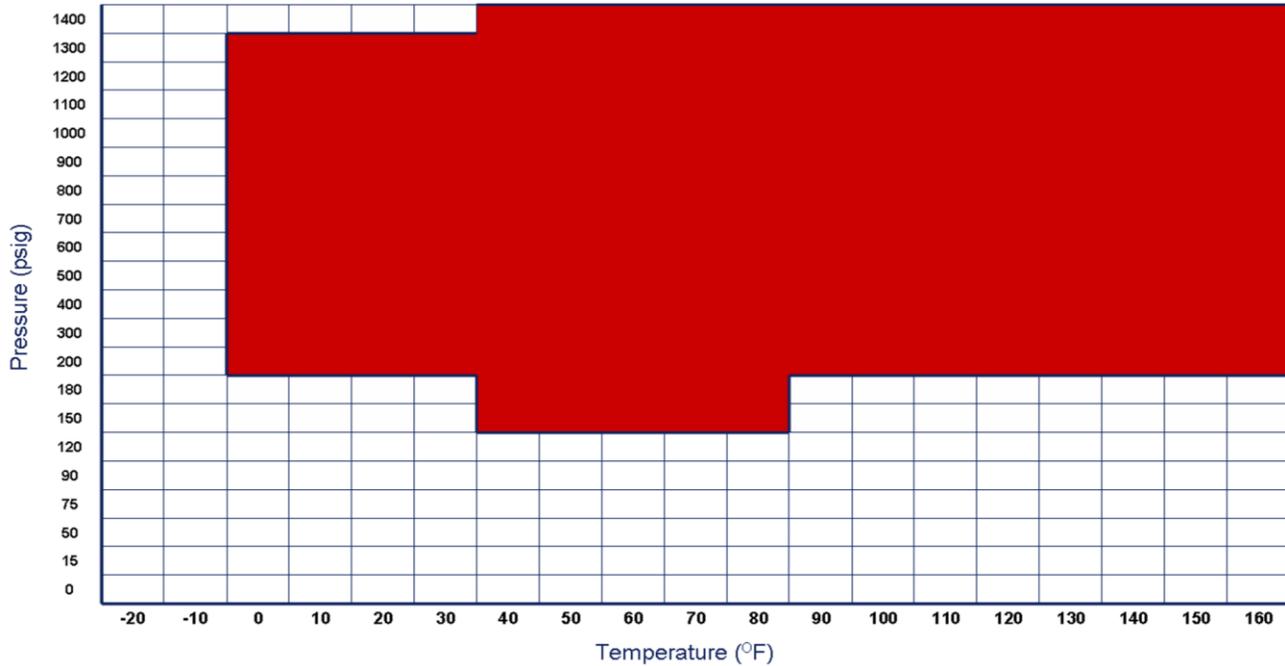
#### **LEAKEAGE OF TOXIC FLUID HAZARD**

For Seniors with a soft-seated valve and grease-assisted slide valves, do not use the "QUICK CHANGE" procedure if the time to complete the plate removal and installation process will exceed 15 minutes.

Exceeding this time frame can allow leakage of possible toxic fluid from the seal. Failure to follow these instructions may result in serious injury or death.

One important factor for an owner or an operator to consider when selecting a grease for a particular application is plate change time. This is the period in minutes required for an operator to initiate, and complete, the Orifice Plate (13) change operation. Refer to [Section 4.1: Plate change procedure](#).

Figure 5-1 Standard grease - Type 1



Pressure (psig) v. Temperature (°F) STANDARD GREASE - TYPE 1 - Part Number:1-213-04-001 OPTIMUM SEALING RANGE WITH NITROGEN FOR A 3" ANSI 600 SENIOR FITTING UNDER LABORATORY CONDITIONS. Colored coordinate boxes indicate no detectable leakage at that Temperature and Pressure for 30 minutes.

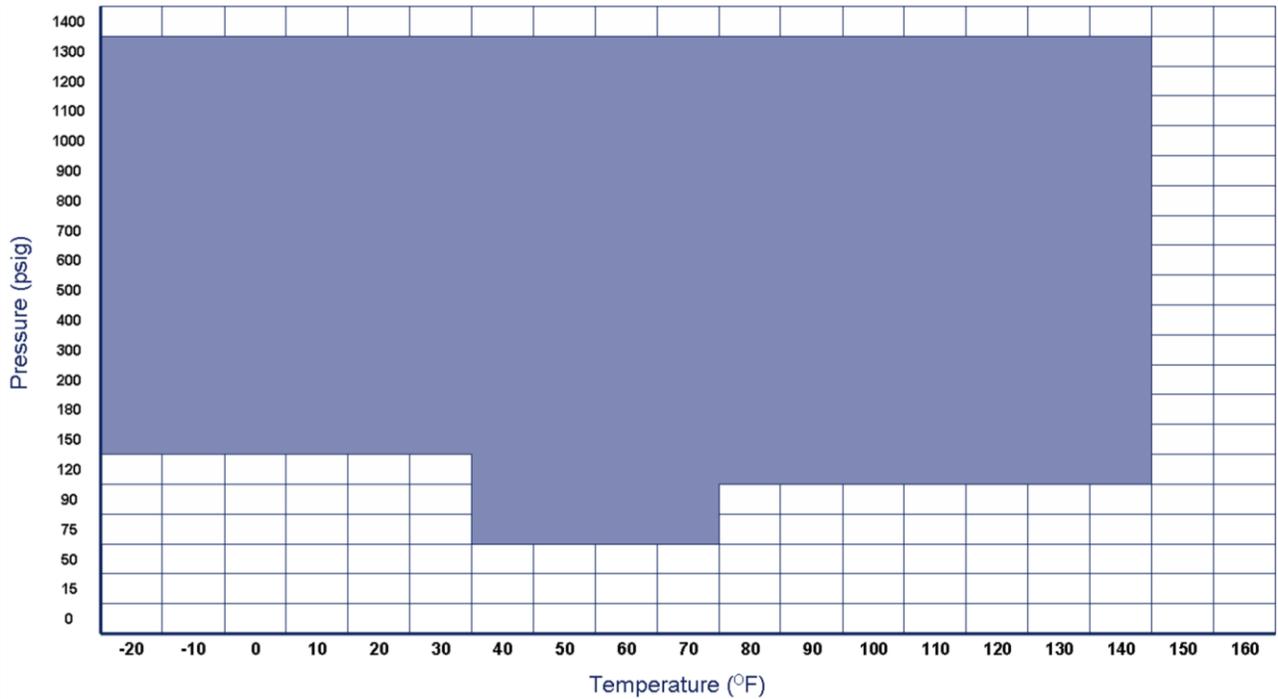
This information can be used as a guideline when evaluating measurement applications. However, the pressure and temperature conditions to which a Senior may be exposed in an application may differ significantly from laboratory conditions.

**Important**

Customers should not rely solely on this information but rather must perform adequate testing on the particular application to confirm that the grease selected is appropriate for that application and will operate as intended.

