INSTALLATION, OPERATION & MAINTENANCE GUIDE

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STYLE 85/85M
SPLIT CARTRIDGE SEAL

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Installation, Operation, & Maintenance Guide

Style 85/85M Split Cartridge Seal

OVERVIEW

This guide outlines the installation, operation and maintenance of the Flexaseal Style 85 and Style 85M Split Cartridge Seal. The Style 85M is a highly engineered heavy duty split cartridge seal designed specifically to meet the challenges of mixers and agitators. This guide, in addition to the manuals provided by the pump manufacturer and the manufacturer of any auxiliary equipment, should be read in its entirety prior to installation.

NOTICE

Flexaseal does not assume responsibility for misuse, or any damages incurred as a result of the misuse of the supplied sealing system. Contact a Flexaseal representative before making any changes to the provided system or design.

SAFETY

1. Read all instructions thoroughly prior to beginning installation. Review engineering prints for special notes and/or instructions.
2. Removal, installation, operation, and maintenance must only be carried out by qualified personnel who have thoroughly read all instructions.
3. The seal must only be used for its intended application. Flexaseal cannot be held liable for use outside the scope of the recommended application.
4. Inspect the replacement seal prior to removal of the old seal or installation of the new seal using the technical information provided in this document. Contact a Flexaseal representative if there are any questions.
5. Follow plant safety regulations and procedures throughout the disassembly/installation process including, but not limited to, the following:
   - Lockout/tagout procedures
   - SDS consultation for any hazardous materials involved
   - Use of proper personal protective equipment
   - Relief of any system pressure and mechanical energy
6. The following symbols have been used throughout the document to highlight important information:

ATTENTION Instructions intended to prevent damage to the seal or equipment.

Mandatory instructions intended to prevent personal injury or extensive damage to equipment.

NOTE: Information to note while installing, or for later use.

Style 85/85M Split Cartridge Seal Maximum Operating Conditions

Style 85				Style 85M			
Shaft Size	**Temperature**	**Speed**	**Pressure**	**Shaft Size**	**Temperature**	**Speed**	**Pressure**
1.750–3.000 in.	350°F	3600 RPM	250 psi	1.500–3.000 in.	350°F	3600 RPM	450 psi
3.125–3.750 in.	350°F	1800 RPM	200 psi	3.125–4.750 in.	350°F	1800 RPM	450 psi
3.875–4.750 in.	350°F	1800 RPM	150 psi	4.875–9.000 in.	350°F	875 RPM	450 psi
≥ 5.000 in.	350°F	875 RPM	100 psi	-	-	-	-

NOTE: Maximum temperature, pressure, and speed indicate operating extremes independently and do not imply the seal will function at these extremes at the same time. Contact Flexaseal if in doubt.

PREPARATION

Verify that equipment has been properly shut off and rendered inoperative according to plant safety protocol (e.g. lockout/tagout procedures).

1. Disassemble the pump seal chamber, in accordance with the pump OEM instructions, to expose the existing seal.

NOTE: Document how the seal chamber is disassembled for re-assembly.

2. Carefully remove the existing sealing device, taking care not to damage the shaft.
3. Clean the shaft, shaft sleeve (if present), and seal chamber face of rust, burrs, grit, sharp edges, and set screw damage using fine emery cloth. Wipe clean.

ATTENTION Avoid making flat spots or reducing the shaft diameter.

4. If the pump is equipped with a shaft sleeve, verify the condition of its O-ring or gasket and ensure that it is properly located (fully engaged against step/hook/snap ring).
5. Sealing surfaces and the shaft or shaft sleeve must have at least a 63 Ra-µin surface finish as seen in Figure 1.

