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Miquelon Daniel Senior

Orifice Fittings

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DANIEL SENIOR[®] ORIFICE FITTINGS

**2" - 8" 150-1500
2" - 6" 2500
10" - 14" 150-1500**

**PARTS LIST AND MATERIALS, INSTRUCTIONS
FOR INSTALLATION, OPERATION
AND MAINTENANCE**

**DANIEL MEASUREMENT AND CONTROL, INC.
AN EMERSON PROCESS MANAGEMENT COMPANY
HOUSTON, TEXAS**

**Part Number 3-9008-001
Revision C**

MARCH 2003



IMPORTANT INSTRUCTIONS

Daniel Measurement and Control, Inc. (Daniel) designs, manufactures and tests this flow product to be operated within specific flow conditions. Because these instruments are sophisticated technical products, you must install, use and maintain them to ensure that they operate within the range specified on the equipment nameplate. The following instructions must be adhered to and integrated into your safety program when installing, using and maintaining Daniel Products, including Daniel Senior[®] Orifice Fittings.



SERIOUS PERSONAL INJURY OR DEATH

Read nameplate to determine maximum allowable operating pressure (MAOP) before placing product in service.

Operating this product above MAOP may lead to serious injury or death.

- **Read all instructions prior to installing, operating and servicing the product.** If this instruction manual is not the correct manual, telephone 1-713-827-6314 and the requested manual will be provided. Save this instruction manual for future reference.
- If you do not understand any of the instructions, contact your Daniel representative for clarification.
- Follow all warnings, cautions and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation and maintenance of the product.
- Install your equipment as specified in the installation instructions of the appropriate instruction manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, use qualified personnel to install, operate, update, program and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by the manufacturer. Unauthorized parts and procedures can affect the Product's performance and place the safe operation of your process at risk. Look-alike substitutions may result in fire, hazards or improper operation.

- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent personal injury.
- **ALWAYS READ AND FOLLOW THE DANIEL SENIOR[®] ORIFICE FITTING OWNER'S MANUAL AND ALL PRODUCT WARNINGS AND INSTRUCTIONS.**

DANIEL SENIOR® ORIFICE FITTINGS

2" - 8" 150-1500

2" - 6" 2500

10" - 14" 150-1500

**PARTS LIST AND MATERIALS, INSTRUCTIONS
FOR INSTALLATION, OPERATION AND MAINTENANCE**

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TABLE OF CONTENTS

1.0 INTRODUCTION 1-1
1.1 General 1-1
1.2 Description 1-1
1.3 Specifications 1-1
 Parts List 1-2 through 1-17

2.0 INSTALLATION 2-1
2.1 Preliminary Steps 2-1
2.2 Daniel Senior® Orifice Fitting Installation 2-2
2.3 Line Pressure Test 2-4
2.4 Orifice Plate Installation 2-6

3.0 MAINTENANCE 3-1
3.1 Normal Conditions 3-1

4.0 OPERATING INSTRUCTIONS 4-1
4.1 Plate Removal 4-2
4.2 Lubrication 4-4
4.3 Plate Insertion 4-5

5.0 SUPPLEMENTAL INFORMATION 5-1
5.1 Recommended Spare Parts for One Year Operation 5-1
5.2 Lubricant Information 5-2
5.3 Screw and Stud Torque Tables 5-2

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1.0 INTRODUCTION

1.1 General

This manual is designed to assist in the installation and operation of Daniel Senior[®] Orifice Fittings. To assure proper installation and startup it is important to read this manual in its entirety.

1.2 Description

The Daniel Senior[®] Orifice Fitting is a fluid measurement device that measures flow based on the differential pressure principle. The Daniel Senior[®] Orifice Fitting utilizes a dual chamber design which positions an orifice plate in a flow stream. The orifice plate generates a pressure drop as flow moves through the Daniel Senior[®] Orifice Fitting. By measuring the pressure drop through pressure taps provided on the Daniel Senior[®] Orifice Fitting, and using this pressure drop (differential pressure) in a universally accepted equation, one can calculate the flow through the fitting.

The Daniel Senior[®] Orifice Fitting is composed of two independent chambers separated by a hardened stainless steel slide valve.

The dual chamber design of the Daniel Senior[®] Orifice Fitting allows for the inspection and/or replacement of orifice plates under line pressure without flow interruption. Use of the Daniel Senior[®] Orifice Fitting can eliminate the need for by-pass piping, valves and other fittings necessary with conventional orifice flange installations.

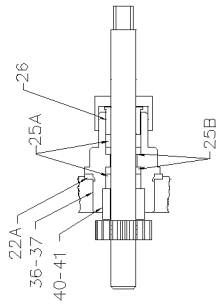
Maintenance technicians can replace and repair all parts of the Daniel Senior[®] Orifice Fitting, including the essential slide valve assembly, without removing the fitting from the line.

All Daniel Senior[®] Orifice Fittings are designed and manufactured to meet or exceed the A.G.A. 2000 recommendations, and are in accordance with ANSI flange connection specifications and ASTM specifications.