Lubricant information

Figure 5-2 Sour grease - Type 2



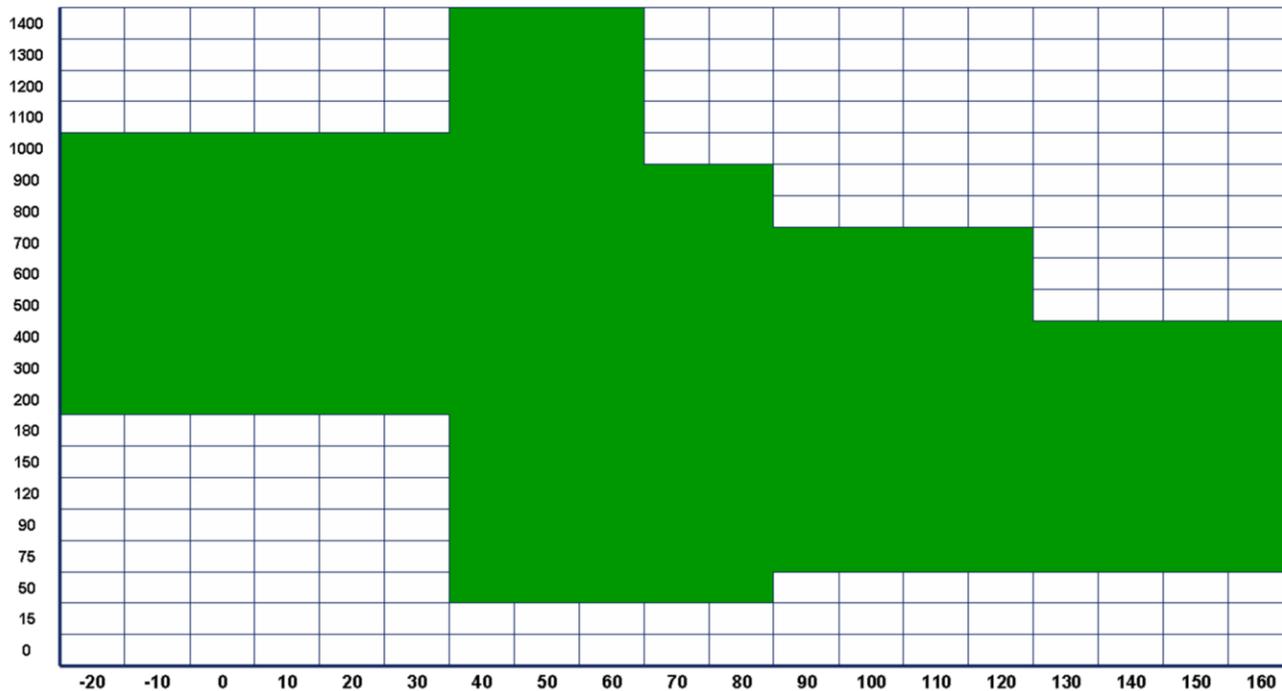
Pressure (psig) v. Temperature (°F) SOUR GAS GREASE - TYPE 2 - Part Number:1-213-04-102 OPTIMUM SEALING RANGE WITH NITROGEN FOR A 3" ANSI 600 SENIOR FITTING UNDER LABORATORY CONDITIONS. Colored coordinate boxes indicate no detectable leakage at that Temperature and Pressure for 30 minutes.

This information can be used as a guideline when evaluating measurement applications. However, the pressure and temperature conditions to which a Senior may be exposed in an application may differ significantly from laboratory conditions.

Important

Customers should not rely solely on this information but rather must perform adequate testing on the particular application to confirm that the grease selected is appropriate for that application and will operate as intended.

Figure 5-3 Carbon dioxide grease - Type 3



Pressure (psig) v. Temperature (°F) CARBON DIOXIDE GREASE - TYPE 3 - Part Number:1-213-04101 OPTIMUM SEALING RANGE WITH NITROGEN FOR A 3" ANSI 600 SENIOR FITTING UNDER LABORATORY CONDITIONS. Colored coordinate boxes indicate no detectable leakage at that Temperature and Pressure for 30 minutes.

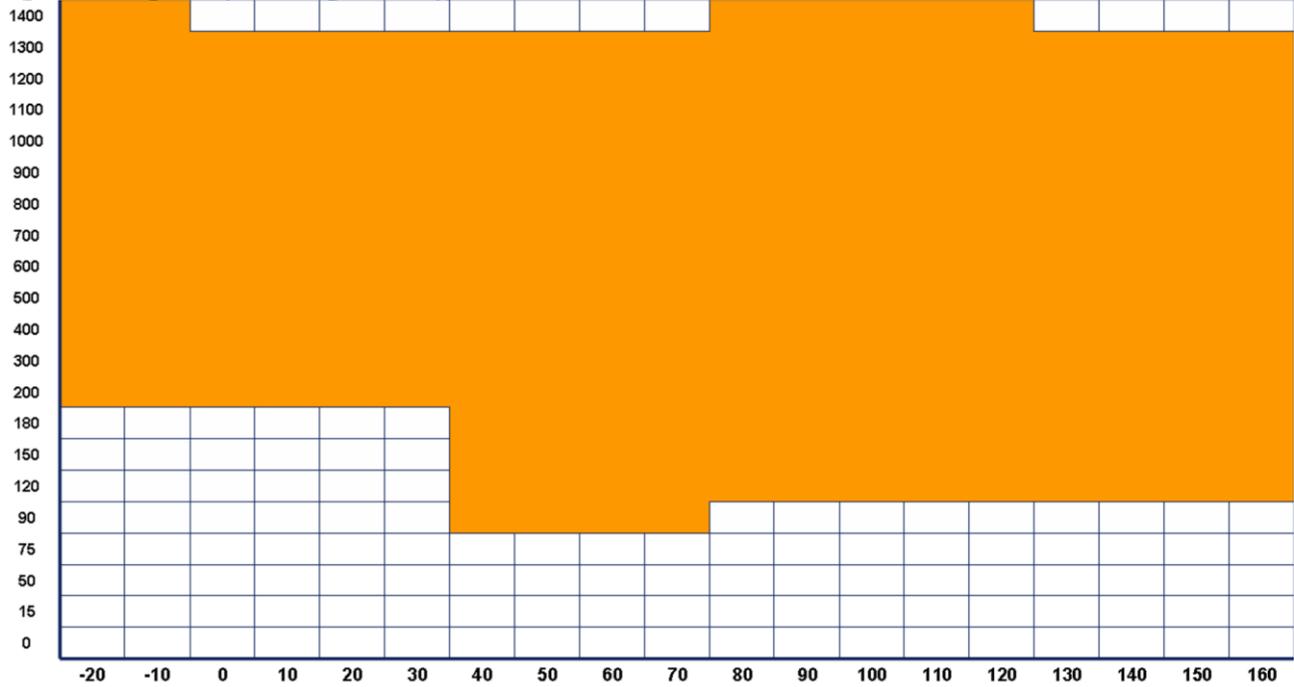
This information can be used as a guideline when evaluating measurement applications. However, the pressure and temperature conditions to which a Senior may be exposed in an application may differ significantly from laboratory conditions.

**Important**

Customers should not rely solely on this information but rather must perform adequate testing on the particular application to confirm that the grease selected is appropriate for that application and will operate as intended.

Lubricant information

Figure 5-4 High temperature grease - Type 4



Pressure (psig) v. Temperature (°F) HIGH TEMPERATURE GREASE - TYPE 4 - Part Number:1-21304-103 OPTIMUM SEALING RANGE WITH NITROGEN FOR A 3" ANSI 600 SENIOR FITTING UNDER LABORATORY CONDITIONS. Colored coordinate boxes indicate no detectable leakage at that Temperature and Pressure for 30 minutes.

