Kam®

Simple Precision™

KAM® IAS™
ISOKINETIC AUTOMATIC SAMPLER

PER API 8.2, ASTM D4177
AND ISO 3171

User Manual

IASMANUAL0723

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CAUTION:

When installing the IAS™ sampler in a pipeline containing petroleum products, petro-chemicals, waste waters with the presence of pressure & temperature, and high-pressure steam refer to the Pipeline Operators' "Health, Safety and Environmental Policy Procedures" to ensure safe installation.

INTRODUCTION

AVAILABLE MODELS and MOUNTING OPTIONS

FIG. 1-1

Option 1: Insertable/Retractable IAS™ on a main pipe with 2", 3", or 4" flanged seal housing

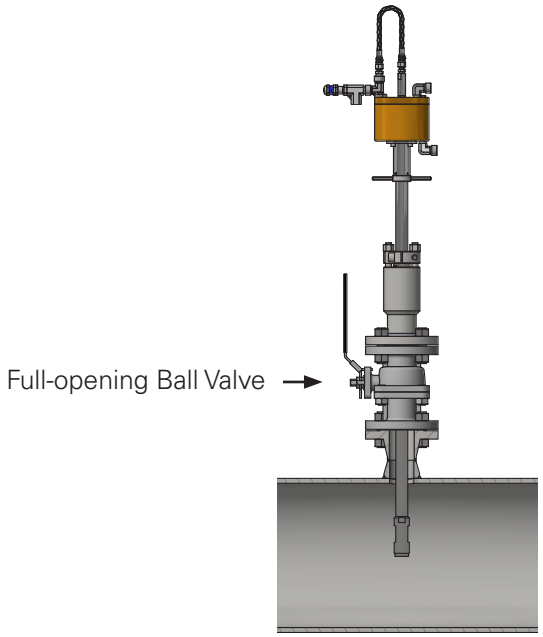


FIG. 1-2

Option 2: Insertable/Retractable IAS™ on a main pipe with 2" MNPT seal housing

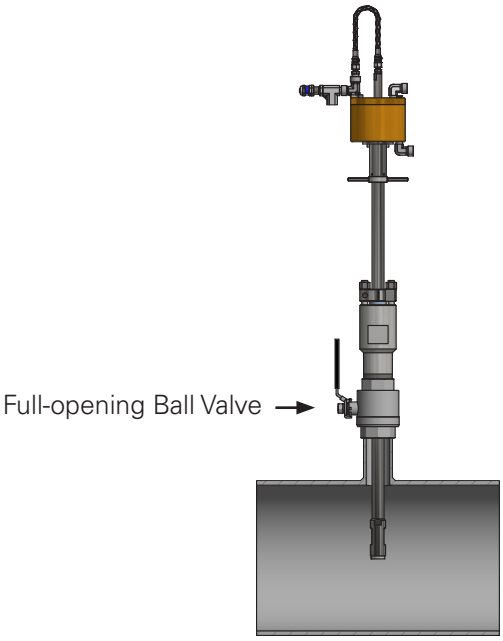
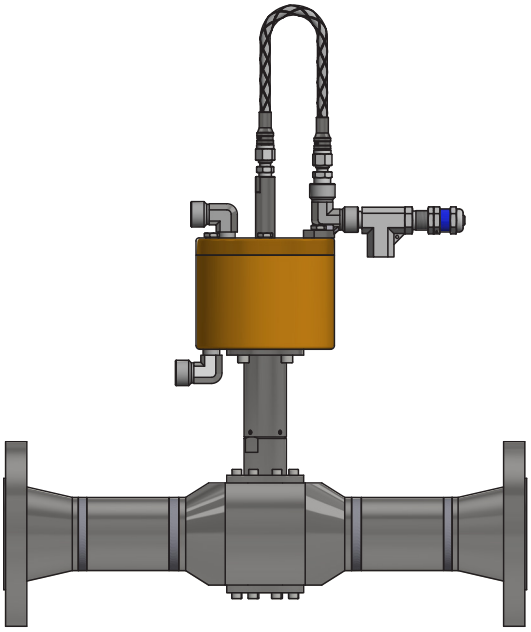
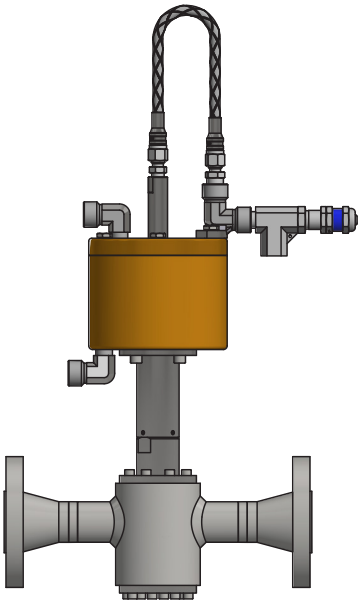