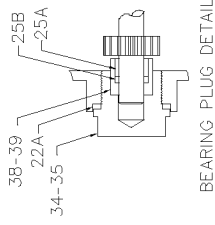
1.3 Specifications

DANIEL SENIOR® ORIFICE FITTING

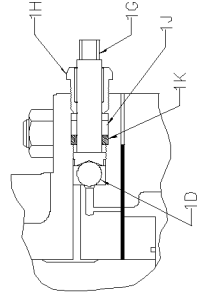
SIZES 2-INCH THRU 8-INCH 150-900



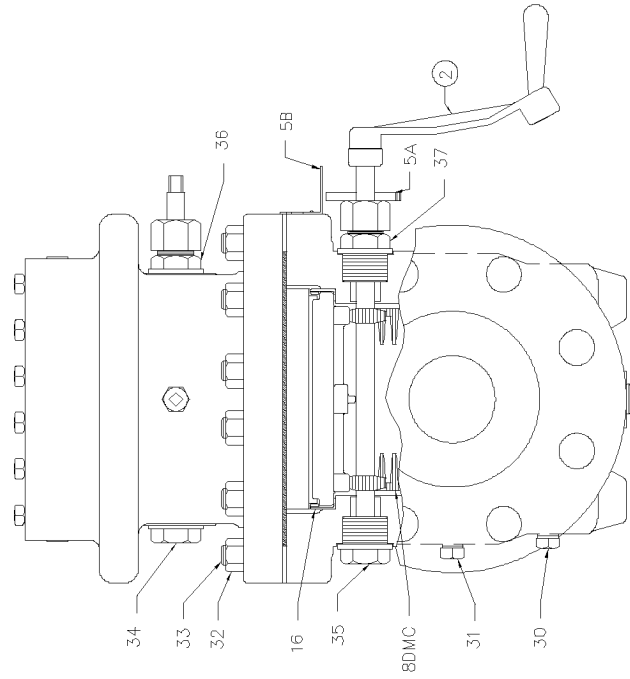
STUFFING BOX DETAIL



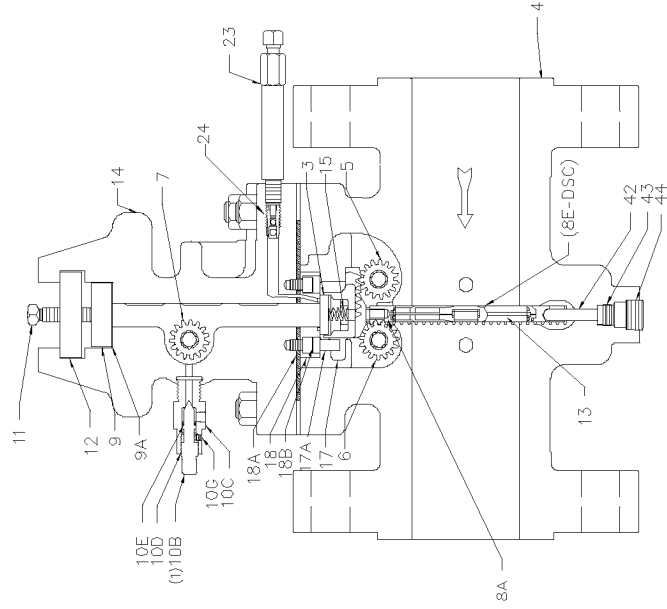
BEARING PLUG DETAIL



DETAIL 1
EQUALIZER VALVE



FRONT PARTIAL SECTIONAL ELEVATION



SIDE SECTIONAL ELEVATION

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

PARTS AND MATERIALS				NUMBER REQUIRED				
				SIZE				
Part 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 (CP)	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 Gear Shaft	CS (CP)	1	1	1	1	1	
* 5A	Slide Valve Indicator Plate	Cast Aluminum	1	1	1	1	1	
* 5B	Slide Valve Indicator Pointer	Stainless Steel	1	1	1	1	1	
6	Lower Plate Carrier Gear Shaft	CS (CP)	1	1	1	1	1	
7	Upper Plate Carrier Gear Shaft	CS (CP)	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 (CP)	1	1	1	1	1	
9A	Sealing Bar Gasket	Composite	1	1	1	1	1	
* 10B ⁽¹⁾	Bleeder Valve (Complete):							
* 10C	Body	CS (CP)	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	4	4	5	6	7	
		CP	4	4	5	6	8	
12	Clamping Bar	CS (CP)	1	1	1	1	1	
13	Orifice Plate	Type 304 or 316 Stainless Steel	1	1	1	1	1	
14	Top	Cast Carbon Steel	1	1	1	1	1	
* 15	Slide Valve Springs	316 Stainless Steel	4	4	4	6	6	

PARTS AND MATERIALS			NUMBER REQUIRED					
			SIZE					
Part No.	Description	Material	2"	3"	4"	6"	8"	
* 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 (CP)	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 (CP)	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 (CP)	3	3	3	3	3	
* 25A	Packing Rings	Teflon	9	9	9	9	9	
* 25B	Centering Ring	Teflon	9	9	9	9	9	
* 26	Stuffing Box Gland	316 SS	3	3	3	3	3	
* 30 ⁽²⁾	Drain Valve Plug	CS (CP)	1	1	1	1	1	
* 31 ⁽²⁾	"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
* 34	Bearing Plug Body (Upper)	CS (CP)	1	1	1	1	1	
* 35	Bearing Plug Body (Lower)	CS (CP)	2	2	2	2	2	
* 36	Stuffing Box Body (Upper)	CS (CP)	1	1	1	1	1	
* 37	Stuffing Box Body (Lower)	CS (CP)	2	2	2	2	2	
38	Bearing Plug Sleeve(Upper)	CS (CP)	1	1	1	1	1	
39	Bearing Plug Sleeve (Lower)	CS (CP)	2	2	2	2	2	
40	Stuffing Box Sleeve (Upper)	CS (CP)	1	1	1	1	1	
41	Stuffing Box Sleeve (Lower)	CS (CP)	2	2	2	2	2	
* 42	Plate Carrier Stop Pin	CS (CP)	1	1	1	1	1	
* 43	Plate Carrier Stop Pin Lock Screw	CS (CP)	1	1	1	1	1	
* 44	Plate Carrier Stop Pin Access Plug	CS (CP)	1	1	1	1	1	

Notes:

1. When venting upper chamber through bleeder valve (#10B), direct fluid and/or gas to a safe area using the threaded connection at the valve discharge port.
2. All Daniel Senior® Orifice Fittings are supplied with pipe plugs on one side only. If additional quantities are required, please contact the factory direct.

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

General Notes:

- Most parts available in other materials upon specification.
- CS (Carbon Steel), CP (Cadmium Plated).
- The materials listed above indicate standard "A" trim. Various part materials are changed for "NACE" & "AASG" trim fittings.
- Shaded part numbers are for items which are fluid media PIC (parts in contact).

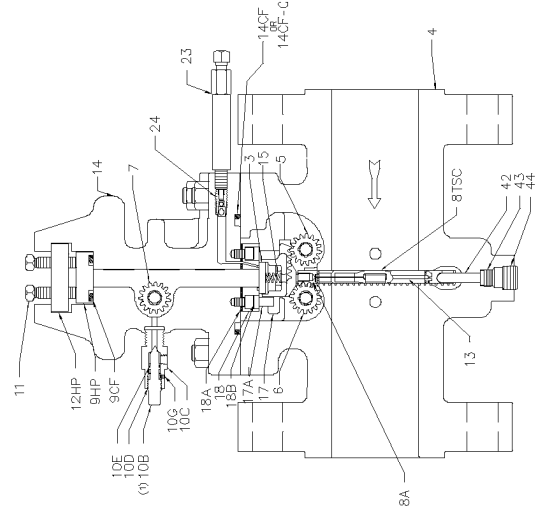
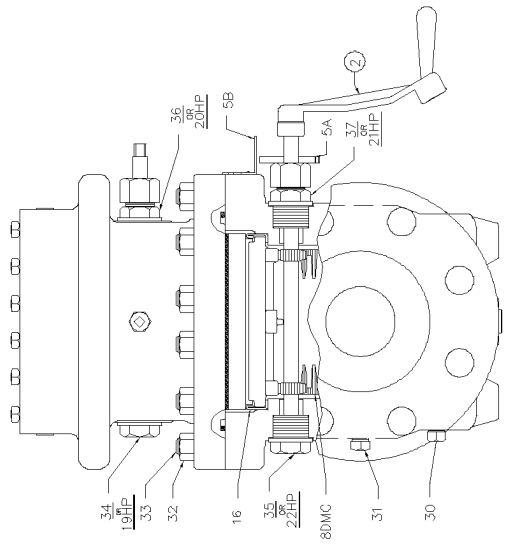
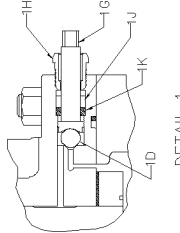
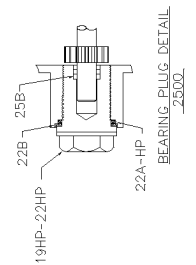
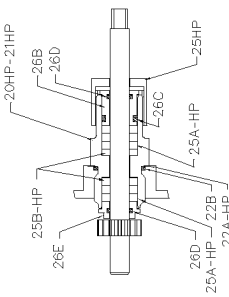
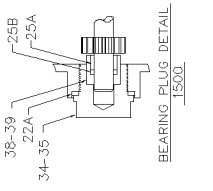
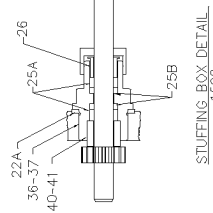
WHEN ORDERING PARTS, PLEASE SPECIFY:

(1) catalog number, (2) size, (3) serial number and date of the original purchase, (4) part number, (5) material, (6) quantity of parts required.

DANIEL SENIOR ORIFICE FITTING

SIZES 2-INCH THRU 8-INCH 1500

SIZES 2-INCH THRU 6-INCH 2500



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

PARTS AND MATERIALS				NUMBER REQUIRED				
				SIZE				
Part 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 (CP)		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 Gear Shaft	CS (CP)		1	1	1	1	1
* 5A	Slide Valve Indicator Plate	Cast Aluminum		1	1	1	1	1
* 5B	Slide Valve Indicator Pointer	Stainless Steel		1	1	1	1	1
6	Lower Plate Carrier Gear Shaft	CS (CP)		1	1	1	1	1
7	Upper Plate Carrier Gear Shaft	CS (CP)		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 (CP)	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 (CP)		1	1	1	1	1
9CF	"Compoflex" Sealing Bar Gasket	Synthetic Composition		1	1	1	1	1
* 10B ⁽¹⁾	Bleeder Valve (Complete):							
* 10C	Body	CS (CP)		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 (CP)	1500	10	10	12	14	16
			2500	10	10	12	14	
12HP	Clamping Bar	CS (CP)		1	1	1	1	1
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