This information can be used as a guideline when evaluating measurement applications. However, the pressure and temperature conditions to which a Senior may be exposed in an application may differ significantly from laboratory conditions.

Important

Customers should not rely solely on this information but rather must perform adequate testing on the particular application to confirm that the grease selected is appropriate for that application and will operate as intended.

## 5.3 Torque information

Daniel utilizes several joint assemblies constructing the Senior. To successfully pass all factory tests, factory personnel torque each fastener in the joint assembly to contain pressure and seal the unit. Product owners and product operators must realize that service conditions and time will impact the tightness and strength of factory assembled joints. Some conditions of time and service may loosen the joint assemblies. Some, but not all, of service conditions that will affect joint assemblies are:

- temperature changes
- vibration
- mechanical loads
- pressure loads
- condition of joint assembly components (fasteners, gaskets, sealing surface conditions)

The information contained in this manual is to provide product owners and operators basic torque values to use as a starting point to provide adequate assembly and in-service clamping force in most applications. However, product owners and product operators are ultimately responsible for joint assembly.

### 5.3.1 Joint assembly procedures

1. Clean all fastening and sealing surfaces of all debris and chase threads by running each fastener through its intended tapped hole by hand
2. Assemble joint and apply torque (refer to per torque application patterns provided)
3. Tighten each fastener as follows:
  - Install fastener - apply less than 20% of required torque
  - Second Pass - apply 20% - 30% of required torque
  - Third Pass - apply 30% - 70% of required torque
  - Fourth Pass - apply 100% of required torque
  - Verify that the Sealing Bar (9, 9HP), Sealing Bar Gasket 9A, 9A-HP, 9CF) and Body (4) were brought together evenly and gasket does not leak.
  - Fifth Pass - apply 100% of required torque four hours after Fourth Pass

*Torque information*

**Table 5-3 Clamping bar screw (11) quantity and torque requirements**

Nominal size (in.)	ANSI Class	Number of screws	Screw size	Required torque (ft. - lbs)	
				Minimum	Maximum
<b>2</b>	150	4	1/2"-13	75	95
	300	4	1/2"-13	75	95
	600	4	1/2"-13	75	95
	900	4	1/2"-13	110	110
	1500	8	5/8"-11	145	180
	2500	10	5/8"-11	145	180
<b>3</b>	150	4	1/2"-13	95	120
	300	4	1/2"-13	95	120
	600	4	1/2"-13	95	120
	900	4	5/8"-11	120	150
	1500	10	5/8"-11	145	180
	2500	10	5/8"-11	145	180
<b>4</b>	150	5	1/2"-13	85	105
	300	5	1/2"-13	85	105
	600	5	1/2"-13	85	105
	900	5	1/2"-13	95	120
	1500	12	5/8"-11	145	180
	2500	12	5/8"-11	145	180
<b>6</b>	150	6	1/2"-13	95	120
	300	6	1/2"-13	95	120
	600	6	1/2"-13	95	120
	900	6	1/2"-13	95	120
	1500	14	5/8"-11	145	180
	2500	14	5/8"-11	145	180

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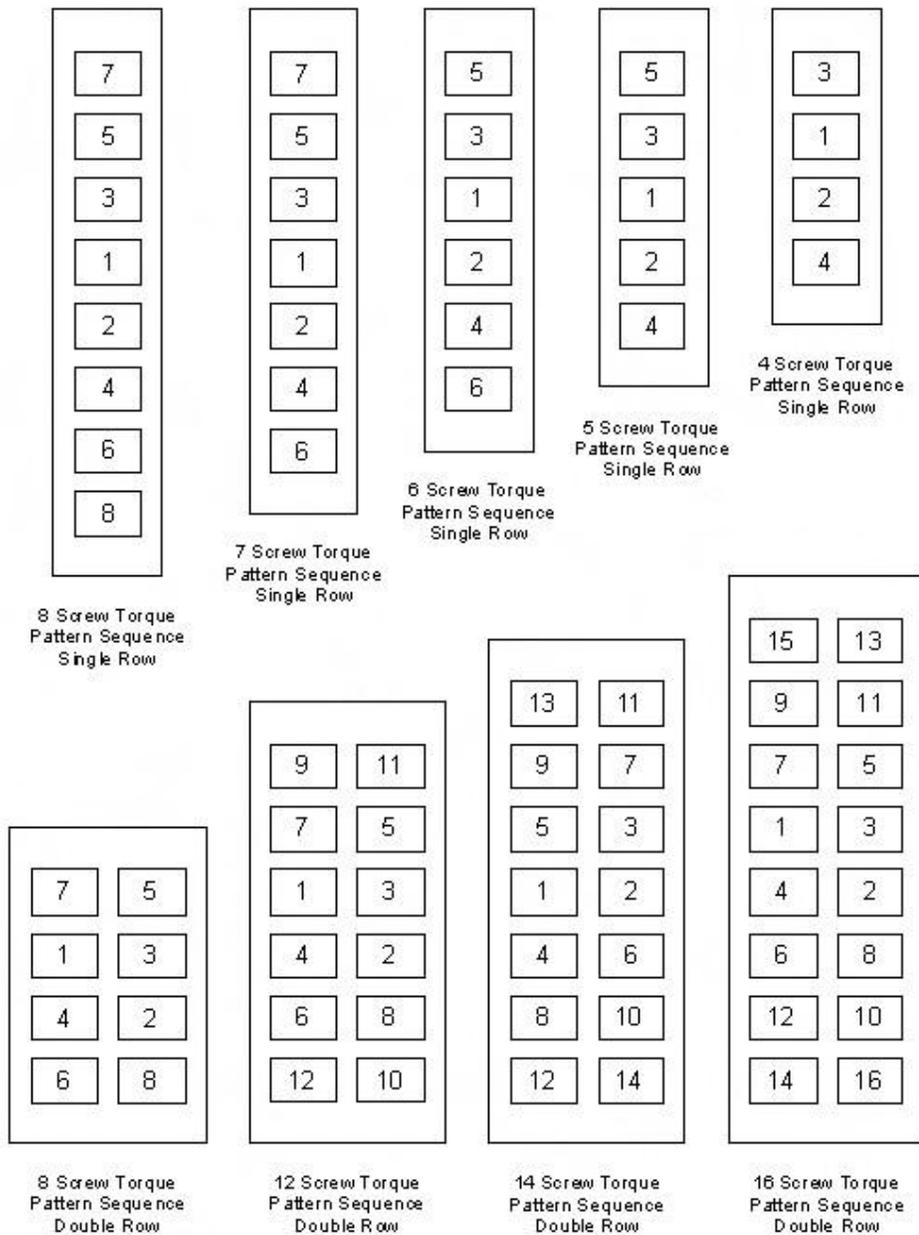
<b>8</b>	150	7	1/2"-13	95	120
	300	7	1/2"-13	95	120
	600	7	1/2"-13	95	120
	900	7	1/2"-13	95	120
	1500	16	5/8"-11	145	180
	2500	28	5/8"-11	145	180