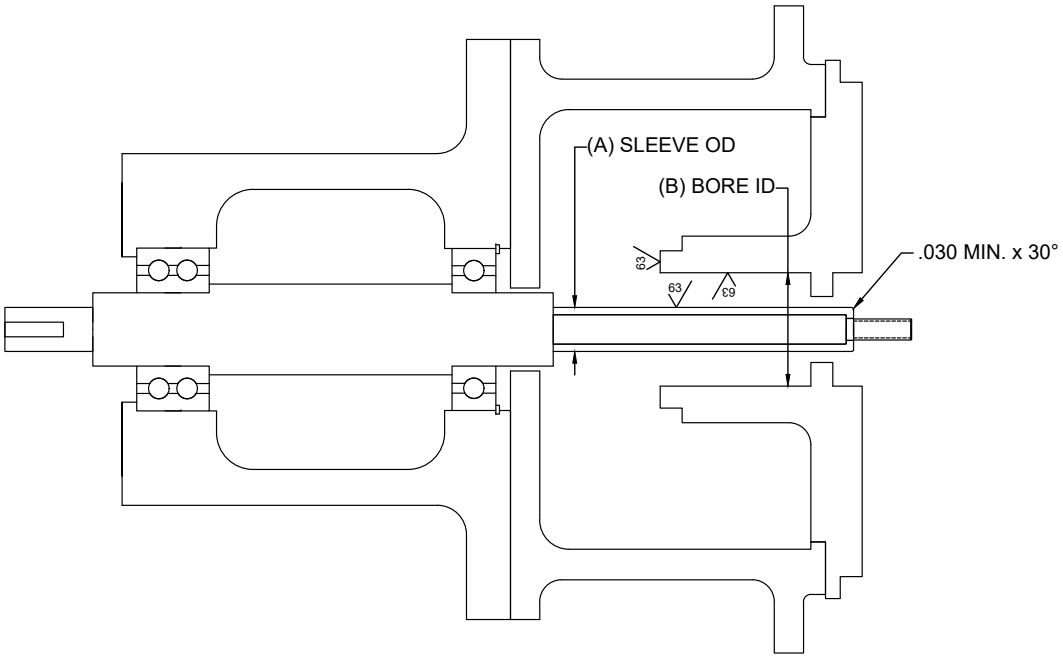


Figure 1: Surface finish and chamfer locations. Fully assembled pump without seal.

VERIFICATION

Successful operation of a Style 85/85M Split Cartridge Seal is contingent on conforming equipment dimensions and alignment. Verify the following prior to continuing:

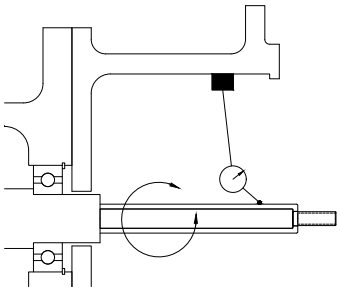


Figure 2: Shaft Runout

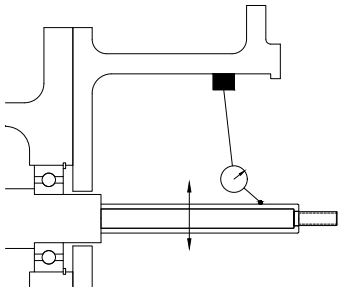


Figure 3: Bearing Fit

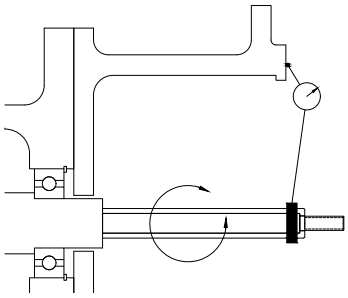


Figure 4: Bearing Frame Perpendicularity

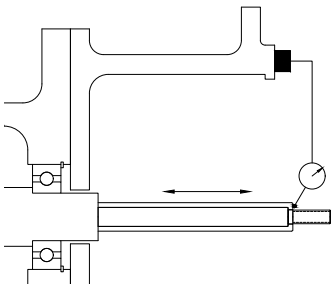


Figure 5: Axial Shaft Movement

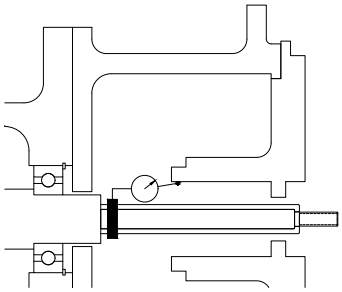


Figure 6: Seal Chamber Bore Concentricity

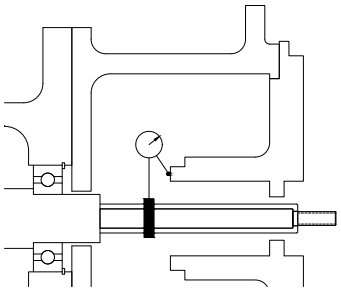


Figure 7: Seal Chamber Face Squareness

Maximum Alignment Variation (TIR)

		Style 85	Style 85M *
Fig. 2	Radial shaft movement (shaft runout)	0.0015–0.003 in.	0.060 in.
Fig. 3	Radial bearing fit	0.002–0.003 in.	0.002–0.003 in.
Fig. 4	Bearing frame perpendicularity	0.0005 in./in.	0.0005 in./in.
Fig. 5	Axial shaft movement (end play)	0.003 in.	0.120 in.
Fig. 6	Seal chamber bore concentricity	0.005 in.	0.005 in.
Fig. 7	Seal chamber face squareness	0.0005 in./in.	0.0005 in./in.

For proper function and satisfactory operation of the seal it is imperative that connections, dimensions, finishes, and alignments are all acceptable based on the specified design. If measured values exceed the values given above, adjust the equipment to meet the specifications before installing the seal. These values are general guidelines and the pump OEM should be used to verify acceptable values whenever possible.

*The Style 85M is a special engineered split cartridge seal typically designed for specific applications with larger runouts than traditional installations. The maximum runout values indicated are highly dependent on the proposed installation and application data. Contact Flexaseal with any questions on allowable values for specific applications.

SEAL INSTALLATION

The advantage of a Style 85/85M Split Cartridge Seal over a typical cartridge seal is seen in the ease of installation and setup for service. When removing packing from an existing pump, a split seal does not require that the pump be taken apart. Ensure alignment verification of equipment has been completed prior to starting the installation procedure. Review engineering prints for special notes and/or instructions.