PARTS AND MATERIALS				NUMBER REQUIRED				
				SIZE				
Part No.	Description	Material		2"	3"	4"	6"	8"
17	Slide Valve Carrier	Cast Carbon Steel		1	1	1	1	
		Cast alloy Iron						1
* 17A	Slide Valve Carrier Stop Pin	Carbon Steel (CP)		2	2	2	2	2
18	Slide Valve Seat	13% Chrome Stainless Steel		1	1	1	1	1
18A	Slide Valve Seat 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
		Phosphate Treat	2500	10	10	11	14	
19HP	Bearing Plug (Upper)	CS (CP)	2500	1	1	1	1	
20HP	Stuffing Box (Upper)	CS (CP)	2500	1	1	1	1	
21HP	Stuffing Box (Lower)	CS (CP)	2500	2	2	2	2	
22HP	Bearing Plug (Lower)	CS (CP)	2500	2	2	2	2	
* 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 "O" Ring	Synthetic Rubber	2500	6	6	6	6	
* 23	Grease Gun (Complete)	CS (CP)		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 (CP)	1500	3	3	3	3	3
* 25HP	Packing Nut	CS (CP)	2500	3	3	3	3	
* 25A	Packing Rings	Teflon	1500	9	9	9	9	9
* 25A-HP	Packing Rings	Teflon	2500	Varies with Fitting Size				
* 25B	Centering Ring	Teflon	1500	9	9	9	9	9
* 25B	Centering Ring - Bearing Plug	Teflon	2500	9	9	9	9	
* 25B-HP	Centering Ring - Stuffing Box	Teflon	2500	6	6	6	6	
* 26	Stuffing Box Gland	316 SS	1500	3	3	3	3	3
* 26B	External Stuffing Box Gland	316 SS	2500	3	3	3	3	
* 26E	Internal Stuffing Box Gland	316 SS	2500	3	3	3	3	
* 26C	Stuffing Box Gland "O" Ring	Synthetic Rubber	2500	3	3	3	3	
* 26D	Stuffing Box Gland "O" Ring	Synthetic Rubber	2500	6	6	6	6	
* 30 ⁽²⁾	Drain Valve Plug	CS (CP)		1	1	1	1	1
* 31 ⁽²⁾	1/2" 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	
* 34	Bearing Plug Body (Upper)	CS (CP)	1500	1	1	1	1	1
* 35	Bearing Plug Body (Lower)	CS (CP)	1500	2	2	2	2	2

PARTS AND MATERIALS				NUMBER REQUIRED				
				SIZE				
Part No.	Description	Material		2"	3"	4"	6"	8"
* 36	Stuffing Box Body (Upper)	CS (CP)	1500	1	1	1	1	1
* 37	Stuffing Box Body (Lower)	CS (CP)	1500	2	2	2	2	2
38	Bearing Plug Sleeve(Upper)	CS (CP)	1500	1	1	1	1	1
39	Bearing Plug Sleeve (Lower)	CS (CP)	1500	2	2	2	2	2
40	Stuffing Box Sleeve (Upper)	CS (CP)	1500	1	1	1	1	1
41	Stuffing Box Sleeve (Lower)	CS (CP)	1500	2	2	2	2	2
* 42	Plate Carrier Stop Pin	CS (CP)		1	1	1	1	1
* 43	Plate Carrier Stop Pin Lock Screw	CS (CP)		1	1	1	1	1
* 44	Plate Carrier Stop Pin Access Plug	CS (CP)		1	1	1	1	1

Notes:

1. When venting upper chamber through bleeder valve (#10B), direct fluid and/or gas to a safe area using the threaded connection at the valve discharge port.
2. All Daniel Senior® Orifice Fittings are supplied with pipe plugs on one side only. If additional quantities are required, please contact the factory direct.

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

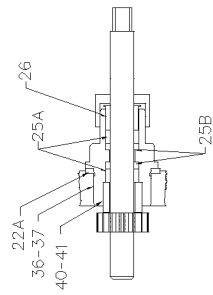
General Notes:

- Most parts available in other materials upon specification.
- CS (Carbon Steel), CP (Cadmium Plated).
- The materials listed above indicate standard "A" trim. Various part materials are changed for "NACE" & "AASG" trim fittings.
- Shaded part numbers are for items which are fluid media PIC (parts in contact).

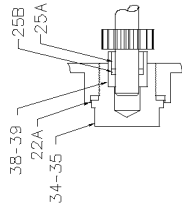
WHEN ORDERING PARTS, PLEASE SPECIFY:

(1) catalog number, (2) size, (3) serial number and date of the original purchase, (4) part number, (5) material, (6) quantity of parts required.

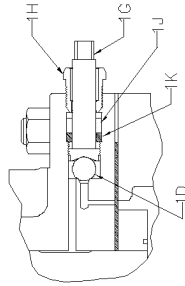
DANIEL SENIOR® ORIFICE FITTING
SIZES 10-INCH THRU 14-INCH 150-900



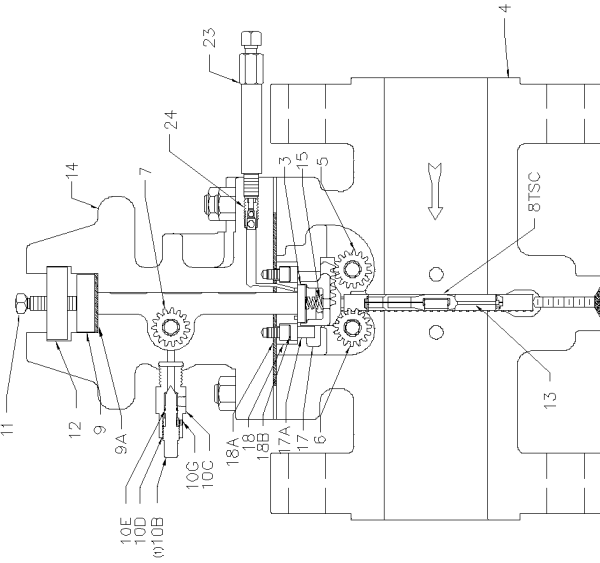
STUFFING BOX DETAIL



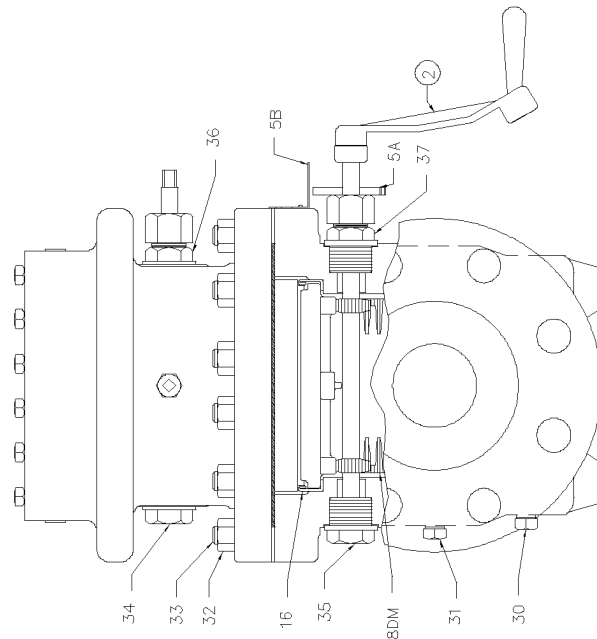
BEARING PLUG DETAIL



DETAIL 1
EQUALIZER VALVE



SIDE SECTIONAL ELEVATION



FRONT PARTIAL SECTIONAL ELEVATION

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

PARTS AND MATERIALS			NUMBER REQUIRED		
			SIZE		
Part No.	Description	Material	10"	12"	14"
* 1	Equalizer Valve (Complete):				
* 1G	Stem	316 Stainless Steel	1	1	1
* 1H	Packing Nut	CS (CP)	1	1	1
* 1D	Ball	18-8 Stainless Steel	1	1	1
* 1K	Packing Washer	17-4PH Stainless Steel	1	1	1
* 1J	Packing Ring	Teflon	2	2	2
* 2	Operating Wrench	Ductile Iron	1	1	1
3	Slide Valve Strip	Type 410 Stainless Steel	1	1	1
4	Body	Cast Carbon Steel	1	1	1
5	Slide Valve Gear Shaft	CS (CP)	1	1	1
* 5A	Slide Valve Indicator Plate	Cast Aluminum	1	1	1
* 5B	Slide Valve Indicator Pointer	Stainless Steel	1	1	1
6	Lower Plate Carrier Gear Shaft	CS (CP)	1	1	1
7	Upper Plate Carrier Gear Shaft	CS (CP)	1	1	1
8DM	Plate Carrier	CS (CP)	1	1	1
8E-DS	Orifice Plate Sealing Unit 150-600	Nitrile (Removable)	1		
8E-DVS	Orifice Plate Sealing Unit 150-600	Nitrile (Bonded to Both Faces of the Orifice Plate)		1	1
8TS	Orifice Plate Sealing Unit 150-900 Alternate Seals Available See Catalog - #500	Teflon (Removable)	1	1	1
9	Sealing Bar	CS (CP)	1	1	1
9A	Sealing Bar Gasket	Composite	1	1	1
* 10B ⁽¹⁾	Bleeder Valve (Complete):				
* 10C	Body	CS (CP)	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
* 11	Clamping Bar Screw	Alloy Steel (CP)	8	10	11
		150-600 900	8	10	22
12	Clamping Bar	CS (CP)	1	1	1
13	Orifice Plate	Type 304 or 316 Stainless Steel	1	1	1
14	Top	Cast Carbon Steel	1	1	1
* 15	Slide Valve Springs	316 Stainless Steel	6	7	8