FIG. 1-3

Option 3: IAS™ Flow Through Models



IAS™ 2" Flow Through



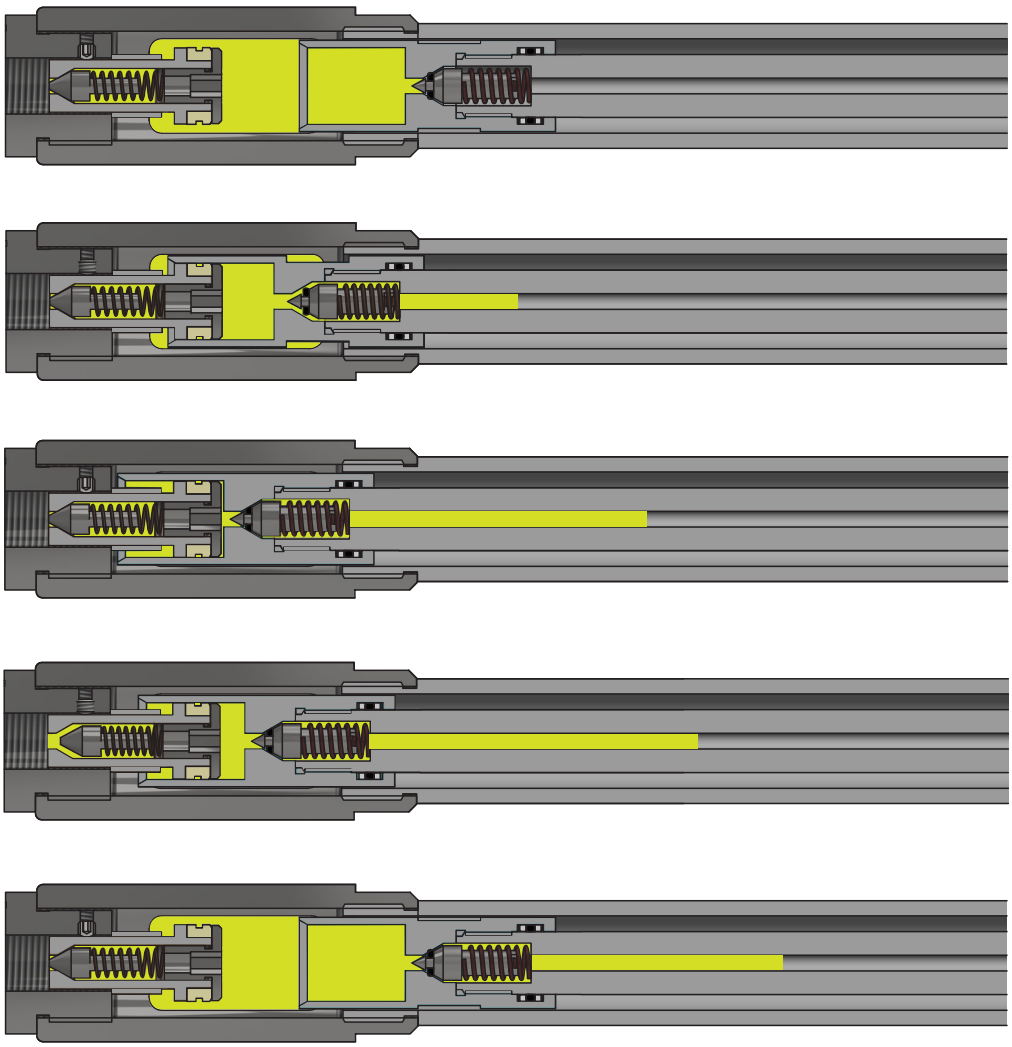
IAS™ 1" Flow Through

THEORY OF OPERATION

Operating similarly to a downhole pump, the KAM® IAS™ Isokinetic Automatic Sampler extracts a known volume of pipeline fluids for collection in a KAM® SR™ Sample Receiver. Sampling is pneumatically or hydraulically driven, and the time interval can be flow-based or time-based. All KAM sampling components comply with API MPMS Chapter 8.2, ASTM D4177, and ISO 3171 standards requirements.

SAMPLER SEQUENCE

FIG. 1-4



SPECIFICATIONS

Media:	Crude oil, refined products, chemicals, water and wastewater
Wetted parts:	316 stainless steel shaft** and probe cage 304 stainless steel sample tube PEEK bottom seal, Teflon available Other materials available
Fluid temperature:	-40º to 350ºF (-40º to 177ºC)
Power:	Pneumatic, hydraulic
Sample size:	0.5 ml – 5 ml (per customer requirements)
Repeatability:	Exceeds API 8.2 requirement
Mounting:	Insertable/Retractable – 2" MNPT Seal Housing** Insertable/Retractable – 2", 3", or 4" Flanged Seal Housing Flow Through – 1" or 2" Flow Through Spool
Pressure ratings:	ANSI 150, 300, 600, 900*
Probe dimensions:	Ø1.25" x 3.1" (32 mm x 79 mm)
Shaft length:	30" (762mm) for insertable/retractable models.
Pipe size:	1" to 42" (50 mm to 1067 mm)
Weight:	From 30 lbs. (13.6 kg)

*Flow-through models only

REQUIREMENTS

Air:	70 to 125 psi
Consumption:	20 cubic inches per stroke
Maximum sample rate:	20 samples/minute