NOTE: It is essential to use a suitable lubricant when installing a seal, as different lubricants will work better with different elastomers.

1. Remove the seal from its packaging and inspect for damage to any components and seal faces.

NOTE: Split cartridge seals are shipped from Flexaseal as two complete halves and should not be disassembled further without cause. If a seal appears damaged prior to installation, contact a Flexaseal representative.

Grease, scratches, or nicks on the seal faces may cause leakage.

2. Ensure the shaft and seal housing have been properly cleaned as described in the preparation section.

3. Lightly lubricate the sleeve O-rings with a suitable and compatible lubricant. Do not get any lubricant on the end of the O-rings where they are split.

4. Hold the bottom half of the split cartridge up against the shaft. Carefully align the top half using the locating pins. Make sure to never release pressure from the bottom half. Start the large shoulder screws in the gland holes and the small shoulder screws in the sleeve holes until they are all finger tight.

5. Tighten all shoulder screws alternately and evenly so that the two halves come together parallel. Recommended torque values for the shoulder bolts are listed in the table below:

Shoulder Bolt Part No.	Recommended Torque
FS11680	50 in-lbs
FS10050-03	50 in-lbs
FS10050-08	80 in-lbs
FS10050-09	100 in-lbs

6. Move the seal forward until it contacts the stuffing box face. Lubricate the gland bolts/studs/nuts and tighten them using the Legacy Method (Star Pattern) until 80–100 in-lbs of torque is achieved.

ATTENTION Do not over tighten gland bolts as this can distort the gland and internal components resulting in seal leakage.

7. Alternately tighten the provided set screws to the specified torque value according to the table below.

8. Remove the setting clips from the seal. Save these for future use in seal removal.

Cup Point Set Screw Torque Specifications

Screw Size	Alloy Steel	Stainless	Screw Size	Alloy Steel	Stainless
#10	36 in.-lbs.	26 in.-lbs.	M4	2.0 N-m	1.5 N-m
1/4	87 in.-lbs.	70 in.-lbs.	M6	7.9 N-m	6.1 N-m
5/16	165 in.-lbs.	130 in.-lbs.	M8	19.6 N-m	15.4 N-m
3/8	290 in.-lbs.	230 in.-lbs.	M10	37.0 N-m	29.5 N-m
1/2	620 in.-lbs.	500 in.-lbs.	M12	60.3 N-m	48.3 N-m