PARTS AND MATERIALS				NUMBER REQUIRED		
				SIZE		
Part No.	Description	Material		10"	12"	14"
* 16	Slide Valve Carrier Guide	316 Stainless Steel		2	2	2
17	Slide Valve Carrier	Cast Alloy Iron		1	1	1
* 17A	Slide Valve Carrier Stop Pin	Carbon Steel (CP)		2	2	2
18	Slide Valve Seat	Cast Alloy Iron	150-600	1	1	1
		TY 410 SS	900	1		
		17-4PH SS	900		1	1
18A	Slide Valve Seat /Top Gasket	Composite		1	1	1
* 18B	Slide Valve Seat Screw	Alloy Steel Phosphate Treat		18	20	24
* 22A	Bearing Plug and Stuffing Box Gasket	Stainless Steel		6	6	6
* 23	Grease Gun (Complete)	CS (CP)		1	1	1
* 24	Grease Seal Double Ball Check Valve	316 Stainless Steel with Chrome-Steel Balls		1	1	1
* 25	Packing Nut	CS (CP)		3	3	3
* 25A	Packing Rings	Teflon		9	9	9
* 25B	Centering Ring	Teflon		9	9	9
* 26	Stuffing Box Gland	316 SS		3	3	3
* 30 ⁽²⁾	Drain Valve Plug	CS (CP)		1	1	1
* 31 ⁽²⁾	"1/2" N.P.T. Plug for Pressure Meter Tap	CS (Chemically Treated)		2	2	2
32	Hex Nut	CS		22	22	24
33	Stud	Alloy Steel		22	22	24
* 34	Bearing Plug Body (Upper)	CS (CP)		1	1	1
* 35	Bearing Plug Body (Lower)	CS (CP)		2	2	2
* 36	Stuffing Box Body (Upper)	CS (CP)		1	1	1
* 37	Stuffing Box Body (Lower)	CS (CP)		2	2	2
38	Bearing Plug Sleeve(Upper)	CS (CP)		1	1	1
39	Bearing Plug Sleeve (Lower)	CS (CP)		2	2	2
40	Stuffing Box Sleeve (Upper)	CS (CP)		1	1	1
41	Stuffing Box Sleeve (Lower)	CS (CP)		2	2	2

Notes:

1. When venting upper chamber through bleeder valve (#10B), direct fluid and/or gas to a safe area using the threaded connection at the valve discharge port.
2. All Daniel Senior® Orifice Fittings are supplied with pipe plugs on one side only. If additional quantities are required, please contact the factory direct.

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

General Notes:

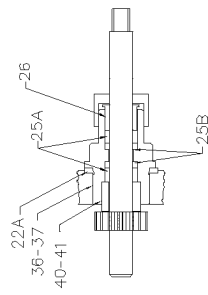
- Most parts available in other materials upon specification.
- CS (Carbon Steel), CP (Cadmium Plated).
- The materials listed above indicate standard "A" trim. Various part materials are changed for "NACE" & "AASG" trim fittings.
- Shaded part numbers are for items which are fluid media PIC (parts in contact).

WHEN ORDERING PARTS, PLEASE SPECIFY:

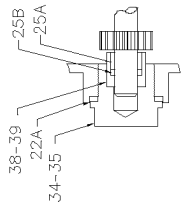
(1) catalog number, (2) size, (3) serial number and date of the original purchase, (4) part number, (5) material, (6) quantity of parts required.

DANIEL SENIOR® ORIFICE FITTING

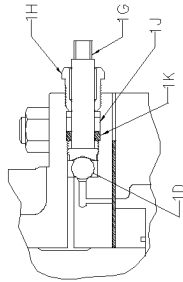
SIZES 10-INCH THRU 14-INCH 1500



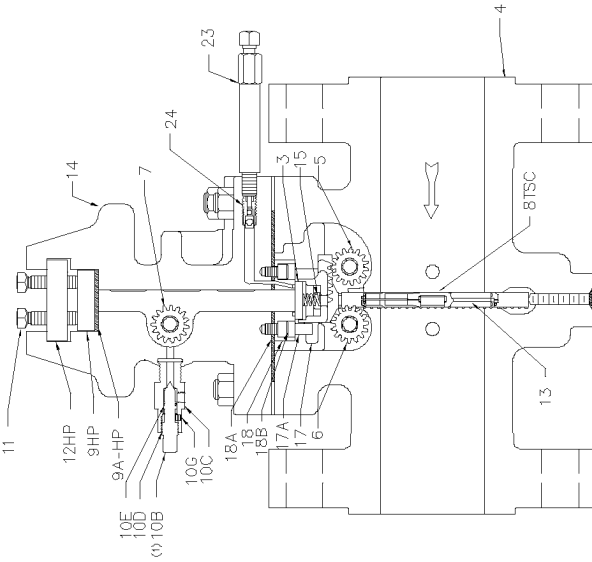
STUFFING BOX DETAIL



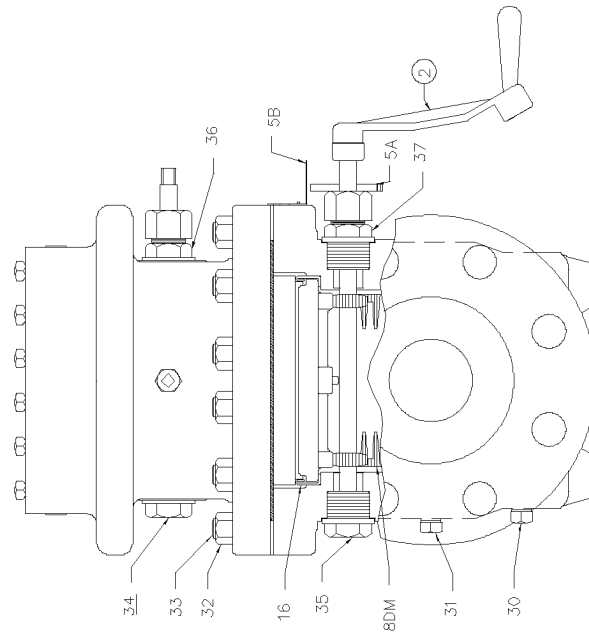
BEARING PLUG DETAIL



DETAIL 1
EQUALIZER VALVE



SIDE SECTIONAL ELEVATION



FRONT PARTIAL SECTIONAL ELEVATION

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

PARTS AND MATERIALS			NUMBER REQUIRED		
			SIZE		
Part No.	Description	Material	10"	12"	14"
* 1	Equalizer Valve (Complete):				
* 1G	Stem	316 Stainless Steel	1	1	1
* 1H	Packing Nut	CS (CP)	1	1	1
* 1D	Ball	18-8 Stainless Steel	1	1	1
* 1K	Packing Washer	17-4PH Stainless Steel	1	1	1
* 1J	Packing Ring	Teflon	2	2	2
* 2	Operating Wrench	Ductile Iron	1	1	1
3	Slide Valve Strip	Type 410 Stainless Steel	1	1	1
4	Body	Cast Carbon Steel	1	1	1
5 ⁽³⁾	Slide Valve Gear Shaft	CS (CP)	1	1	1 ⁽³⁾
* 5A	Slide Valve Indicator Plate	Cast Aluminum	1	1	1
* 5B	Slide Valve Indicator Pointer	Stainless Steel	1	1	1
6 ⁽³⁾	Lower Plate Carrier Gear Shaft	CS (CP)	1	1	1 ⁽³⁾
7 ⁽³⁾	Upper Plate Carrier Gear Shaft	CS (CP)	1	1	1 ⁽³⁾
8DM	Plate Carrier	CS (CP)	1	1	1
8TS	Orifice Plate Sealing Unit Alternate Seals Available See Catalog - #500	Teflon (Removable)	1	1	1
9HP	Sealing Bar	CS (CP)	1	1	1
9A-HP	Sealing Bar Gasket	Composite	1	1	1
* 10B ⁽¹⁾	Bleeder Valve (Complete):				
* 10C	Body	CS (CP)	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
* 11	Clamping Bar Screw	Alloy Steel (CP)	16	20	22
12HP	Clamping Bar	CS (CP)	1	1	1
13	Orifice Plate	Type 304 or 316 Stainless Steel	1	1	1
14	Top	Cast Carbon Steel	1	1	1
* 15	Slide Valve Springs	316 Stainless Steel	6	7	8
* 16	Slide Valve Carrier Guide	316 Stainless Steel	2	2	2
17	Slide Valve Carrier	Cast Alloy Iron	1	1	1
* 17A	Slide Valve Carrier Stop Pin	Carbon Steel (CP)	2	2	2
18	Slide Valve Seat	Type 410 Stainless Steel	1		
		17-4PH Stainless Steel		1	1
18A	Slide Valve Seat /Top Gasket	Composite	1	1	