** Seal Housing for 2" MNPT Models are Carbon Steel.

INSTALLATION

PRIOR TO INSTALLATION

- Before installing the IAS™ Sampler, unpack and carefully inspect to ensure that it was not damaged during transit.
- The IAS™ Sampler is normally shipped with a PRV spring per the pressure range of the application. Ensure the PRV is set to 50 to 100 psi above the maximum operating pressure as per instructions on page 11. Refer to Table 3-1 to ensure provided spring matches line pressure.
- The IAS™ Sampler should be installed per KAM recommendations, including the mixing requirement calculated per customer provided flow conditions.
- At the time of installation, the pipeline pressure needs to be reduced to under 100 psi or use a KAM® IT™ Insertion Tool where line pressure exceeds 100 psi in order to be able to install the IAS™ Sampler.
- The IAS™ Sampler Probe should be inserted so that the middle of the sampling window is approximately in the center half area of the pipe per API MPMS Chapter 8.2 guidelines. FIG. 3-1.
- For insertable/retractable models, before mounting the IAS™ Sampler on the Full-Opening Ball Valve, determine the insertion length required per procedure on page 7. The Full-Opening Ball Valve is used to isolate the IAS™ Sampler from the pipeline during installation or removal. The Seal Housing of the IAS™ Sampler allows the Sampler Probe to be inserted in and out of the pipe under pressure and flow conditions up to 100 psi. It is the user's responsibility to ensure that the IAS™ Sampler is placed in the most representative point in the flow profile.

FIG. 3-1 End View of a KAM® IAS™ Installed on a Main Pipe

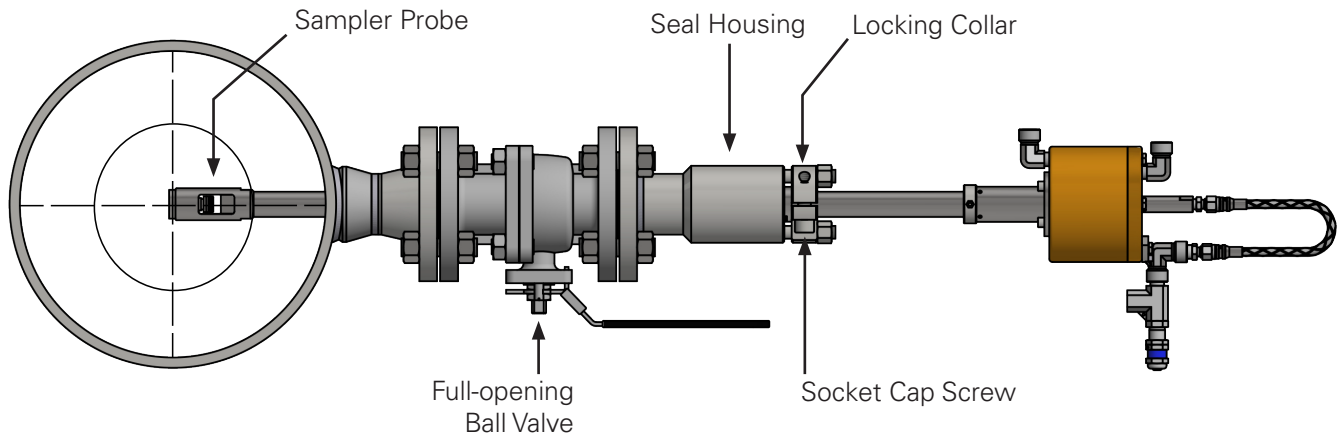


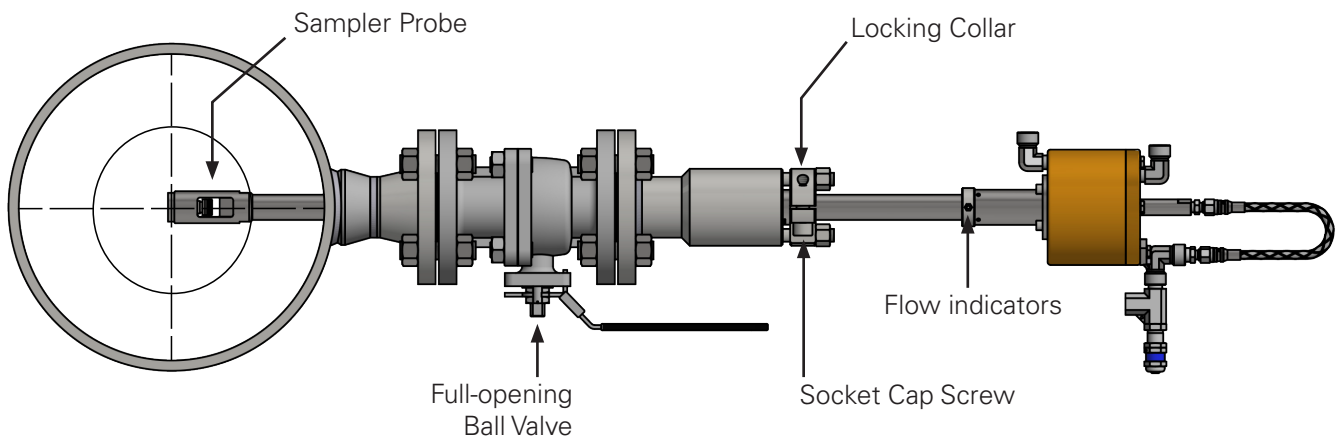
TABLE 3-1

PRV Spring Cracking Pressure Range (psig)	Spring Color
50 to 350	Blue
350 to 750	Yellow
750 to 1500	Purple
1500 to 2250	Orange