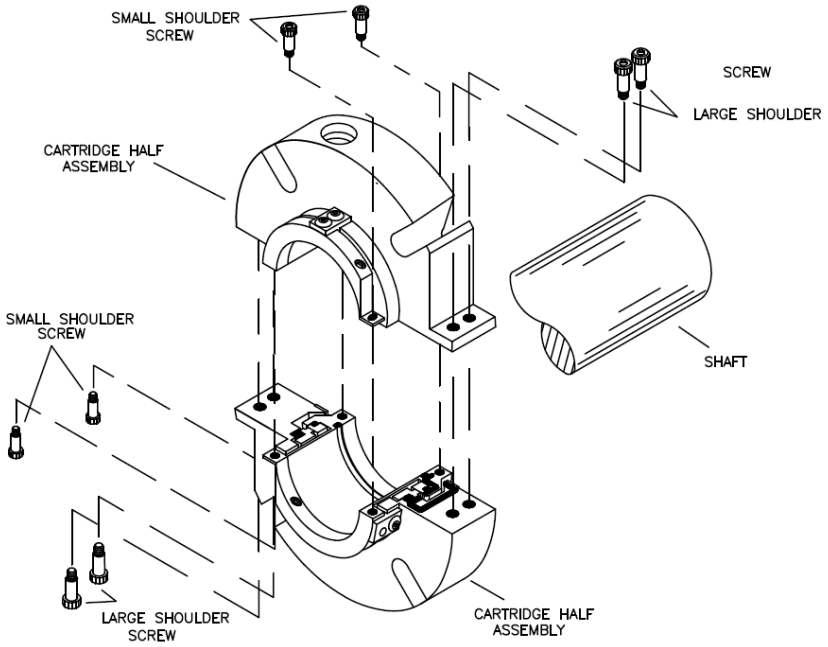


Figure 8: Exploded view of split cartridge

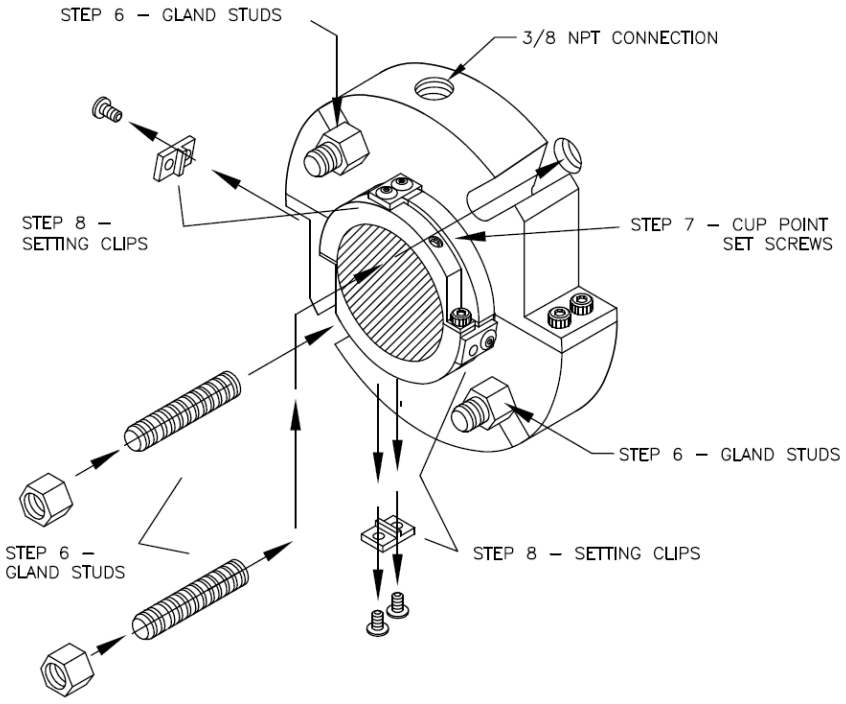


Figure 9: Installation of split cartridge

BEFORE STARTING THE EQUIPMENT

1. Ensure the pump shaft is properly aligned at the coupling with the motor.
2. Check that all gland plate bolts and all screws are securely fastened.
3. Once the pump is reassembled, turn the shaft by hand if possible to check for free rotation, if not, recheck installation.
4. Verify that all plumbing and piping plans for the seal are connected and configured according to best practice.
5. Flood the pump, vent all air from the seal chamber, and check the seal for leakage.
6. Ensure all plumbing and venting are free of obstruction and that the chamber is filled with liquid. Check that all alarms connected to auxiliary systems are properly functioning to alert personnel if any issues arise.

ATTENTION Dry-running is a major cause for leakage and/or failure of mechanical seals. It is imperative that the seal chamber be completely vented prior to startup and that adequate lubrication is supplied to the seal.

7. Start the pump per the pump manufacturer's recommendations, observe for proper operation, and check for excessive heat at the seal gland.

ATTENTION Check periodically during operation to ensure that the seal is not overheating.

OPERATION & MAINTENANCE

If leakage is detected, it should be addressed as soon as possible to prevent hazards and protect personnel. Leakage could come from a number of leak paths in the seal, or be caused by changes in the pump operation or condition. Although seals should be inspected regularly for signs of leakage, a properly selected and functioning mechanical seal will run for extended durations without need for extra attention and should not be disturbed unnecessarily (i.e. shut down and disassembled without cause). Below is an inexhaustive list of possible causes of leakage.

Primary Causes

- Worn seal faces
- Damaged O-rings
- Damaged springs

Secondary Causes

- Change in duty conditions
- Dry-running
- Worn bearings
- Increased vibration

It is important to periodically inspect and maintain flush systems, shaft alignment, and consistent duty parameters to ensure the seal performs as designed. Often, there is a case of cause & effect with machinery and processing issues upstream that can cause a seal to leak. Check for the root cause of leakage when disassembling equipment for inspection or service.

DECOMMISSIONING EQUIPMENT

When decommissioning equipment it is important to ensure that the pump has been fully isolated from the process and power sources for personnel safety. Pressure and fluid should be fully released before disassembly of the equipment is to begin.

If the equipment has been used with toxic or hazardous fluids, ensure that it is decontaminated and neutralized before decommission begins. There is often residual fluid remaining from the draining process so consult the pump OEM for special cases.