Table 5-3 Clamping bar screw (11) quantity and torque requirements

Nominal size (in.)	ANSI Class	Number of screws	Screw size	Required torque (ft. - lbs)	
				Minimum	Maximum
<b>10</b>	150	8	1/2"-13	75	95
	300	8	1/2"-13	75	95
	600	8	1/2"-13	75	95
	900	8	5/8"-11	145	180
	1500	16	5/8"-11	145	180
	2500	28	5/8"-11	145	180
<b>12</b>	150	10	1/2"-13	75	95
	300	10	1/2"-13	95	120
	600	10	1/2"-13	95	120
	900	10	5/8"-11	120	150
	1500	20	5/8"-11	145	180
	2500	28	5/8"-11	145	180
<b>14</b>	150	11	1/2"-13	75	95
	300	11	1/2"-13	75	95
	600	11	1/2"-13	95	120
	900	22	5/8"-11	145	180
	1500	22	5/8"-11	155	195
<b>16</b>	150	12	1/2"-13	75	95
	300	12	1/2"-13	75	95

	600	12	5/8"-11	145	180
	900	28	5/8"-11	145	180
	1500	28	5/8"-11	155	195

Figure 5-5 Torque pattern sequences



NOTE: For 26 Screw Double Row use the 14 screw Double Row as reference and continue torque pattern sequence

**Table 5-4 Seat Screw Torque LBF-FT**

Size	Torque (lbf-ft)	
	Min	Max
STD Trim 2"-8"	45	55
STD Trim 10"	50	65
STD Trim 12" +:	55	70
316, Monel & all AASG	35	45

**Important**

Daniel calculated the torque values below based on the following design parameters:

- Zinc plated 4130 Carbon Steel screws
- Rubber bonded compressed fiber material gasket
- Assembly at room temperature, factory conditions
- Service temperature range 0<sup>o</sup>F to 100<sup>o</sup>F

Torque values may vary with changes in the design parameters

**Table 5-5 Daniel Senior Orifice Fitting Body(4) / Top (14) stud torque FT-LBS**

Size (in.)	ANSI class	No. of screws	Screw size	Torque	
				Minimum	Maximum
<b>2</b>	150	14	5/8" - 18	120	150
	300	14	5/8" - 18	120	150
	600	14	5/8" - 18	120	150
	900	14	3/4" - 16	210	265
	1500	14	3/4" - 16	250	315
	2500	16	1 1/8" - 12	710	860
<b>3</b>	150	15	5/8" - 18	120	150
	300	15	5/8" - 18	120	150
	600	15	5/8" - 18	120	150

	900	15	3/4" - 16	210	265
	1500	15	3/4" - 16	250	315
	2500	16	1 1/8" - 12	710	860

**Table 5-5 Daniel Senior Orifice Fitting Body(4) / Top (14) stud torque FT-LBS**

Size (in.)	ANSI class	No. of screws	Screw size	Torque	
				Minimum	Maximum
<b>4</b>	150	15	3/4" - 16	210	265
	300	15	3/4" - 16	210	265
	600	15	3/4" - 16	210	265
	900	15	3/4" - 16	250	315
	1500	16	1" - 14	500	625
	2500	16	1 1/8" - 12	710	860
<b>6</b>	150	18	3/4" - 16	210	265
	300	18	3/4" - 16	210	265
	600	18	3/4" - 16	210	265
	900	18	3/4" - 16	275	345
	1500	18	1" - 14	500	625
	2500	18	1 1/8" - 12	710	860
<b>8</b>	150	19	3/4" - 16	210	265
	300	19	3/4" - 16	210	265
	600	19	3/4" - 16	210	265
	900	20	1" - 14	500	625
	1500	18	1 1/8" - 12	710	860
	2500	20	1 1/4" - 8	955	1,105
<b>10</b>	150	22	3/4" - 16	210	265
	300	22	3/4" - 16	210	265
	600	22	3/4" - 16	210	265
	900	22	1" - 14	500	625

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	1500	22	1" - 14	500	625
	2500	20	1-5/8" - 8	2,145	2,295
<b>12</b>	150	22	3/4" - 16	250	315
	300	22	3/4" - 16	250	315
	600	22	3/4" - 16	250	315
	900	22	1 1/8" - 12	705	855
	1500	22	1 1/8" - 12	875	1,025
	2500	20	1-5/8" - 8	2,145	2,295

Table 5-5 Daniel Senior Orifice Fitting Body(4) / Top (14) stud torque FT-LBS

Size (in.)	ANSI class	No. of screws	Screw size	Torque	
				Minimum	Maximum
<b>14</b>	150	24	3/4" - 16	210	265
	300	24	3/4" - 16	210	265
	600	24	7/8" - 14	335	420
	900	24	7/8" - 14	425	530
	1500	28	1-1/4"-12	975	1,125
<b>16</b>	150	31	3/4" - 16	210	265
	300	31	3/4" - 16	210	265
	600	28	1" - 14	500	625
	900	28	1" - 14	525	655
	1500	32	1-1/4"-12	1,250	1,400

## 5.4 Plate and valve carrier clearances

Table 5-6 Plate carrier to valve carrier clearances (inches)

Line size	Minimum clearance	Maximum clearance
2	.006	.018
3	.006	.018
4	.006	.018
6	.006	.018
8	.006	.018
10	.008	.023
12	.009	.028
14	.010	.030
16	.012	.035

## 5.5 Instructions to retro-fit Senior with soft seat slide valve

### 5.5.1 Scope (applicable to 2" thru 12", 150 thru 600 ANSI only)

These instructions list the required steps to field retro-fit a Soft Seat Slide Valve sub-assembly within a Daniel Senior Orifice Fitting. Read these instructions prior to the implementation of this procedure.

All tools required to perform this procedure should be field available, except for recommended Daniel tool #J-01955 (can be purchased separately, Daniel part number 1-201-99-021). Refer to [Section 5.5.7: Senior Fittings 2"-8" Non "API-14.3" & all 10" thru 12"](#), [Step 42](#) thru [Step 44](#) for additional information for instructions on the removal of the existing plate.

## 5.5.2 Material List

The field technician will need to verify that all materials necessary for the retro-fit are included in the parts kit prior to beginning this procedure. Below is a breakdown of those parts and quantities (refer to Figure 5-6 for pictorial reference). Should any parts be missing, contact your authorized Daniel representative for replacement parts.

**Table 5-7 Material list**

Item no.	Description	Material	Numbered required
3-SS	Soft Seat Slide Valve Strip	5/16 X 1-3/8 410 SS Flat Bar	1
9A	Sealing Bar Gasket (9A, 9A-HP or 9CF)	Nitrile/Cotton duct "compoflex"	1
15-SS	Soft Seat Slide Valve Spring	Inconel X750	2
16-SS	Spring Loaded Slide Valve Carrier Guides (2" - 14" only-not shown in Figure 5-6)	VC Guide Base — 316SS VC Leaf Spring - Elgiloy	2
17-SS	Soft Seat Slide Valve Carrier	316SS	1
17A	Slide Valve Carrier Stop Pin (tapered dowel)	CS	2
17B	Plate Carrier Positioner	316SS	1
18-SS	Soft Seat Slide Valve Seat	316SS	1
18A	Slide Valve Seat / Body-Top Gasket	Aramide Fiber/NBR binder non-Asbestos Flat Sheet	1
23C	1/4" NPT Pipe Plug (to replace fitting's Grease Gun Assembly)	CS	1
23D	Soft Seat Slide Valve Warning Plate	304SS	1
45	Soft Seat O-Ring	HNBR — other materials optional	1
46	Slide Valve Assembly Flat Washer	18-8SS	2
47	Slide Valve Assembly Machine Screw	18-8SS	2
48	Soft Seat Slide Valve Operating Instruction Plate (to replace existing Instruction Plate)	304SS	1
	Daniel Tool #J-01955, Recommended Tool to Remove Existing Instruction Plate (not included in this parts kit, but can be purchased separately, Daniel part number 1-201-99-021)		1

Material List

## 5.5.3 Disassembly

**Important**

It is not necessary to remove the Senior from the process line to facilitate these instructions. Removing the Daniel Senior Orifice Fitting should only be done at the discretion of the end user and after completing Step 1, below.