PARTS AND MATERIALS			NUMBER REQUIRED		
			SIZE		
Part No.	Description	Material	10"	12"	14"
18VSG	Slide Valve Seat Gasket	Composite (not shown)			1
18BTG	Body /Top Gasket	Composite (not shown)			1
* 18B	Slide Valve Seat Screw	Alloy Steel Phosphate Treat	18	20	24
* 22A	Bearing Plug and Stuffing Box Gasket	Stainless Steel	6	6	6
* 23	Grease Gun (Complete)	CS (CP)	1	1	1
* 24	Grease Seal Double Ball Check Valve	316 Stainless Steel with Chrome-Steel Balls	1	1	1
* 25	Packing Nut	CS (CP)	3	3	6
* 25A	Packing Rings	Teflon	9	9	12
* 25B	Centering Ring	Teflon	9	9	12
* 26	Stuffing Box Gland	316 SS	3	3	6
* 30 ⁽²⁾	Drain Valve Plug	CS (CP)	1	1	1
* 31 ⁽²⁾	"½" N.P.T. Plug for Pressure Meter Tap	CS (Chemically Treated)	2	2	2
32	Hex Nut	CS	22	22	28
33	Stud	Alloy Steel	22	22	28
* 34	Bearing Plug Body (Upper)	CS (CP)	1	1	
* 35	Bearing Plug Body (Lower)	CS (CP)	2	2	
* 36	Stuffing Box Body (Upper)	CS (CP)	1	1	2
* 37	Stuffing Box Body (Lower)	CS (CP)	2	2	4
38	Bearing Plug Sleeve(Upper)	CS (CP)	1	1	
39	Bearing Plug Sleeve (Lower)	CS (CP)	2	2	
40	Stuffing Box Sleeve (Upper)	CS (CP)	1	1	2
41	Stuffing Box Sleeve (Lower)	CS (CP)	2	2	4

Notes:

1. When venting upper chamber through bleeder valve (#10B), direct fluid and/or gas to a safe area using the threaded connection at the valve discharge port.
2. All Daniel Senior® Orifice Fittings are supplied with pipe plugs on one side only. If additional quantities are required, please contact the factory direct.
3. 14" 1500 Gear Shafts are double-ended to allow operation from either side of the Daniel Senior® Orifice Fitting.

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

General Notes:

- Most parts available in other materials upon specification.
- CS (Carbon Steel), CP (Cadmium Plated).
- The materials listed above indicate standard "A" trim. Various part materials are changed for "NACE" & "AASG" trim fittings.
- Shaded part numbers are for items which are fluid media PIC (parts in contact).

WHEN ORDERING PARTS, PLEASE SPECIFY:

(1) catalog number, (2) size, (3) serial number and date of the original purchase, (4) part number, (5) material, (6) quantity of parts required.

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2.0 INSTALLATION

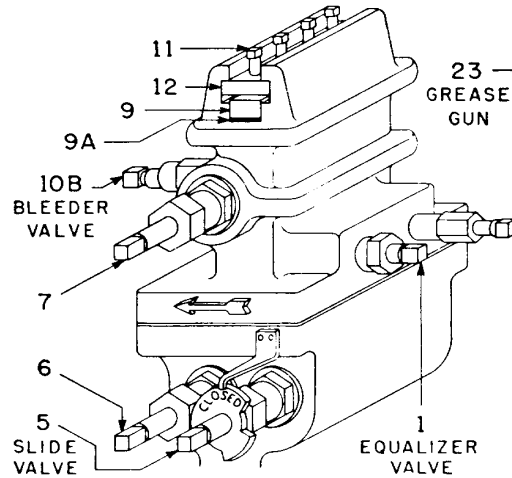


Figure 2-1. Typical Configuration

2.1 Preliminary Steps

The Daniel Senior® Orifice Fitting is a major part of any orifice metering element. To complete the unit, a meter tube must be attached to the Daniel Senior® Orifice Fitting. If the Daniel Senior® Orifice Fitting is received without a meter tube attached, see the appropriate code (AGA-3, etc.) for meter tube requirements.

Before installing the Daniel Senior® Orifice Fitting and meter tube assembly into the line, clean piping of all foreign material such as welding chips, scale, oil, grease, and dirt.

Remove all foreign matter such as scale, oil, grease, and dirt from the Daniel Senior® Orifice Fitting and meter tube piping and internal cavities of the fitting that may have collected during the time of final factory inspection and line installation.

If the installation personnel expect the Daniel Senior® Orifice Fitting to encounter severe conditions (conditions where there is likely to be an accumulation of sediment for any cause), installation personnel should install blow down valves in place of the pipe plugs (30) at the bottom of the fitting. Record the serial plate data for future reference. Always provide the serial number and model number of the Daniel Senior® Orifice Fitting when ordering spare parts.

Orifice plates and seal rings are packaged separately.

2.2 Daniel Senior® Orifice Fitting Installation



SERIOUS PERSONAL INJURY OR DEATH

The Daniel Senior® Orifice Fitting is a device that contains fluid at elevated pressure.

Failure to follow the instructions in this manual can result in serious injury or death.

Installation personnel must confirm that the line flow direction corresponds to the flow arrow cast on the Daniel Senior® Orifice Fitting body.

The Daniel Senior® Orifice Fitting should be installed in any horizontal line with the plate access opening in a vertical up position or with the fitting 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.

1. Confirm the operating clearance around the Daniel Senior® Orifice Fitting. Clearance for both fitting wrench operation and plate changing must be verified. Check accessibility of all meter pressure taps (31) and drain taps (30) prior to installation.
2. Check shipment to confirm that the shipping kit contains an operating wrench (2), grease gun (23), indicator plate (5A) and indicator pointer (5B).

3. Install grease gun(s) (23) into holes in the base of the top chamber (14) by first removing plastic shipping plugs, putting thread sealer on end threads of grease gun body (23) and tightening securely.
4. Install the indicator pointer (5B) in the top chamber (14) by tapping the two drive screws into the holes located above the slide valve shaft (5). Install the indicator plate (5B) on the slide valve shaft (5), directly below the pointer (5A). Orient the indicator plate (5B) as stated below depending on shaft location of right or left side:
 - Shaft on **left hand side** facing with the flow (standard position): When the shaft is rotated **clockwise** until it stops, the indicator plate (5B) word **OPEN** should appear below the indicator pointer (5A). Install the indicator plate (5B) on the shaft in this position and tighten set screw securely.
 - Shaft on **right hand side** facing with the flow (reverse shafts): When the shaft is rotated **counterclockwise** until it stops, the indicator plate (5B) word **OPEN** should appear below the indicator pointer (5A). Install the indicator plate (5B) on the shaft in this position and tighten the set screw securely.
 - Note that right hand and left hand indicator plates (5B) are different and not interchangeable.
 - After installation, rotate the slide valve shaft (5) until it stops. The word **CLOSED** should appear below the indicator pointer (5A).
5. Daniel Senior® Orifice Fittings leave the factory with the plate carriers (8DM or 8DMC) in the bottom chamber (4). Daniel ships the Daniel Senior® Orifice Fitting in this manner to prevent plate carrier (8DM or 8DMC) or slide valve damage during transit. Whether or not the Daniel Senior® Orifice Fitting arrives directly from the factory, installation personnel must open the top chamber (14) and slide valve to ensure that the plate carrier (8DM or 8DMC) is inside. The plate carrier (8DM or 8DMC) should be removed before performing any tests. With the slide valve in the fully opened position, rotate the lower plate carrier shaft (6) first, then the upper plate carrier shaft (7) to remove the carrier. Put the plate carrier (8DM or 8DMC) in a safe, protected area for use later in the installation process. Replace sealing bar (9 or 9HP), gasket (9A, 9A-HP or 9CF) and clamping bar (12 or 12HP) and tighten screws (11) to the required torque.
6. Install gaskets on any line flanges and/or weld the meter tube in the line. If your Daniel Senior® Orifice Fitting is a flanged model, installation personnel must tighten the flange bolts to the appropriate torque values for the flange rating.