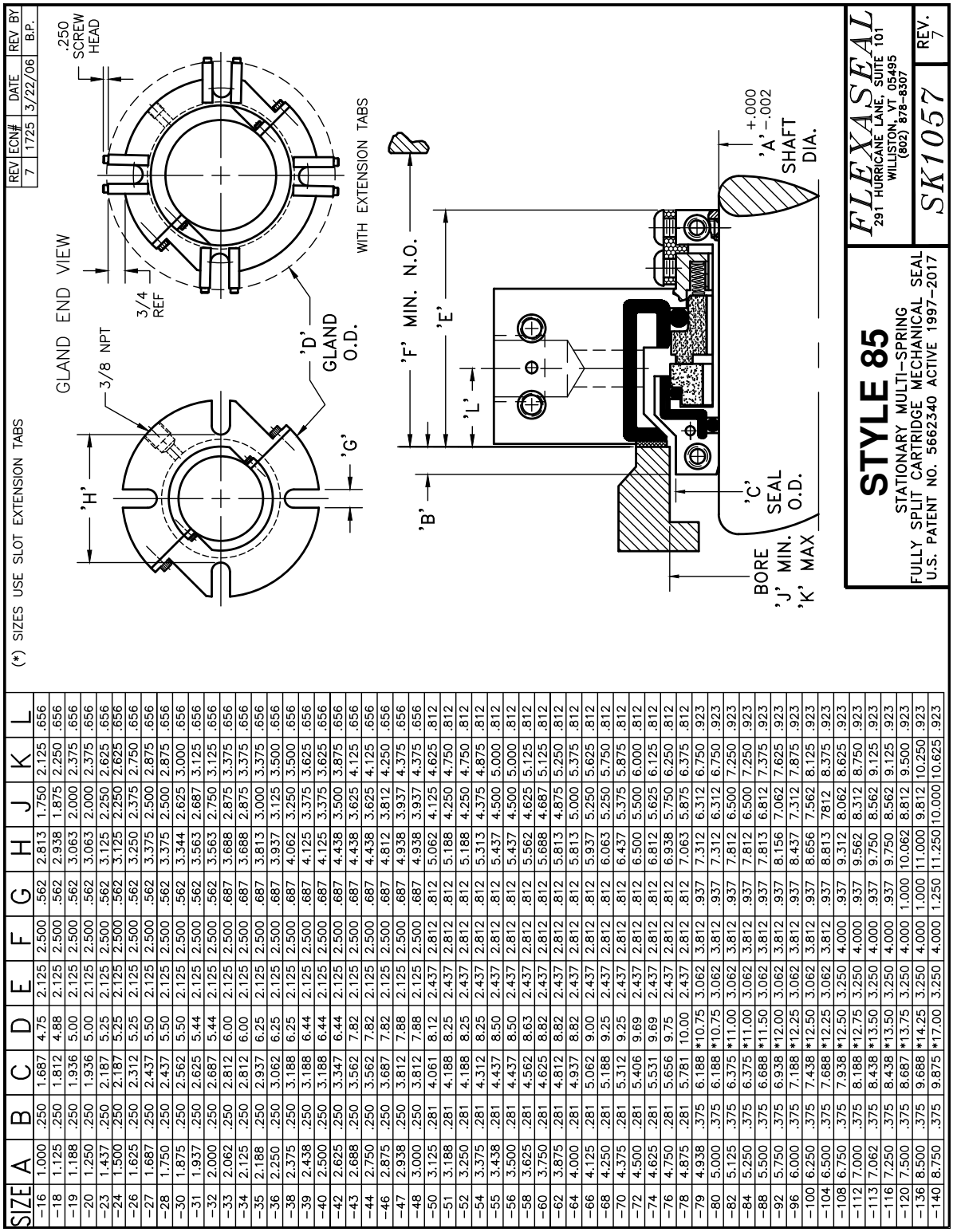
REMOVING THE SEAL

Before opening the pump to remove the seal the warning stated above regarding toxins and hazardous products must be reiterated. Make note of all fluids contained in the pump, drain and decontaminate before opening the housing for seal service.

1. Ensure all fluid has been drained and vented. Equipment should be shut down and locked/tagged out according to OEM and plant specifications.
2. Dismantle equipment sufficiently so that the gland plate and seal housing are exposed and accessible for service.
3. Reset the setting clips that were saved from installation.
4. Back-out the cup point set screws.
5. Remove the gland bolts/nuts in an even manner.
6. While supporting the bottom half of the cartridge to ensure that it does not drop, remove the shoulder bolts holding the two halves together.
7. Carefully separate the halves and remove them from the pump.