CONSIDERATIONS FOR INSERTABLE/RETRACTABLE MODELS INSTALLATION

- Insertable models of the IAS™ Sampler should be installed according to FIG. 3-2. The Full-Opening Ball Valve is used to isolate the IAS™ Sampler from the pipeline during installation or removal.
- In horizontal lines, the IAS™ Sampler should be installed with the probe horizontally oriented at 3 or 9 o'clock. At the time of installation, the pipeline pressure needs to be reduced to under 100 psi in order to safely install the IAS™ Sampler or installed using a KAM® IT™ Insertion Tool.
- The IAS™ Sampler Probe should be inserted so that the middle of the sampling window is approximately in the center half area of the pipe. It is the user's responsibility to ensure that the IAS™ Sampler is placed in the most representative point in the flow profile as per API MPMS Ch. 8.2 guidelines.

FIG. 3-2



INSERTABLE/RETRACTABLE MODELS INSTALLATION

WARNING: Do not actuate the IAS until you have set the appropriate cracking pressure (page 11).

1. With the probe on the ground or a table, use a 3/8" Allen wrench to loosen the Socket Cap Screws on the Locking Collar. FIG. 3-2. This will allow the IAS™ Sampler Shaft to slide through the Seal Housing.

2. If not already done, push the IAS™ back through the Seal Housing until the sampler probe is fully retracted inside the Seal Housing. FIG. 3-3 and FIG. 3-4.

   NOTE: On flanged models with 5 cc bite size, the sampler probe may rest flush with or slightly extend from the end of the seal housing.

FIG. 3-3 2" MNPT Seal Housing

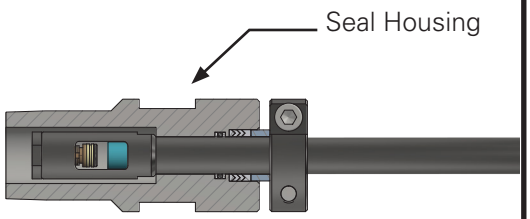
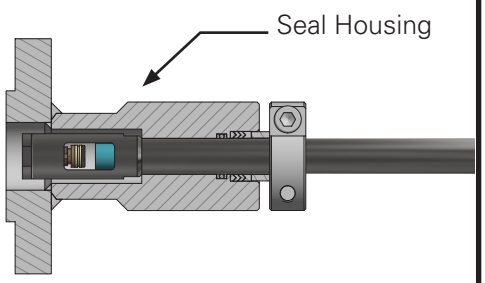


FIG. 3-4 Flanged Seal Housing



3. Re-tighten the Socket Cap Screws on the Locking Collar. This will prevent the IAS™ shaft from sliding and the probe from getting damaged during mounting.

4. Measure the distance (D1) from the top of the main pipe to the end of the connection where the IAS™ Sampler is going to be installed. FIG. 3-5 and FIG. 3-6.

FIG. 3-5
Measurements for
Flanged Models

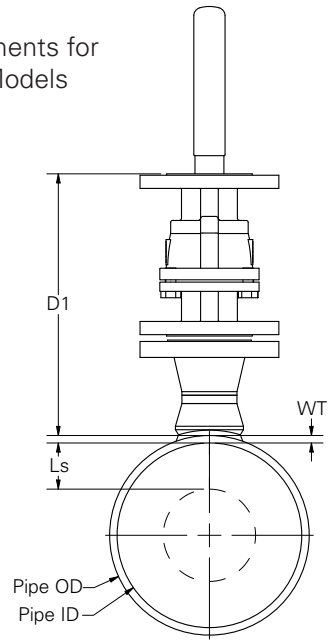
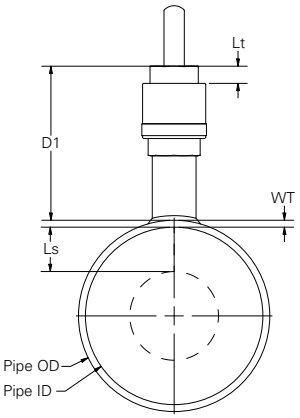


FIG. 3-6
Measurements for
MNPT Models



* Dashed line represents center 50% of pipe internal diameter (specified sample location per API MPMS Chapter 8.2)

5. Calculate the insertion distance:

For Flanged Seal Housing

MID	–	Minimum Insertion Distance
D1	–	Distance from the top of the valve to the pipe
Lg	–	Gasket Width (Typical 0.134")
WT	–	Pipe Wall Thickness
Ls	–	Pipe ID x 0.25