---

Refer to [Figure 5-6](#) for pictorial reference.

1. Isolate the Senior from line pressure.
2. Open the Equalizer Valve (1) to equalize the pressure between the Top (14) and the Body (4) of the Senior.
3. Rotate the Slide Valve Shaft (5) to open the slide valve assembly.
4. Rotate the Lower Plate Carrier Shaft (6) and the Upper Plate Carrier Shaft (7) to raise the Plate Carrier (8DM or 8DMC), the Orifice Plate (13) and the Plate Seal Ring (8E-DSC, 8E, etc.) sub-assembly into the Top (14).

**⚠ WARNING****PRESSURIZED TOXIC FLUID HAZARD**

When opening the bleeder valve (10B) or venting the Top (14) thru the bleeder valve (10B), direct the released pressurized fluid and/or gas to safe area away from any individual in accordance with local environment regulations.

The bleeder valve (10B) releases pressurized fluid that may cause contamination and/or accumulation of volatile gas mixtures. Failure to do so may cause serious injury or death.

---

5. Open the Bleeder Valve (10B) and bleed the internal pressure to atmosphere. Leave both the Equalizer Valve (1) and the Bleeder Valve (10B) open.
6. Loosen the Clamping Bar Screws (11) and remove the Clamping Bar (12HP).
7. Remove the Sealing Bar (9) and Sealing Bar Gasket (9A, 9A-HP or 9CF).
8. Thoroughly remove all residues from the Sealing Bar (9) and from the gasket surface of the Top (14).
9. Discard the gasket, its replacement is in the parts kit. Store the other items in a safe place for reuse later.
10. Rotate the Upper Plate Carrier Shaft (7) to raise the Plate Carrier (8DM or 8DMC), Orifice Plate (13) and Plate Seal Ring (8E-DSC, 8E, etc.) sub-assembly and remove from the Senior.

*Disassembly*

11. Store these items in a safe place for reuse later (remove the plate/seal assembly from the Plate Carrier (8DM or 8DMC) and store as a separate item).
12. Mark four places minimum on the Body (4) and Top (14) crown flanges for match marks, one each per side (six marks preferred, two each per long side and one each per short side).
13. Loosen and remove the stud bolt Hex Nuts (32) and store in a safe place for reuse later.
14. Using a jib crane or equivalent, gently raise the Top (14) from the Body (4).

**⚠ CAUTION**

LIFTING HAZARD

The field technician should always use mechanical assistance when lifting the Top (14).

Failure to do so may result in serious injury.

---

15. Move the Top (14) to a safe work area. Place the Top (14) on a clean sturdy surface with the Slide Valve Seat (18) facing upward (if the Slide Valve Strip (3) is still attached to the Slide Valve Seat (18), remove it at this time).

**⚠ WARNING**

ESCAPING PRESSURE HAZARD

Do not remove the Grease Gun Double ball check valve (24) while the Senior is under line pressure.

Doing so will allow line pressure to escape resulting in injury or death.

---

16. Remove the Grease Gun (23) assembly from the Top (14). This item will not be reused. Its replacement, 1/4" NPT Pipe Plug (23C) is in the parts kit.
17. The Slide Valve Seat (18) is secured to the Top (14) with either 12-point headed cap screws or hexagon socket head cap screws. As applicable, use either a 3/8" 12-point deep socket or a 5/16" hexagon wrench adapter to loosen and remove the Slide Valve Seat Screws (18B).
18. Store the Slide Valve Seat Screws (18B) in a safe place for reuse later.
19. Using a soft mallet, gently strike the side of the Slide Valve Seat (18) to loosen and remove it from the Slide Valve Seat/Body-Top Gasket (18A).
20. Remove the Slide Valve Seat/Body-Top Gasket (18A) from the Top (14) crown flange. These items will not be reused. Their replacements are in the parts kit.
21. Thoroughly remove all residue from the gasket surface of the Top (14) crown flange. Store the Top (14) in a safe place. See re-assembly instructions later in this procedure.

*Disassembly*

## 5.5.4 Slide valve removal

2" - 14" Only - From inside the slide valve cavity of the Body (4), remove the Slide Valve Strip (3), Slide Valve Carrier (17), Slide Valve Springs (15) and Slide Valve Carrier Guides (16). These items will not be reused. Their replacements are in the parts kit.

16" Only - From inside the slide valve cavity of the Body (4), remove the Slide Valve Strip (3), Slide Valve Carrier (17), Slide Valve Springs (15) and Slide Valve Carrier Guides (16C). These items will not be reused except the Slide Valve Carrier Guides. The replacements of the other items are in the parts kit.

## 5.5.5 Re-assembly

Some assembly may be required, of the Soft Seat Slide Valve sub-assembly prior to installing into the Body (4) slide valve cavity. If so, use the following steps (refer to [Figure 5-6](#)):

1. On a clean sturdy surface, place the Soft Seat Slide Valve Strip (3-SS) so that the tapered surface is facing upwards. Lubricate the tapered surface with a low-viscosity lubricant or oil suitable for use in the flow media subjected to the Senior.
2. Place the tapered surface of the Soft Seat Slide Valve Carrier (17-SS) against the tapered surface of the Soft Seat Slide Valve Strip (3-SS) being certain that the rack profiles of the Slide Valve Carrier (17) are parallel with the assembly surface.
3. Insert the Slide Valve Assembly Machine Screw (47) through the Soft Seat Slide Valve Spring (15-SS) and then through the Slide Valve Assembly Flat Washer (46).
4. Add a thread sealant (Loc-Tite or equal) to the threads of the Slide Valve Assembly Machine Screw (47) and insert the Screw/Spring/Washer sub-assembly through the slot of the Soft Seat Slide Valve Carrier (17-SS). Install it into the threaded hole of the Soft Seat Slide Valve Strip (3-SS). Tighten until the threads bottom-out.

---

### Important

For 12" and smaller assemblies, the Plate carrier positioner (17B) is cast integrally on the bottom of the soft seat slide valve carrier (17-SS).

- 
5. Turn the Soft Seat Slide Valve sub-assembly over to expose the grooved surface of the Soft Seat Slide Valve Strip (3-SS). Lubricate the Soft Seat O-Ring (45) with a lowviscosity oil and install into the grooved portion of the Slide Valve Strip (3).

---

### Important

Do not allow the O-Ring (45) to "roll" and/or expose its molded flash joint. This could prevent the O-Ring (45) from sealing during the function test.

---

6. Install the Soft Seat Slide Valve sub-assembly into the Body (4) slide valve cavity. *Slide valve*

*removal*

### 5.5.6 Senior Fittings 2"-8" for "API-14.3"

1. Retrieve the Plate Carrier (8DM or 8DMC) from its safe storage.
2. Reinstall it into the Senior Body (4) by first rotating the Lower Plate Carrier Shaft (6) "backwards" to "back-rack" the Plate Carrier (8DM or 8DMC), ensuring proper gear engagement, and then reversing the Shaft rotation to lower the Plate Carrier (8DM or 8DMC) into the slot region of the Body (4), until it rests against the Plate Carrier Stop Pin (42).