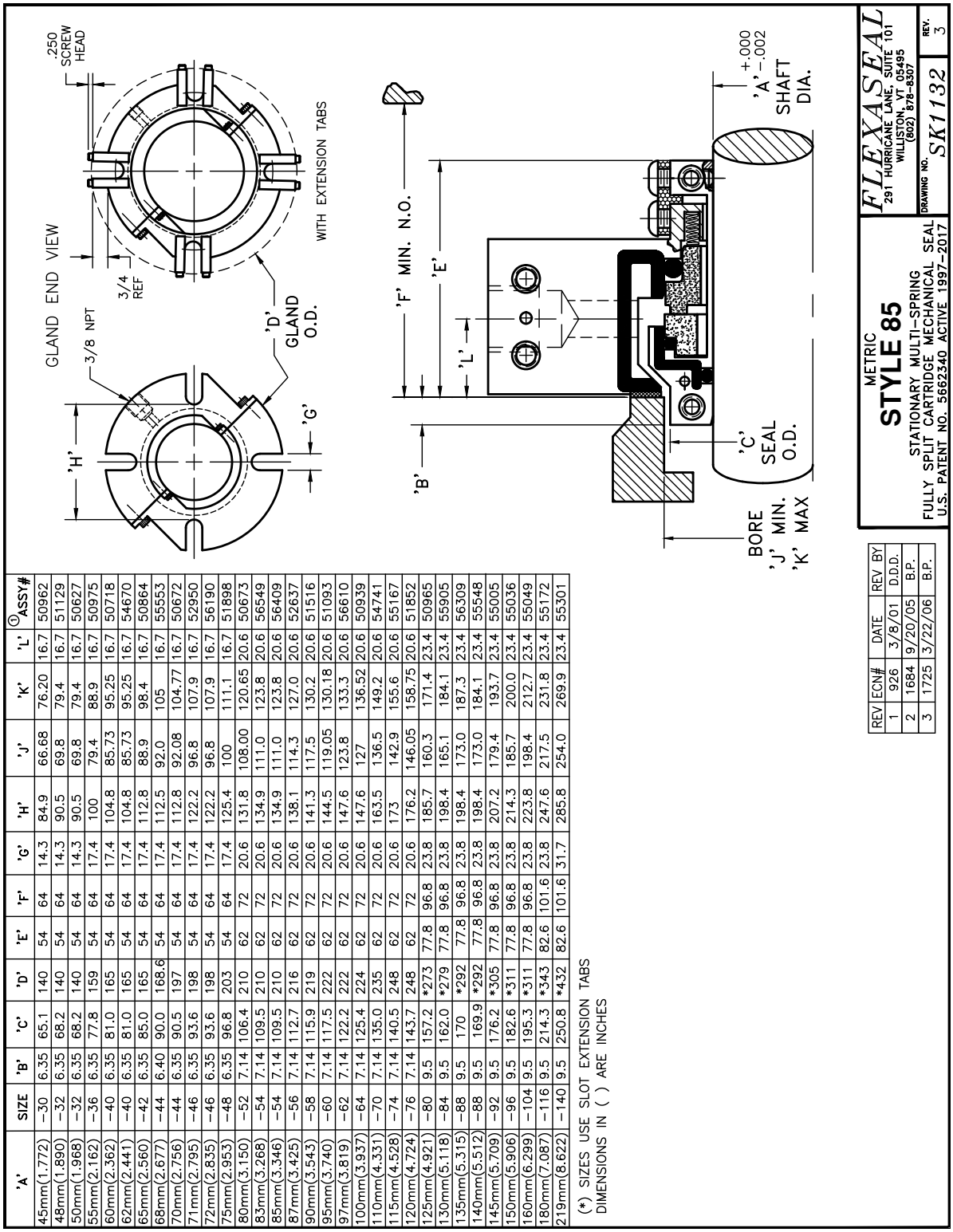
If a part is going to be returned for service or to any third party, all shipments should have appropriate safe-handling instructions securely attached to the package.

STYLE 85 DIMENSIONAL DATA (INCH)