MID=D1 + Lg + WT + Ls + IAS Factor (per Table 3-2)

Example: D1=14"
Lg=0.134"
WT=0.322"
ID=7.98"
IAS Factor 2" 150#=2.5"

MID=14 + 0.134 + 0.322 + (7.98 x 0.25) + 2.5
MID=14 + 0.134 + 0.322 + 1.995 + 2.5=18.951"

TABLE 3-2 IAS Factor- Flanged SH

Class Rating	2" Size	3" Size
150#	2.50"	2.69"
300#	2.62"	2.87"
600#	3.00"	3.25"
900#	3.50"	3.50"

For 2" MNPT Seal Housing

MID	–	Minimum Insertion Distance
D1	–	Distance from the top of the valve to the pipe
WT	–	Pipe Wall Thickness
Ls	–	Pipe ID x 0.25 (Sampling Area Length)
Lt	–	Thread Engagement (0.75")
IAS Factor	–	3.25"

MID=D1 + WT + Ls + IAS Factor - Lt

Example: D1=14"
WT=0.322"
ID=7.98"
IAS Factor=3.25
Lt=0.75"

MID=14 + 0.322 + (7.98 x 0.25) + 3.25 - 0.75
MID=14 + 0.322 + 1.995 + 3.25 - 0.75=18.817"

6. Measure the calculated MID from the top of the Locking Collar and place a mark with a permanent marker or tape on the Shaft (Do not use anything sharp to mark the shaft as this will create grooves that will damage the O-rings in the seal housing.) FIG. 3-7 and FIG. 3-8.

7. You are now ready to attach either model to the valve on the pipeline.

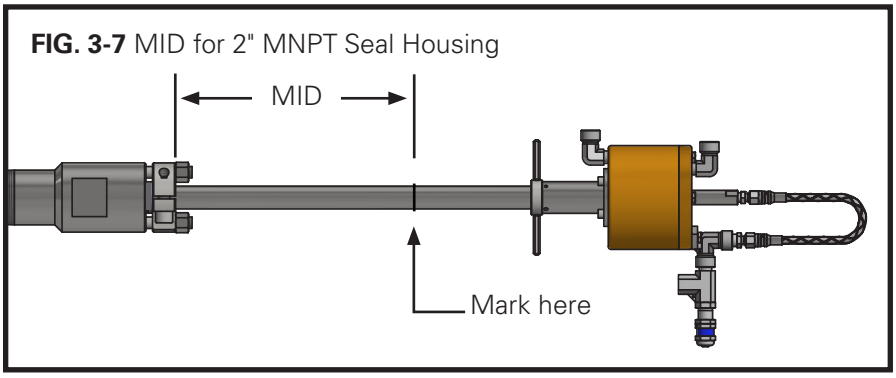


FIG. 3-7 MID for 2" MNPT Seal Housing

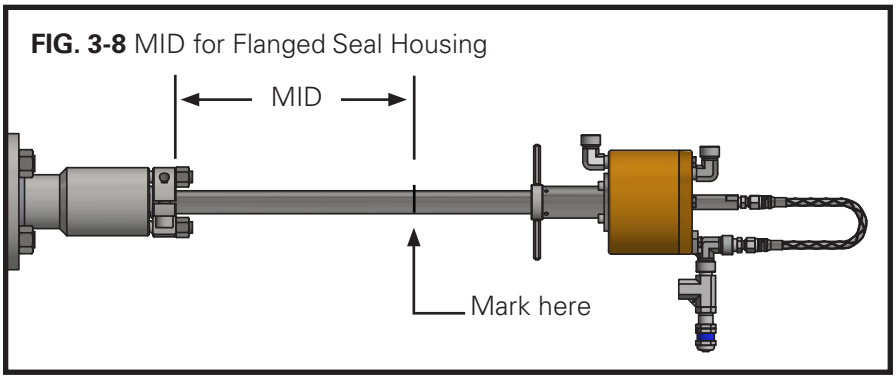


FIG. 3-8 MID for Flanged Seal Housing

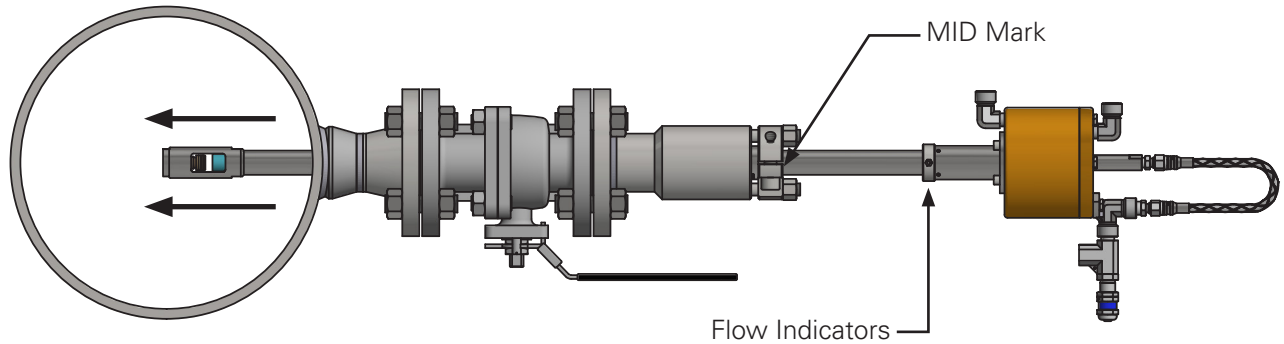
8. Slowly open Full-opening Valve and check for leaks.