---

#### Important

Mismatch of the Plate Carrier (8DM or <sup>1</sup>DMC) racks and Shaft pinions will prevent the Plate Carrier (8DM or 8DMC) from resting properly against the Slide Valve Carrier Stop Pin (17A).

---

3. Retrieve the Soft Seat Spring-Loaded Slide Valve Carrier Guides (16-SS) from the parts kit.
4. Place the guides on the guide rails of the Soft Seat Slide Valve Carrier (17-SS) and install this assembly onto the machined pads above the Shafts.
5. Make certain that the racks of the Soft Seat Slide Valve Carrier (17-SS) engage the pinions of the Slide Valve Shaft (5).

- 
- <sup>1</sup>. Rotate the Slide Valve Shaft (5) to move the slide valve assembly until it partially covers the slot within the Body (4).

6. With the Plate Carrier (8DM or 8DMC) resting against the Plate Carrier Stop Pin (42), and while holding the slide valve assembly in place against the machined pads, rotate the Slide Valve Shaft (5) to move the slide valve assembly to its full "close" and full "open" position several times.

The Plate Carrier Spring Pin (8A), which is installed in the Plate Carrier (8DM or 8DMC), should depress slightly as the Soft Seat Slide Valve Carrier (17-SS) moves over it. The Soft Seat Slide Valve Carrier (17-SS) should not contact the Spring Pin body (if the Spring Pin requires an adjustment, it can be raised or lowered by using a 3/8" or wider flat blade screwdriver to depress the spring plunger, inserting the blade in the notches outside of the plunger and rotating as needed).

7. Rotate the Slide Valve Shaft (5) to move the slide valve assembly to its "open" position and expose the Plate Carrier (8DM or 8DMC). By rotating the Lower Plate Carrier Shaft (6), raise and lower the Plate Carrier (8DM or 8DMC) within the slot region of the Body (4) to verify that the Plate Carrier (8DM or 8DMC) will clear the slide valve assembly. If additional clearance is needed, file or grind the body cavity or Soft Seat Slide Valve Carrier's (17-SS) rack. Store the Plate Carrier (8DM or 8DMC) in a safe place for reuse later.

## NOTICE

Do not move the Soft Seat Slide Valve Assembly from this position, [Step 8](#). If the Soft Seat Slide Valve Assembly is located too far in either direction, the Assembly might be damaged or it could become dislodged and possibly cause damage to the Soft Seat Slide Valve Seat (18-SS).

## 5.5.7 Senior Fittings 2"-8" Non "API-14.3" & all 10" thru 12"

1. Retrieve the Plate Carrier (8DM or 8DMC) from its safe storage.
2. Reinstall it into the Senior Body (4) by first rotating the Lower Plate Carrier Shaft (6) "backwards" to "back-rack" the Plate Carrier (8DM or 8DMC), ensuring proper gear engagement, and then reversing the Shaft rotation to lower the Plate Carrier (8DM or 8DMC) into the slot region of the Body (4) until it rests against the Plate Carrier (8DM or 8DMC) stop pin.

---

### Important

Mismatch of the Plate Carrier (8DM or 8DMC) racks and Shaft pinions will prevent the Plate Carrier (8DM or 8DMC) from resting properly against the Slide Valve Carrier Stop Pin (17A).

---

3. Retrieve the Soft Seat Spring-Loaded Slide Valve Carrier Guides (16-SS) from the parts kit. Place the guides along the guide rails of the Soft Seat Slide Valve Carrier (17-SS) and place these onto the machined pads above the Shafts located inside the slide valve cavity of the Body (4). Make certain that the racks of the Soft Seat Slide Valve Carrier (17-SS) engage the pinions of the Slide Valve Shaft (5).
4. Verify that the soft seat slide valve assembly has sufficient clearance to move freely over the Plate Carrier (8DM or 8DMC). Material may need to be added or removed from the Plate Carrier Positioner (17B) portion of the Soft Seat Slide Valve Carrier (17-SS) to provide this clearance.
5. Place a depth indicator inside the Senior's bore with its anvil against the Plate Carrier (8DM or 8DMC).
6. While holding the soft seat slide valve assembly in place against the machined pads, rotate the Lower Plate Carrier Shaft (6) to raise the Plate Carrier from its bottom rest until it strikes against the Plate Carrier Positioner (17B) portion of the Slide Valve Carrier (17).  

The full indicated movement of the Plate Carrier (8DM or 8DMC) must be within the values listed in [Table 5-5](#). If adjustments are needed, the Plate Carrier Positioner (17B) portion of the Soft Seat Slide Valve Carrier (17-SS) can be modified by grinding to remove material or by welding with 316SS weld-rod to add material.
7. Rotate the Slide Valve Shaft (5) position and expose the Plate Carrier (8DM or 8DMC).
8. Remove the Plate Carrier (8DM or 8DMC) from the Body (4) by rotating the Lower Plate Carrier Shaft (6). Store the Plate Carrier (8DM or 8DMC) in a safe place for reuse later.

## NOTICE

Do not move the Soft Seat Slide Valve Assembly from this position, [Step 9](#). If the Soft Seat Slide Valve Assembly is located too far in either direction, the Assembly might be damaged or it could become dislodged and possibly cause damage to the Soft Seat Slide Valve Seat (18-SS).

---

9. Rotate the Slide Valve Shaft (5) to move the soft seat slide valve assembly until it partially covers the slot within the Body (4).

Re-assemble the Top (14) as instructed below.

1. Retrieve the Top (14) from its safe storage. Verify that the gaskets surfaces (sealing bar region of tee-slot and the crown flange) have been cleaned of all residue.
  2. Place the Top (14) on a clean, sturdy surface with the crown flange facing upward.
  3. Retrieve the Slide Valve Seat/Body-Top Gasket (18A) and the Soft Seat Slide Valve Seat (18-SS) from the parts kit.
  4. Position the Gasket so that the holes in the Gasket match-up to the holes in the Top (14) (some holes in the Gasket may not have mating holes in the Top (14)).
  5. Place the Soft Seat Slide Valve Seat (18-SS) (counter-bored holes facing upward) on the Slide Valve Seat/Body-Top Gasket (18A), making certain that the holes through the Seat match the holes of the Gasket/crown flange.
  6. Retrieve the Slide Valve Seat Screws (18B) from their safe storage.
  7. Lubricate the threads of the screws with a low-viscous oil. Insert the Screws through the holes of the Soft Seat Slide Valve Seat (18-SS) and install them into the threaded holes of the Top (14).
  8. Using a 3/8" 12-point socket, tighten the Slide Valve Seat Screws (18B) until the Soft Seat Slide Valve Seat (18-SS) is "snug" against the Gasket/crown flange.
  9. Apply torque to the screws in a crisscross fashion, working from the center of the Soft Seat Slide Valve Seat (18-SS) outward.
  10. Tighten the Slide Valve Seat Screws (18B) to 35-40 ft.lbf torque.
  11. Retrieve the Slide Valve Carrier Stop Pins (17A) from the parts kit.
  12. Insert the small diameter end of the Slide Valve Carrier Stop Pins (17A) into the stop pin holes of the Soft Seat Slide Valve Seat (18-SS) (located between the Slide Valve Seat Screw (18B) hole pattern and the outer edge of the Soft Seat Slide Valve Seat (18-SS)).
  13. Using a hammer or metal mallet, drive the Slide Valve Carrier Stop Pins (17A) into the Slide Valve Seat (18), locking them into place.
  14. Retrieve the 1/4" NPT Pipe Plug (23C) and the Soft Seat Slide Valve Warning Plate (23DSS) from the parts kit.
  15. Lubricate the threads of the 1/4" NPT Pipe Plug (23C) with a thread sealant or Teflon tape.
  16. Insert the 1/4" NPT Pipe Plug (23C) through the hole of the Soft Seat Slide Valve Warning Plate (23D-SS) and install the 1/4" NPT Pipe Plug (23C) into the hole vacated by the Grease Gun (23).
  17. Tighten the 1/4" NPT Pipe Plug (23C) as needed to provide a pressure tight seal.
- 

## Important

Do not remove the Grease Seal Double Ball Check Valve (24) prior to installing the 1/4" NPT Pipe Plug (23C).