SIZE	A	B	C	D	E	F	G	H	J	K	L
-16	1.000	.250	1.687	4.75	2.125	2.500	.562	2.813	1.750	2.125	.656
-18	1.125	.250	1.812	4.88	2.125	2.500	.562	2.938	1.875	2.250	.656
-19	1.188	.250	1.936	5.00	2.125	2.500	.562	3.063	2.000	2.375	.656
-20	1.250	.250	1.936	5.00	2.125	2.500	.562	3.063	2.000	2.375	.656
-23	1.437	.250	2.187	5.25	2.125	2.500	.562	3.125	2.250	2.625	.656
-24	1.500	.250	2.187	5.25	2.125	2.500	.562	3.125	2.250	2.625	.656
-26	1.625	.250	2.312	5.25	2.125	2.500	.562	3.250	2.375	2.750	.656
-27	1.687	.250	2.437	5.50	2.125	2.500	.562	3.375	2.500	2.875	.656
-28	1.750	.250	2.437	5.50	2.125	2.500	.562	3.375	2.500	2.875	.656
-30	1.875	.250	2.562	5.50	2.125	2.500	.562	3.344	2.625	3.000	.656
-31	1.937	.250	2.625	5.44	2.125	2.500	.562	3.563	2.687	3.125	.656
-32	2.000	.250	2.687	5.44	2.125	2.500	.562	3.563	2.750	3.125	.656
-33	2.062	.250	2.812	6.00	2.125	2.500	.687	3.688	2.875	3.375	.656
-34	2.125	.250	2.812	6.00	2.125	2.500	.687	3.688	2.875	3.375	.656
-35	2.188	.250	2.937	6.25	2.125	2.500	.687	3.813	3.000	3.375	.656
-36	2.250	.250	3.062	6.25	2.125	2.500	.687	3.937	3.125	3.500	.656
-38	2.375	.250	3.188	6.25	2.125	2.500	.687	4.062	3.250	3.500	.656
-39	2.438	.250	3.188	6.44	2.125	2.500	.687	4.125	3.375	3.625	.656
-40	2.500	.250	3.188	6.44	2.125	2.500	.687	4.125	3.375	3.625	.656
-42	2.625	.250	3.347	6.44	2.125	2.500	.687	4.438	3.500	3.875	.656
-43	2.688	.250	3.562	7.82	2.125	2.500	.687	4.438	3.625	4.125	.656
-44	2.750	.250	3.562	7.82	2.125	2.500	.687	4.438	3.625	4.125	.656
-46	2.875	.250	3.687	7.82	2.125	2.500	.687	4.812	3.812	4.250	.656
-47	2.938	.250	3.812	7.88	2.125	2.500	.687	4.938	3.937	4.375	.656
-48	3.000	.250	3.812	7.88	2.125	2.500	.687	4.938	3.937	4.375	.656
-50	3.125	.281	4.061	8.12	2.437	2.812	.812	5.062	4.125	4.625	.812
-51	3.188	.281	4.188	8.25	2.437	2.812	.812	5.188	4.250	4.750	.812
-52	3.250	.281	4.188	8.25	2.437	2.812	.812	5.188	4.250	4.750	.812
-54	3.375	.281	4.312	8.25	2.437	2.812	.812	5.313	4.375	4.875	.812
-55	3.438	.281	4.437	8.50	2.437	2.812	.812	5.437	4.500	5.000	.812
-56	3.500	.281	4.437	8.50	2.437	2.812	.812	5.437	4.500	5.000	.812
-58	3.625	.281	4.562	8.63	2.437	2.812	.812	5.562	4.625	5.125	.812
-60	3.750	.281	4.625	8.82	2.437	2.812	.812	5.688	4.687	5.125	.812
-62	3.875	.281	4.812	8.82	2.437	2.812	.812	5.813	4.875	5.250	.812
-64	4.000	.281	4.937	8.82	2.437	2.812	.812	5.813	5.000	5.375	.812
-66	4.125	.281	5.062	9.00	2.437	2.812	.812	5.937	5.250	5.625	.812
-68	4.250	.281	5.188	9.25	2.437	2.812	.812	6.063	5.250	5.750	.812
-70	4.375	.281	5.312	9.25	2.437	2.812	.812	6.437	5.375	5.875	.812
-72	4.500	.281	5.406	9.69	2.437	2.812	.812	6.500	5.500	6.000	.812
-74	4.625	.281	5.531	9.69	2.437	2.812	.812	6.812	5.625	6.125	.812
-76	4.750	.281	5.656	9.75	2.437	2.812	.812	6.938	5.750	6.250	.812
-78	4.875	.281	5.781	10.00	2.437	2.812	.812	7.063	5.875	6.375	.812
-79	4.938	.375	6.188	*10.75	3.062	3.812	.937	7.312	6.312	6.750	.923
-80	5.000	.375	6.188	*10.75	3.062	3.812	.937	7.312	6.312	6.750	.923
-82	5.125	.375	6.375	*11.00	3.062	3.812	.937	7.812	6.500	7.250	.923
-84	5.250	.375	6.375	*11.00	3.062	3.812	.937	7.812	6.500	7.250	.923
-88	5.500	.375	6.688	*11.50	3.062	3.812	.937	7.813	6.812	7.375	.923
-92	5.750	.375	6.938	*12.00	3.062	3.812	.937	8.156	7.062	7.625	.923
-96	6.000	.375	7.188	*12.25	3.062	3.812	.937	8.437	7.312	7.875	.923
-100	6.250	.375	7.438	*12.50	3.062	3.812	.937	8.656	7.562	8.125	.923
-104	6.500	.375	7.688	*12.25	3.062	3.812	.937	8.813	7812	8.375	.923
-108	6.750	.375	7.938	*12.50	3.250	4.000	.937	9.312	8.062	8.625	.923
-112	7.000	.375	8.188	*12.75	3.250	4.000	.937	9.562	8.312	8.750	.923
-113	7.062	.375	8.438	*13.50	3.250	4.000	.937	9.750	8.562	9.125	.923
-116	7.250	.375	8.438	*13.50	3.250	4.000	.937	9.750	8.562	9.125	.923
-120	7.500	.375	8.687	*13.75	3.250	4.000	1.000	10.062	8.812	9.500	.923
-136	8.500	.375	9.688	*14.25	3.250	4.000	1.000	11.000	9.812	10.250	.923
-140	8.750	.375	9.875	*17.00	3.250	4.000	1.250	11.250	10.000	10.625	.923

STYLE 85 DIMENSIONAL DATA (METRIC)