9. Loosen Socket Cap Screws on the Locking Collar using a 3/8" Allen wrench.

10. Align window of the IAS™ Sampler to face the flowing stream. This can be done by aligning the Flow Indicators in parallel with the main pipe. The Flow Indicators are located at the bottom of the Actuator Housing. FIG. 3-9.

11. Push the IAS™ Sampler in until the MID Mark is at the top edge of the Locking Collar. FIG. 3-9.

FIG. 3-9



12. Re-tighten the Socket Cap Screws so that the gaps between each half of the Locking Collar are even, as tight as possible done by hand. Failure to properly tighten could result in ejection of the unit under process conditions. FIG. 3-10.

13. Use a 3/4" wrench to tighten the Hex Nuts holding the Locking Collar from ¼ to ½ of a turn. The Hex Nuts holding down the Locking Collar should never be over-tightened. Their major function is to apply light pressure on the Chevron Packing to ensure a seal between the Seal Housing body and the Insertion Shaft. FIG. 3-11.

FIG. 3-10 Top View Locking Collar

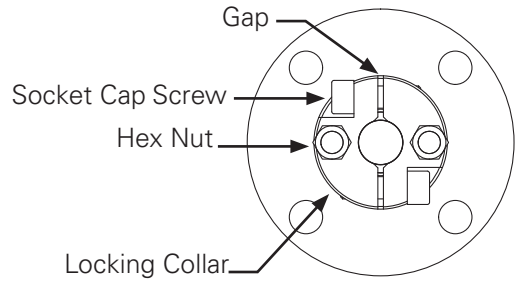
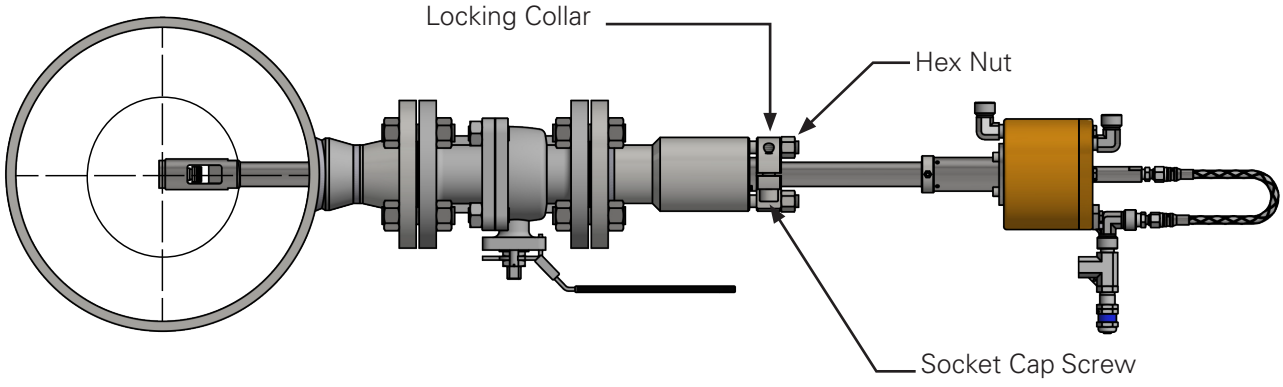


FIG. 3-11



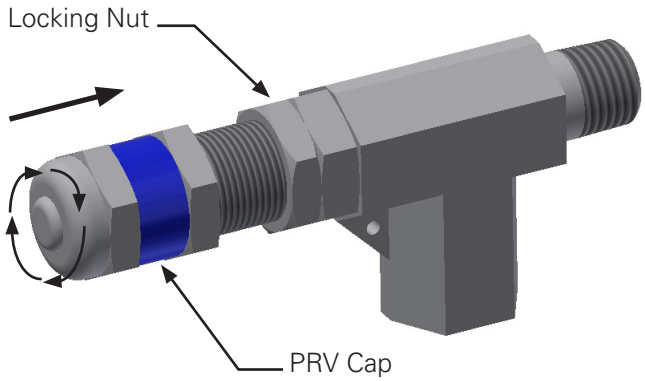
NOTE: If your line pressure is within the range of the cracking pressure of the PRV, follow steps on the next section "PRV Cracking Pressure Setup" to set the correct cracking pressure.

PRV CRACKING PRESSURE SETUP

1. Turn the PRV Locking Nut clockwise until it reaches the start of the PRV threads. FIG. 3-12.

2. Turn the PRV Cap clockwise until it reaches the Locking Nut to reach reference/starting point for cracking pressure procedure. FIG. 3-12.