## **▲ CAUTION**

### LIFTING HAZARD

The field technician should always use mechanical assistance when lifting the Top (14).

Failure to do so may result in serious injury.

---

18. Using a jib crane or equivalent, gently lower the Top (14) onto the Body (4). Make certain that the match up lines on the crown flanges of the Top (14) and Body (4) line up as close as possible.
  19. Retrieve the stud bolt Hex Nuts (32) from storage and lubricate the threads with a lowviscous oil.
  20. Install two Hex Nuts (32) on both "long" sides of the crown flange joint and tighten to "snug" only.
  21. Rotate the Slide Valve Shaft (5) to move the soft seat slide valve assembly from full "open" to full "close" position several times to verify that it operates smoothly.
  22. Rotate the Slide Valve Shaft (5) to move the soft seat slide valve assembly into its "open" position.
  23. Retrieve the Plate Carrier (8DM or 8DMC) from its safe storage.
  24. Reinstall it into the Senior Top (14) by rotating the Upper Plate Carrier Shaft (7) to "back-rack" the Plate Carrier (8DM or 8DMC) and then reversing the Shaft rotation to lower the Plate Carrier (8DM or 8DMC) into the slot region of the Top (14).
  25. Continue to lower the Plate Carrier (8DM or 8DMC) through the Slide Valve Seat (18) to verify that it clears the soft seat slide valve assembly and engages the Lower Plate Carrier Shaft (6).
  26. Rotate the Lower Plate Carrier Shaft (6) until the Plate Carrier (8DM or 8DMC) rests against the Plate Carrier Stop Pin (42).
  27. Raise and lower the Plate Carrier (8DM or 8DMC) several times to verify smooth operation. Movement of the Top (14) may be required to accomplish this task.
- 

### Important

Mismatch of the Plate Carrier (8DM or 8DMC) racks and Shaft pinions will prevent the Plate Carrier (8DM or 8DMC) from resting properly against the Slide Valve Carrier Stop Pin (17A) when lowered and could possibly require the removal of the Top (14) to extract the Plate Carrier (8DM or 8DMC) from the Body (4).

---

28. With the Plate Carrier (8DM or 8DMC) resting against the Plate Carrier Stop Pin (42), rotate the Slide Valve Shaft (5) to move the soft seat slide valve assembly to its full "close" position and full "open" position several times. This is to verify that it operates smoothly over the Plate Carrier (8DM or 8DMC). For assemblies using the Plate Carrier (8DMC), a slight pressure will be observed as the soft seat slide valve assembly moves over the Plate Carrier (8DMC).

29. Rotate the Slide Valve Shaft (5) to move the soft seat slide valve assembly into its full “open” position.
  30. Install the balance of the stud bolt Hex Nuts (32) and tighten to “snug” only.
  31. Apply torque to the Hex Nuts (32) in a crisscross fashion, working from the center of the crown flange outward.
  32. Tighten the Hex Nuts (32) to the minimum torque values shown in [Table 5-4](#). Allowable tolerance of these torque values is +20% or +20 ft.lbf, whichever is less.
  33. Retrieve the Plate Carrier (8DM or 8DMC), Orifice Plate (13) and Plate Seal Ring (8EDSC, 8E, etc.) from their safe storage.
  34. Reassemble and install the sub-assembly into the fitting Top (14) by rotating Upper Plate Carrier Shaft (7) to “back-rack” the Plate Carrier (8DM or 8DMC) and then reversing the Shaft rotation to lower the sub-assembly until it clears the gasket surface of the teeslot region.
- 

#### Important

Mismatch of the Plate Carrier (8DM or 8DMC) racks and Shaft pinions will prevent the Plate Carrier (8DM or 8DMC) from resting properly against the Slide Valve Carrier Stop Pin (17A) when lowered and could possibly require the removal of the Top (14) to extract the Plate Carrier (8DM or 8DMC) from the Body (4).

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35. Retrieve the Sealing Bar Gasket (9A, 9A-HP or 9CF) from the parts kit and position it over the slot opening of the Top (14) tee-slot region.
36. Retrieve the Sealing Bar (9 or 9HP) and Clamping Bar (12 or 12HP) from their safe storage.
37. Position the Sealing Bar (9 or 9HP) over the Gasket.
38. Insert the Clamping Bar (12 or 12HP) into the tee-slot and position over the Sealing Bar (9 or 9HP).
39. Tighten the Clamping Bar Screws (11) to “snug” only.
40. Apply torque to the Screws in a back-and-forth fashion, working from the center of the Clamping Bar (12 or 12HP) outward.
41. Tighten the Clamping Bar Screws (11) to the minimum torque values shown in [Table 53](#). Allowable tolerance of these torque values is +15% or +15 ft.lbf, whichever is less.
42. Using Daniel tool #J-01955 (P/N 1-201-99-021) or a thin profile slotted pry-bar, drive the tool under the corners of the existing slide valve operating instruction plate to dislodge the drive screws.
43. Remove and discard the Plate.
44. Retrieve the Soft Seat Slide Valve Operating Instruction Plate (48) (it already has drive screws inserted) from the parts kit, and install into the holes vacated by the “old” Instruction Plate.
45. If the Senior was removed from the process line, reinstall at this time.
46. Close the Bleeder Valve (10B).
47. Apply line pressure to the Senior and verify that the gasket joints of the Sealing Bar (9 or 9HP)/Top (14) and the crown flanges of the Body are not leaking.