2.3 Line Pressure Test

⚠ DANGER

SERIOUS PERSONAL INJURY OR DEATH

The Daniel Senior® Orifice Fitting is a device that contains fluid at elevated pressure.

Failure to follow the instructions in this manual can result in serious injury or death.

Once the Daniel Senior® Orifice Fitting is installed and the top chamber (14) is sealed, the installation personnel can perform a pressure test for the line including the meter tube and Daniel Senior® Orifice Fitting.

Both the slide valve and the equalizer valve (1) should be in the OPEN position. The bleeder valve (10B) should be closed during the test.

1. Install a pressure gauge in a location that will indicate the pressure in the Daniel Senior® Orifice Fitting. The gauge should have a maximum pressure range slightly above the maximum to be applied during the test.
2. Slowly pressurize the Daniel Senior® Orifice Fitting at a rate of 1 psig per second (0.15 bars per second) until the pressure inside the fitting reaches 20 psig (1.4 bar) then stop and hold that pressure for five minutes. During the five-minute hold, apply a leak detection solution to all joint and connector areas of the Daniel Senior® Orifice Fitting 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 Daniel Senior® Orifice Fitting to 0 psig (0 bar). Tighten any fastener or connector adjacent to the leak area and repeat the leak test again.
4. If the leak persists after several attempts to stop it, call your Daniel representative for assistance. Contact information is found in the back of this manual.

A red rectangular warning icon with a white exclamation mark inside a triangle on the left and the word "DANGER" in white capital letters on a red background to the right.**SERIOUS PERSONAL INJURY OR DEATH**

Correct all leaks prior to operation.

Failure to stop any size leak may lead to serious injury or death.

5. Once the 20 psig (1.4 bar) leak test is complete, and no leaks are detected, slowly raise the pressure inside the Daniel Senior® Orifice Fitting at a rate of 10 psig per second to 1.5 times the maximum operating pressure of the lowest rated item in the system. Hold the 1.5 times maximum operating pressure on the system for a period of 10 minutes.

An orange rectangular warning icon with a black exclamation mark inside a triangle on the left and the word "WARNING" in black capital letters on an orange background to the right.**SERIOUS PERSONAL INJURY OR DEATH POSSIBLE**

Never exceed 1.5 times the maximum allowable operating pressure of the lowest rated item in the system. The installation technician must confirm the maximum allowable operating pressure (MAOP) of each item in the system, including the Daniel Senior® Orifice Fitting, prior to performing this leak test.

Failure to confirm the maximum allowable operating pressure of each item in the system could result in serious injury or death.

6. During the 10 minute hold period, apply a leak detection solution to all joint and connector areas of the Daniel Senior® Orifice Fitting and line connections. No leakage should be visibly detectable or audibly detectable during the hold period.
7. If a leak is detected, mark the leak area with a marker and reduce the pressure inside the Daniel Senior® Orifice Fitting to 0 psig (0 bar). Tighten any fastener or connector adjacent to leak area and repeat leak test again.
8. If the leak persists after several attempts to stop it, call Daniel for assistance.

9. Slowly release the pressure from the Daniel Senior[®] Orifice Fitting until the gauge reads zero (0) psig.

2.4 Orifice Plate Installation



SERIOUS PERSONAL INJURY OR DEATH

The Daniel Senior[®] Orifice Fitting is a device that contains fluid at elevated pressure.

Failure to follow the instructions in this manual can result in serious injury or death.

After completion of the leak test, installation personnel must install and lower the plate carrier (8DM or 8DMC) and orifice plate assembly (13) into the body chamber (4) to begin measurement operations according to the steps below.

1. The Daniel Senior[®] Orifice Fitting must be at atmospheric pressure (0 psig). Open bleeder valve (10B) to confirm no pressure is in the fitting. Bleeder valve (10B) to remain open.
2. Confirm that the equalizer valve (1) is open.
3. Remove clamping bar (12 or 12HP) by loosening all screws (11) two turns maximum and sliding bar from slot.
4. Remove sealing bar (9) and gasket (9A, 9A-HP or 9CF).
5. Confirm that the slide valve is still in the OPEN position.

6. The orifice plate (13), with the appropriate seal ring, should be installed in the plate carrier (8DM or 8DMC). If a rubber seal is used, lubricate both seal faces with a light oil or grease. The assembly should then be inserted into the top (14) until the upper plate carrier gears mesh with the plate carrier rack. The gear shaft should then be rotated 1/4 turn in the OPPOSITE direction used for lowering the carrier, to allow the carrier to “align” itself with the gear teeth. Then lower the plate carrier assembly (8DM or 8DMC) from the top (14) to the bottom chamber (4) using the upper (7), then lower (6) gear shafts until it is completely inserted into the body chamber (4).

**⚠ DANGER****SERIOUS PERSONAL INJURY OR DEATH**

The correct positioning and installation of the gasket (9A, 9A-HP or 9CF), sealing bar (9), and clamping bar (12 or 12HP) are essential to provide a pressure barrier between the line pressure and atmospheric pressure.

Failure to *properly* install the gasket, sealing bar, and clamping bar can result in serious injury or death.

7. Install the sealing bar (9), the gasket (9A, 9A-HP or 9CF), and clamping bar (12) in position on the top chamber (14) and tighten the fasteners (11).
8. The operator will rotate the slide valve shaft (5) to the CLOSED position. This closes the slide valve, separating the body chamber (4) from the top chamber (14).
9. Close both the equalizer (1) and bleeder valves (10B).
10. The Daniel Senior® Orifice Fitting is now ready for final pressurization and operation.

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3.0 MAINTENANCE

⚠ DANGER

SERIOUS PERSONAL INJURY OR DEATH

The Daniel Senior® Orifice Fitting is a device that contains fluid at elevated pressure.

Failure to follow the instructions in this manual can result in serious injury or death.

3.1 Normal Conditions

Under normal measurement conditions, Daniel recommends that maintenance personnel both lubricate the slide valve and exercise several key components of the Daniel Senior® Orifice Fitting every thirty days (See 3.1.2). If normal plate changing operations are performed within this period, omit this operation.

3.1.1 Lubrication

This does not apply to Daniel Senior® Orifice Fittings equipped with Soft Seat slide valves.

In order to perform this operation:

- The slide valve must be in the "CLOSED" position,
- The bleeder valve (10B) must be in the "OPEN" position,
- The equalizer valve (1) must be in the "CLOSED" position, and
- The Daniel Senior® Orifice Fitting must be under line pressure of 100 psig minimum.

**SERIOUS PERSONAL INJURY OR DEATH**

Opening the bleeder valve (10B) releases line pressure fluid into the atmosphere.

Failure to direct the released pressurized fluid to a safe area during the discharge cycle may result in the release fluid causing contamination and/or the accumulation of volatile gas mixtures. Volatile gas mixtures are explosive and/or toxic and may lead to serious injury or death.

1. Once the maintenance personnel positions the valves as described above, remove the stem from the grease gun (23) and insert a Daniel lubricant stick into the grease gun (23).
2. 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 very slow rate.
3. By turning the stem slowly, the lubricant is forced through the grease channels at a rate that allows the lubricant to travel freely, yet not separate the valve strip from the valve seat. This will keep fresh grease in the lubrication passages.
4. Close bleeder valve (10B).

3.1.2 Component Exercise

In order to perform the following operations:

- The slide valve must be in the "CLOSED" position,
- The bleeder valve (10B) must be in the "CLOSED" position, and
- The equalizer valve (1) must be in the "OPEN" position.

At this point the fluid pressure in the body chamber (4) will equal the fluid pressure in the top chamber (14).

1. Reduce the differential pressure across the meter to a maximum of 100 inches of H₂O.
2. Once the maintenance personnel position the valves as described above and the maximum differential across the meter is set, maintenance personnel should turn the plate carrier shaft (7) located in the top chamber (14) several times in both directions. The shaft (7) should turn freely.
3. Rotate the slide valve shaft (5) in both directions until it stops. Repeat this action 2-3 times. The slide valve should travel freely in both directions with light resistance. Leave the valve in the OPEN position.