FIG. 3-12



3. Turn the PRV Cap counterclockwise to set the PRV cracking pressure to 50 psi above your maximum operating pressure per Table 3-3.

   Example:

   Maximum operating pressure=175 psi
   Desired cracking pressure=175 psi + 50 psi=225 psi

   Turning the PRV Cap counterclockwise 4 full turns will set the cracking pressure to around 225 psi.

   NOTE: Pressure vs. number of turns are estimates only. Always make sure there are no leaks at the set cracking pressure with the maximum operating pressure. Not setting the PRV correctly will lead to an incorrect amount of sample being drawn.

TABLE 3-3 Spring Cracking Pressure (psi)

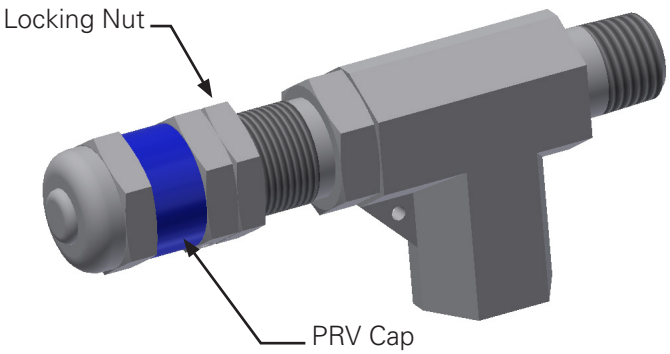
# Turns	Blue (50-350 psi)	Yellow (350-750 psi)	Purple (750-1,500 psi)
2	340	N/A	N/A
2.5	320	795	1,520
2.75	310	744	1,466
3	285	664	1,379
3.5	248	607	1,242
4	225	494	1,095
4.5	184	431	945
5	150	316	810
5.5	105	N/A	N/A
6	75	N/A	N/A
6.5	50	N/A	N/A

4. Hold the PRV Cap in place using a 3/4" wrench while turning the Locking Nut counterclockwise until it reaches the PRV Cap and tighten to the point that the cap cannot move. Lock the PRV Cap with the Locking Nut and the provided wire and lead lock. FIG. 3-13.

5. Thread provided wire through holes in Locking Nut and PRV Cap and twist to tighten.

   NOTE: See included PRV manual for further instructions.

FIG. 3-13



FIELD AIR CONNECTIONS

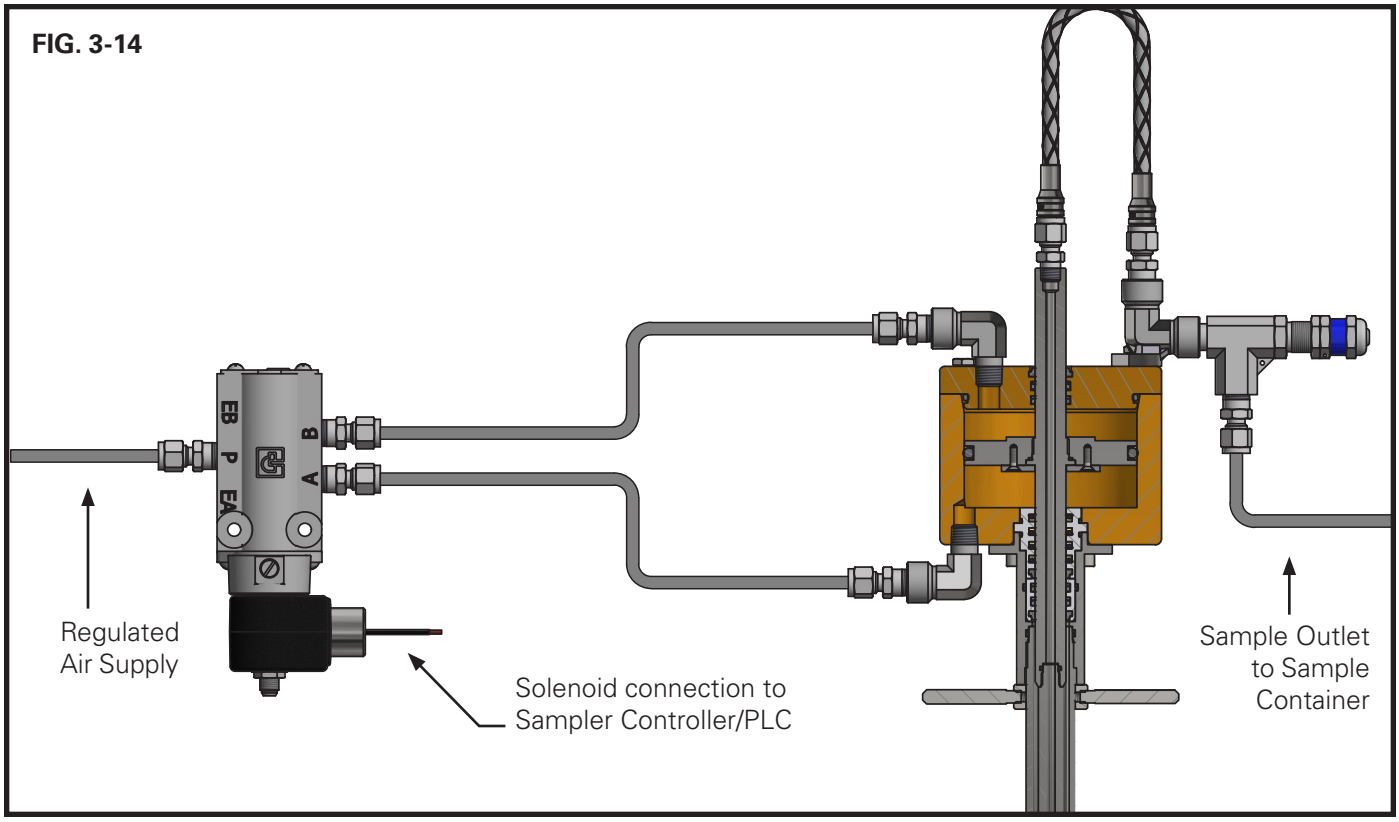
1. Using Stainless Steel Tubing or Stainless Steel Braided Hose, connect the normally open port (usually marked with a letter "A" or "NO") of the Solenoid Valve to the bottom of the Actuator Housing. Connect the normally closed port (usually marked "B" or "NC") to the top of the Actuator Housing. FIG. 3-14.