48. Close the Equalizer Valve (1) and rotate the Slide Valve Shaft (5) to close the Soft Seat Slide Valve assembly.

## **⚠ WARNING**

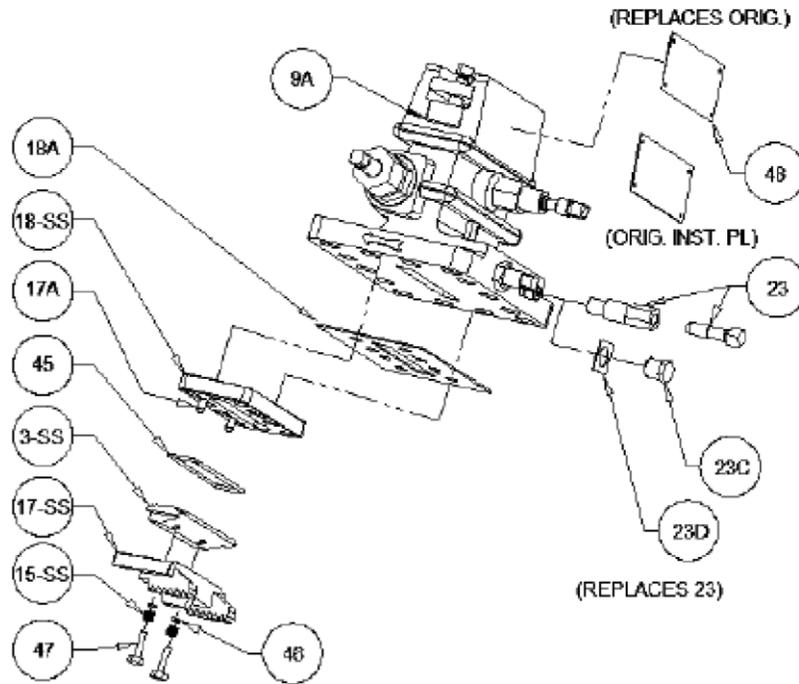
### PRESSURIZED TOXIC FLUID HAZARD

When opening the bleeder valve (10B) or venting the Top (14) thru the bleeder valve (10B), direct the released pressurized fluid and/or gas to safe area away from any individual in accordance with local environment regulations.

The bleeder valve (10B) releases pressurized fluid that may cause contamination and/or accumulation of volatile gas mixtures. Failure to do so may cause serious injury or death.

- 
49. Open the Bleeder Valve (10B) and bleed the Top (14) to atmosphere to verify that the Soft Seat Slide Valve Assembly has sealed.
  50. Close the Bleeder Valve (10B) and open the Equalizer Valve (1).
  51. Rotate Slide Valve Shaft (5) to open the slide valve assembly.
  52. Rotate the Upper Plate Carrier Shaft (7) and the Lower Plate Carrier Shaft (6) until the Plate Carrier (8DM or 8DMC) rests against the Plate Carrier Stop Pin (42).
  53. Rotate the Slide Valve Shaft (5) to close the slide valve assembly.
  54. Close the Equalizer Valve (1).
  55. Open the Bleeder Valve (10B) and bleed the pressure to atmosphere.
  56. Close the Bleeder Valve (10B).
-

Figure 5-6 Daniel Senior Orifice Fitting

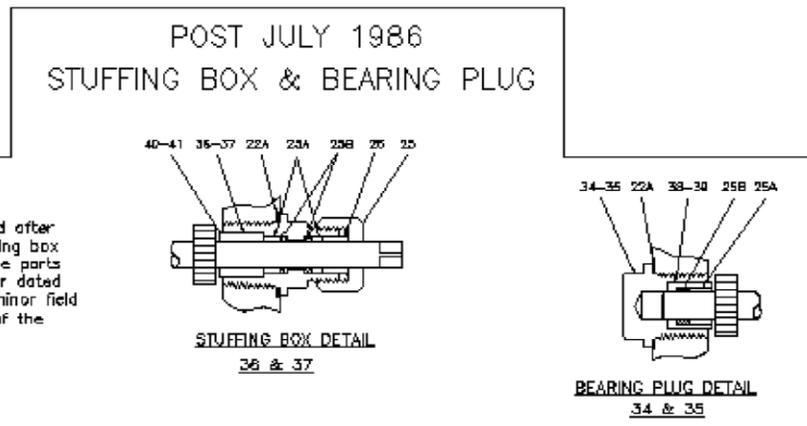
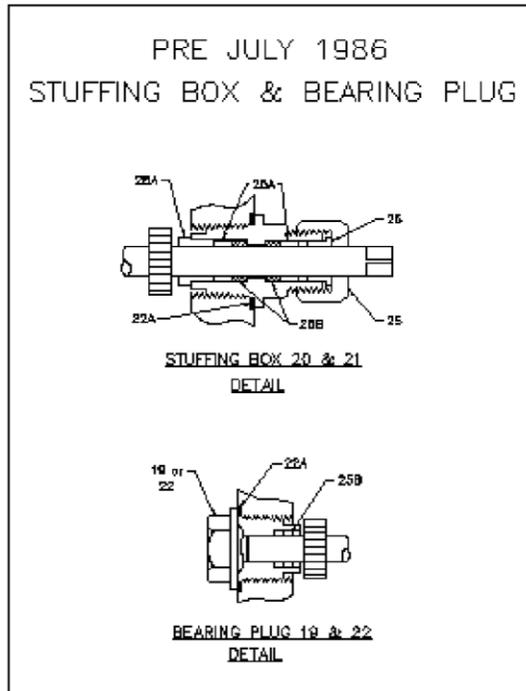


Refer to [Table 5-7](#) in [Section 5: Supplemental information](#) for item numbers and part descriptions

**Important**

Fittings manufactured after July 1985 use these stuffing box and bearing plug parts. The parts are interchangeable to prior dated fittings, but may require minor field modification (shortening) of the sleeves only.

Figure 5-7 Stuffing box and bearing plug



NOTE: Fittings manufactured after July, 1986 use these stuffing box and bearing plug parts. The parts are interchangeable in prior dated fittings, but may require minor field modification (shortening) of the sleeves only.

# DANIEL™ MEASUREMENT AND CONTROL, INC.

## RETURNED MATERIAL AUTHORIZATION

### REPAIR FORM FOR USED EQUIPMENT INCLUDING DECONTAMINATION/CLEANING STATEMENT

A Return Material Authorization (RMA) number must be obtained prior to returning any equipment for any reason. Download the RMA form from the Support Services web page by selecting the link below.

<http://www2.emersonprocess.com/EN-US/BRANDS/DANIEL/SUPPORT-SERVICES/Pages/Support-Services.aspx>

1. Return Material Authorization (RMA) Number \_\_\_\_\_
2. Equipment to be returned:  
Model Number \_\_\_\_\_ Serial Number \_\_\_\_\_
3. Reason for return:  
\_\_\_\_\_  
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Decontamination/Cleaning Fluids Process	
A. List each substance in which the equipment was exposed. Attach additional documents if necessary.	
Common CAS# if Name	Used for Hazardous Waste (20 CFR 261) if used for hazardous waste
	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Yes <input type="checkbox"/> No
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B. Circle any hazards and/or process fluid types that apply:	
Infertious	Radioactive
Explosive	Pryophoric
Poison Gas	
Cyanides Sulfides	Corrosive Oxidizer
Flammable	Poison Carcinogen
Peroxide	Reactive-Air
Reactive- Water	Reactive- Other (list):
<b>Other Hazard Category (list):</b>	
C. Describe decontamination/cleaning process. Include MSDS description for substances used in decontamination and cleaning processes. Attach additional documents if necessary.	

## Shipping Requirements

**Failure to comply with this procedure will result in the shipment being refused.**

1. Write the RMA number on the shipping package.
2. Inside the package include one copy of this document and all required Material Safety Data Sheets (MSDS)
3. Outside of the package attach one copy of this document and all required Material Safety Data Sheets (MSDS).

**THIS EQUIPMENT, BEING RETURNED "FOR REPAIR," HAS BEEN COMPLETELY DECONTAMINATED AND CLEANED. ALL FOREIGN SUBSTANCES HAVE BEEN DOCUMENTED ABOVE AND MSDS SHEETS ARE ATTACHED.**

By \_\_\_\_\_  
(Signature) ( Print name )

Title: \_\_\_\_\_ Date: \_\_\_\_\_

Company: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_



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