NOTICE

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

4. Rotate the plate carrier shaft (6) located in the body chamber (4) one turn in both directions. 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 seal is initially loosened from the Daniel Senior® Orifice Fitting seal surface. Resistance to turning will also be present when the plate carrier (8DM or 8DMC) is lowered into position again.
5. Return the plate carrier (8DM or 8DMC) to fully seated position in body. Close slide valve. Close Equalizer valve (1).
6. If at any point during the exercise of the components, the resistance encountered when turning the shafts is greater than the torque applied by hand using the Daniel wrench (2), inspection of the Daniel Senior® Orifice Fitting is required.

4.0 OPERATING INSTRUCTIONS

⚠ DANGER

SERIOUS PERSONAL INJURY OR DEATH

The Daniel Senior® Orifice Fitting is a device that contains fluid at elevated pressure.

Failure to follow the instructions in this manual can result in serious injury or death.

Daniel Senior® Orifice Fitting's dual chamber design allows an operator to install or remove the plate carrier (8DM or 8DMC) without flow interruption. An internally mounted slide valve separates the two chambers. The flow stream chamber or "body" chamber (4) contains the plate carrier (8DM or 8DMC) during measurement operations. The transfer chamber, or "top" chamber (14) contains the plate carrier (8DM or 8DMC) during inspection and replacement of the orifice plate (13).

Within the Daniel Senior® Orifice Fitting, is a rectangular plate or "plate carrier" (8DM or 8DMC) that positions the orifice plate (13) firmly in the flow stream. Formed along the edges of the plate carrier (8DM or 8DMC) are two gear tooth racks. Additionally, two pinion gears mounted on a shaft are positioned to mesh with the plate carrier gear tooth racks. There are two such shafts (6 & 7) located in the Daniel Senior® Orifice Fitting, one in the body chamber (4) and one in the top chamber (14). By rotating these shafts (6 & 7) in sequence, an operator may move the plate carrier (8DM or 8DMC) into, or out of, the flow stream.

During measurement operations the plate carrier (8DM or 8DMC), containing an orifice plate (13), is positioned in the flow stream. The slide valve is in the CLOSED position, separating the body chamber (4) from the top chamber (14).

4.1 Plate Removal

Conditions:

- Daniel Senior[®] Orifice Fitting operating at line pressure.
- Plate carrier (8DM or 8DMC) located in flow stream.

Procedure:

1. To remove the orifice plate (13) the operator must first balance the pressure between the body chamber and the top chamber (14).
2. Open the equalizer valve (1) (1/2 to 1 turn is sufficient).
3. Wait several seconds while the top chamber (14) pressure equalizes with the actual line pressure.
4. Rotate the slide valve shaft (5) until it stops and OPEN is indicated on the indicator plate.
5. Rotate the plate carrier shaft (6) located in the body chamber (4) in a direction that will move the plate carrier (8DM or 8DMC) out of the body chamber (4) and into the upper gear shaft (7) located in the top chamber (14).
6. Rotate the plate carrier shaft (7) located in the top chamber (14) in a direction that will lift the plate carrier (8DM or 8DMC) completely out of the body chamber and fully into the top chamber. Rotate shaft until the plate carrier (8DM or 8DMC) stops against the seal bar.
7. **Once the plate carrier (8DM or 8DMC) is completely out of the body chamber (4), rotate the slide valve shaft (5) to the CLOSED position. This rotation closes the slide valve thus separating and sealing the body chamber (4) from the top chamber (14).**
8. Close equalizer valve (1).
9. Open the bleeder valve (10B).

 **DANGER****SERIOUS PERSONAL INJURY OR DEATH**

Opening the bleeder valve (10B) releases line pressure fluid into the atmosphere.

Failure to direct the released pressurized fluid to a safe area during the discharge cycle may result in the release fluid causing contamination and/or the accumulation of volatile gas mixtures. Volatile gas mixtures are explosive and/or toxic and may lead to serious injury or death.

Once pressure in the top chamber (14) is reduced to ambient pressure, the operator may then extract the plate carrier (8DM or 8DMC), containing the orifice plate (13), from the Daniel Senior® Orifice Fitting using the following steps.

 **WARNING****SERIOUS PERSONAL INJURY OR DEATH POSSIBLE**

Never place any part of the head or body in front of the top opening when the clamping bar (12 or 12HP) is removed and the line is under pressure.

Failure to keep clear of the top opening could result in serious injury or death.

10. Loosen (approximately two turns, but do not remove) each fastener (11), located in the clamping bar on the extreme end of the top chamber.
11. Once the fasteners (11) are loose, the operator should then turn the plate carrier shaft (7) located in the top chamber (14) in the direction to raise the plate carrier (8DM or 8DMC) and to tap the inside surface of the sealing bar (9) to free both it and the gasket.
12. Slide the clamping bar (12 or 12HP) containing the fasteners (11), sealing bar (9) and gasket (9A, 9-HP or 9CF) from the top chamber (14). The removal of these components exposes the interior of the top chamber.

**SERIOUS PERSONAL INJURY OR DEATH POSSIBLE**

Never place any part of the head or body in front of the top opening when the clamping bar (12 or 12HP) is removed and the line is under pressure.

Never place the operating wrench (2) on the slide valve shaft (5) when the clamping bar (12 or 12HP) is removed from the Daniel Senior® Orifice Fitting and the line is under pressure.

Failure to heed these warnings may result in serious injury or death.

13. Rotate the top chamber plate carrier shaft (7) to lift the plate carrier (8DM or 8DMC) out of the Daniel Senior® Orifice Fitting.

4.2 Lubrication

The following three steps are for Daniel Senior® Orifice Fittings equipped with lubricated slide valves only. For Soft Seat equipped Daniel Senior® Orifice Fittings, skip steps 1-3.

1. Lubricate the slide valve by removing the stem from the grease gun (23) and inserting a Daniel Lubricant Stick into the grease gun (23).
2. 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 very slow rate.
3. By turning the stem ***SLOWLY***, the lubricant is forced through the grease channels at a rate that allows the lubricant to travel freely, yet not separate the valve strip from the valve seat. This will keep fresh grease in the lubrication passages and assist in sealing the valve. One stick of lubricant is normally sufficient for sizes to 12" and two sticks for 14" and larger.

NOTICE

If the addition of lubricant does not reduce the flow from the bleeder valve (10B) to near zero, close the bleeder valve (10B), open the equalizer valve (1) and crank the slide valve back and forth 2-3 times and then close the equalizer valve (1) and repeat the process. If excessive leakage still is present, close the slide valve and tag the Daniel Senior® Orifice Fitting for maintenance.

4.3 Plate Insertion**CAUTION****EQUIPMENT DAMAGE OR PERSONAL INJURY**

Observe the instructions below if the listed conditions are present.

Failure to do so may cause injury or damage to equipment.

Conditions:

- Line at operating pressure.
- Slide valve in CLOSED position.
- Top chamber (14) evacuated and exposed to ambient pressure.
- Bleeder valve (10B) in the OPEN position.
- Equalizer valve (1) in the CLOSED position.
- Sealing bar (9 or 9HP), seal bar gasket (9A, 9A-HP or 9CF), and clamping bar (12 or 12HP) removed from top chamber (14).

**SERIOUS PERSONAL INJURY OR DEATH POSSIBLE**

Never place any part of the head or body in front of the top opening when the clamping bar (12 or 12HP) is removed and the line is under pressure.

Never place the operating wrench (2) on the slide valve shaft (5) when the clamping bar (12 or 12HP) is removed from the Daniel Senior® Orifice Fitting and the line is under pressure.

Failure to hear these warnings may result in serious injury or death.

Procedure:

1. Align the plate carrier (8DM OR 8DMC) and orifice plate assembly gear rack with the plate carrier shaft pinion gears and place the assembly into the top chamber (14) until the upper plate carrier gears mesh with the plate carrier rack. (If a rubber seal is used, lubricate both seal faces with a light oil or grease).
2. The gear shaft should then be rotated 1/4 turn in the OPPOSITE direction used for lowering the carrier, to allow the carrier to “align” itself with the gear teeth.

EQUIPMENT DAMAGE

Align the plate carrier assembly (8DM or 8DMC) with the plate carrier shaft (7).