'A'	SIZE	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'J'	'K'	'L'	①ASSY#
45mm(1.772)	-30	6.35	65.1	140	54	64	14.3	84.9	66.68	76.20	16.7	50962
48mm(1.890)	-32	6.35	68.2	140	54	64	14.3	90.5	69.8	79.4	16.7	51129
50mm(1.968)	-32	6.35	68.2	140	54	64	14.3	90.5	69.8	79.4	16.7	50627
55mm(2.162)	-36	6.35	77.8	159	54	64	17.4	100	79.4	88.9	16.7	50975
60mm(2.362)	-40	6.35	81.0	165	54	64	17.4	104.8	85.73	95.25	16.7	50718
62mm(2.441)	-40	6.35	81.0	165	54	64	17.4	104.8	85.73	95.25	16.7	54670
65mm(2.560)	-42	6.35	85.0	165	54	64	17.4	112.8	88.9	98.4	16.7	50864
68mm(2.677)	-44	6.40	90.0	168.6	54	64	17.4	112.5	92.0	105	16.7	55553
70mm(2.756)	-44	6.35	90.5	197	54	64	17.4	112.8	92.08	104.77	16.7	50672
71mm(2.795)	-46	6.35	93.6	198	54	64	17.4	122.2	96.8	107.9	16.7	52950
72mm(2.835)	-46	6.35	93.6	198	54	64	17.4	122.2	96.8	107.9	16.7	56190
75mm(2.953)	-48	6.35	96.8	203	54	64	17.4	125.4	100	111.1	16.7	51898
80mm(3.150)	-52	7.14	106.4	210	62	72	20.6	131.8	108.00	120.65	20.6	50673
83mm(3.268)	-54	7.14	109.5	210	62	72	20.6	134.9	111.0	123.8	20.6	56549
85mm(3.346)	-54	7.14	109.5	210	62	72	20.6	134.9	111.0	123.8	20.6	56409
87mm(3.425)	-56	7.14	112.7	216	62	72	20.6	138.1	114.3	127.0	20.6	52637
90mm(3.543)	-58	7.14	115.9	219	62	72	20.6	141.3	117.5	130.2	20.6	51516
95mm(3.740)	-60	7.14	117.5	222	62	72	20.6	144.5	119.05	130.18	20.6	51093
97mm(3.819)	-62	7.14	122.2	222	62	72	20.6	147.6	123.8	133.3	20.6	56610
100mm(3.937)	-64	7.14	125.4	224	62	72	20.6	147.6	127	136.52	20.6	50939
110mm(4.331)	-70	7.14	135.0	235	62	72	20.6	163.5	136.5	149.2	20.6	54741
115mm(4.528)	-74	7.14	140.5	248	62	72	20.6	173	142.9	155.6	20.6	55167
120mm(4.724)	-76	7.14	143.7	248	62	72	20.6	176.2	146.05	158.75	20.6	51852
125mm(4.921)	-80	9.5	157.2	*273	77.8	96.8	23.8	185.7	160.3	171.4	23.4	50965
130mm(5.118)	-84	9.5	162.0	*279	77.8	96.8	23.8	198.4	165.1	184.1	23.4	55905
135mm(5.315)	-88	9.5	170	*292	77.8	96.8	23.8	198.4	173.0	187.3	23.4	56309
140mm(5.512)	-88	9.5	169.9	*292	77.8	96.8	23.8	198.4	173.0	184.1	23.4	55548
145mm(5.709)	-92	9.5	176.2	*305	77.8	96.8	23.8	207.2	179.4	193.7	23.4	55005
150mm(5.906)	-96	9.5	182.6	*311	77.8	96.8	23.8	214.3	185.7	200.0	23.4	55036
160mm(6.299)	-104	9.5	195.3	*311	77.8	96.8	23.8	223.8	198.4	212.7	23.4	55049
180mm(7.087)	-116	9.5	214.3	*343	82.6	101.6	23.8	247.6	217.5	231.8	23.4	55172
219mm(8.622)	-140	9.5	250.8	*432	82.6	101.6	31.7	285.8	254.0	269.9	23.4	55301

(*) SIZES USE SLOT EXTENSION TABS
DIMENSIONS IN ( ) ARE INCHES

REV	ECN#	DATE	REV BY
1	926	3/8/01	D.D.D.
2	1684	9/20/05	B.P.
3	1725	3/22/06	B.P.

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Flexaseal Engineered Seals and Systems, LLC (hereinafter referred to as "FAS") warrants that new goods manufactured by FAS (with the exception of "wear parts" or consumables all of which are not warranted) will be free from defects in material and workmanship (the “Warranty”). The Warranty shall be in effect for a period of the earlier of three (3) months from the date of installation or six (6) months from the date of shipment from FAS’s facility (which date of shipment shall not be greater than thirty (30) days after receipt of notice that the goods are ready to ship) (the “Warranty Period”). FAS shall, at its option and expense, either repair, replace, or refund amounts paid for any goods that fail to conform to the Warranty. In no case shall FAS be obligated to remove the defective goods or install the replaced or repaired goods, and the end user shall be responsible for providing ready access to the goods and areas for warranty work, and all other associated costs, including, but not limited to, service costs, shipping fees, and expenses. FAS shall have complete discretion as to the method or means of repair or replacement. The end user’s failure to comply with FAS’s repair or replacement directions shall constitute a waiver of its rights and render all warranties void. Any goods repaired or replaced under the Warranty are warranted only for the balance of the Warranty Period on the goods that were repaired or replaced. The Warranty is conditioned on the end user giving written notice to FAS of any goods that fail to meet the Warranty within ten (10) days of the date when any defects first become apparent. FAS shall have no warranty obligations to the end user with respect to any goods or parts of a good that: (a) have been repaired by parties other than FAS or without FAS’s written approval; (b) have been subject to misuse, misapplication, neglect, alteration, accident, or physical damage; (c) have been used in a manner contrary to FAS’s instructions for installation, operation and maintenance; (d) have been damaged from ordinary wear and tear, corrosion, or chemical attack; (e) have been damaged due to abnormal conditions, vibration, failure to properly prime, or operation without flow; (f) have been damaged due to a defective power supply or improper electrical protection; or (g) have been damaged resulting from the use of accessory Products not sold by FAS or not approved by FAS in connection with goods supplied by FAS.

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