Failure to align the plate carrier assembly with the plate carrier shaft may damage the Daniel Senior® Orifice Fitting.

3. Rotate the plate carrier shaft (7) in the direction that will lower the plate carrier (8DM or 8DMC) into the top chamber (14).
4. Lower the plate carrier assembly (8DM or 8DMC) into the top chamber (14) until the plate carrier assembly JUST CLEARS the top surface of the opening.

 **WARNING****EQUIPMENT DAMAGE**

Do not lower the plate carrier (8DM or 8DMC) on to the slide valve as this may damage the precision machined surface.

Failure to use caution while lowering the plate carrier (8DM or 8DMC) may cause equipment damage.

5. Install a new seal bar gasket (9A, 9A-HP or 9CF).
6. Replace the sealing bar (9 or 9HP).
7. Slide the clamping bar (12 or 12HP) into position.
8. Tighten each of the clamping bar screws (11) to the torque recommended in Section 5.3 of this manual.

 **DANGER****SERIOUS PERSONAL INJURY OR DEATH**

The correct positioning and installation of the gasket, sealing bar, and clamping bar are essential to provide a pressure barrier between the line pressure and atmospheric pressure.

Failure to *properly* install the gasket, sealing bar, and clamping bar can result in serious injury or death.

9. Close the bleeder valve (10B).
10. Open the equalizer valve (1) (1/2 to 1 turn is sufficient).
11. Wait several seconds while the top chamber pressure equalizes with the actual line pressure.
12. Rotate the slide valve shaft (5) until it stops in the OPEN position.
13. Rotate the plate carrier shaft (7) located in the top chamber in the direction that will lower the plate carrier assembly (8DM or 8DMC) into the bottom chamber (4).
14. Rotate the plate carrier shaft (6) located in the body chamber (4) in the direction that will lower the plate carrier assembly (8DM or 8DMC) into the body chamber (4). Turn shaft until a solid stop is felt.

Resistance to turning will be present when the plate carrier (8DM or 8DMC) is approaching its measurement position due to the friction between the fitting body and the plate carrier assembly seals.

15. Once the plate carrier (8DM or 8DMC) is positioned in the body chamber (4), turn the slide valve shaft (5) in the direction of flow. This rotation closes the slide valve thus separating the body chamber (4) from the top chamber (14).
16. Close the equalizer valve (1).
17. Open the bleeder valve (10B).



SERIOUS PERSONAL INJURY OR DEATH

Opening the bleeder valve (10B) releases line pressure fluid into the atmosphere.

Failure to direct the released pressurized fluid to a safe area during the discharge cycle may result in the release fluid causing contamination and/or the accumulation of volatile gas mixtures. Volatile gas mixtures are explosive and/or toxic and may lead to serious injury or death.

18. To lubricate the Daniel Senior[®] Orifice Fitting (see Lubrication Section 4.2 or Lubricant Information Section 5.2). **Not applicable for Soft Seat Daniel Senior[®] Orifice Fitting.**
19. Close the bleeder valve (10B).

5.0 SUPPLEMENTAL INFORMATION

5.1 Recommended Spare Parts for One-Year Operation

- PRICES ON APPLICATION -

QUANTITY	PART NO.	DANIEL	DESCRIPTION	MATERIAL
1	5	150-2500	Gear Shaft	CS (CP)
5	8E	150-600	Orifice Plate Sealing Unit	Nitrile
3	8TS	900-2500	Orifice Plate Sealing Unit	Teflon
5	9A	150-900	Sealing Bar Gasket	Composition
3	9CF	1500-2500	Sealing Bar Gasket	Synthetic Composition
2	11	150-2500	Clamping Bar Screws	Alloy Steel, CP
1	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-C	2500	Body/Top Gasket	Parker Seal
2	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
1-SET	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	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
3 BOXES		150-2500	Slide Valve Lubricant	

IMPORTANT - See ordering information in Section 1.

5.2 Lubricant Information

Daniel recommends the use of "DANIEL TYPE 1" lubricant for use in Daniel Senior® Orifice Fittings. "DANIEL TYPE 1" is ideal for lubricating the slide valve thus insuring maximum operating performance. "DANIEL TYPE 1" lubricant is not a petroleum base product. Therefore, the "DANIEL TYPE 1" has the following advantages over other products:

- Operating temperature range for lubricant: -40°F (-40°C) to +500°F (+260°C).
- Contains no fillers or inert materials to reduce hardening and oxidizing.
- Is insoluble in water. (Preferred solvent is Castor Oil).
- Resistant to hydrocarbons within it's operating temperature range.
- Supplied in "B" size sticks to fit in the supplied grease gun.

Specialty lubricants for difficult services (sour gas, etc) are available on request.

5.3 Screw and Stud Torque Tables**SEAT SCREW TORQUE FT-LBS**

SIZE	TORQUE
STD Trim 2" - 8"	45
STD Trim 10"	50
STD Trim 12" +	55
316, Monel & all AASG	35

CLAMPING BAR SCREW TORQUE FT-LBS

SIZE	DANIEL	NO. OF SCREWS	SCREW SIZE	TORQUE
2"	150	4	1/2"-13	40
	300	4	1/2"-13	45
	600	4	1/2"-13	50
	900	4	1/2"-13	70
	1500	8	5/8"-11	80
	2500	10	5/8"-11	135
3"	150	4	1/2"-13	50
	300	4	1/2"-13	55
	600	4	1/2"-13	65
	900	4	1/2"-13	75
	1500	10	5/8"-11	80
	2500	10	5/8"-11	135
4"	150	5	1/2"-13	45
	300	5	1/2"-13	50
	600	5	1/2"-13	55
	900	5	1/2"-13	70
	1500	12	5/8"-11	80
	2500	12	5/8"-11	130
6"	150	6	1/2"-13	40
	300	6	1/2"-13	45
	600	6	1/2"-13	60
	900	6	1/2"-13	75
	1500	14	5/8"-11	85
	2500	14	5/8"-11	140
8"	150	7	1/2"-13	40
	300	7	1/2"-13	50
	600	7	1/2"-13	60
	900	7	1/2"-13	80
	1500	16	5/8"-11	90
	10"	150	8	1/2"-13
300		8	1/2"-13	50
600		8	1/2"-13	70
900		8	5/8"-11	115
1500		16	5/8"-11	105
12"		150	10	1/2"-13
	300	10	1/2"-13	50
	600	10	1/2"-13	60
	900	10	5/8"-11	100
	1500	20	5/8"-11	100
	14"	150	11	1/2"-13
300		11	1/2"-13	55
600		11	1/2"-13	65
900		11	1/2"-13	75
		22	5/8"-11	75

DANIEL SENIOR® ORIFICE FITTING STUD TORQUE FT-LBS

SIZE	DANIEL	NO. OF SCREWS	SCREW SIZE	TORQUE
2"	150	14	5/8"-18	40
	300	14	5/8"-18	50
	600	14	5/8"-18	65
	900	14	3/4"-16	100
	1500	14	3/4"-16	160
	2500	16	1 1/8"-12	375
3"	150	15	5/8"-18	50
	300	15	5/8"-18	60
	600	15	5/8"-18	80
	900	15	3/4"-16	115
	1500	15	3/4"-16	160
	2500	16	1 1/8"-12	375
4"	150	15	3/4"-16	60
	300	15	3/4"-16	75
	600	15	3/4"-16	100
	900	15	3/4"-16	130
	1500	16	1" - 14	265
	2500	16	1 1/8"-12	510
6"	150	18	3/4"-16	70
	300	18	3/4"-16	85
	600	18	3/4"-16	115
	900	18	3/4"-16	140
	1500	18	1" - 14	285
	2500	18	1 1/8"-12	425
8"	150	19	3/4"-16	70
	300	19	3/4"-16	85
	600	19	3/4"-16	120
	900	20	1" - 14	190
	1500	18	1 1/8"-12	460
	10"	150	22	3/4"-16
300		22	3/4"-16	85
600		22	3/4"-16	120
900		22	1" - 14	210
1500		22	1" - 14	300
12"		150	22	3/4"-16
	300	22	3/4"-16	120
	600	22	3/4"-16	160
	900	22	1 1/8"-12	290
	1500	22	1 1/8"-12	500
	14"	150	24	3/4"-16
300		24	3/4"-16	110
600		24	7/8"-14	175
900		24	7/8"-14	225