   NOTE: If solenoid valve is not provided by KAM, please consult with manufacturer for further instructions.

2. Connect the Solenoid Valve to the KAM® SC™ Sampler Controller or PLC according to the manual for the Solenoid Valve. The Controller/PLC should be programmed in a way that it energizes the coil for at least 1.5 seconds. Every time the coil is energized and de-energized the IAS™ Sampler will take a sample.

3. Using ¼" Stainless Steel Tubing and/or Stainless Steel Braided Hose, connect the IAS™ Sampler PRV outlet to the inlet of a Sample Container. Sample Outlet line should slope consistently downward from sampler to sample container.

FIG. 3-14



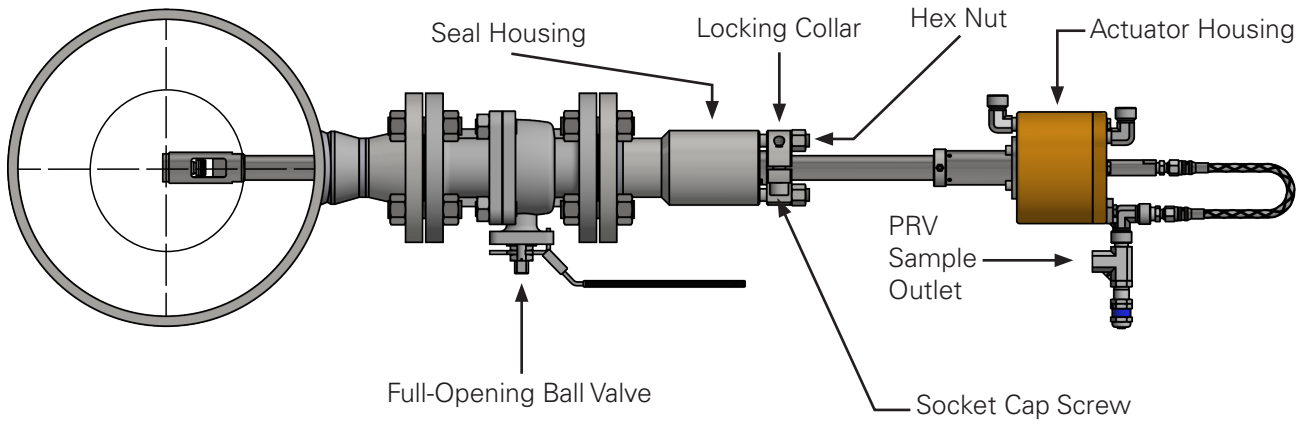
NOTE: All wiring and maintenance on the KAM® IAS™ must be done in accordance with regional and classification requirements. It is the user's responsibility to understand these requirements.

REMOVING THE IAS™ SAMPLER

1. Turn off the air supply going to the Solenoid Valve.
2. Disconnect the ¼" air connections going to the IAS™ Sampler Actuator Housing. FIG. 3-15.
3. Disconnect the ¼" connection going to the IAS™ Sampler PRV sample outlet. FIG. 3-15.

   NOTE: If line pressure exceeds 100 psi, use a KAM® IT Insertion Tool when installing/removing the IAS™ Sampler. Failure to do so could result in bodily injury or damage to the sampler.
4. Use a 3/4" wrench to loosen the Hex Nuts holding the Locking Collar ¼ to ½ turn. FIG. 3-15.
5. Slowly loosen the Locking Collar by turning the Socket Cap Screws counter-clockwise using a 3/8" Allen wrench. If there is pressure on the line, it will push the IAS™ Sampler out when the Locking Collar is loose. If there is not enough pressure on the line, manually pull the IAS™ Sampler until the end of the probe stops inside the Seal Housing.
6. Tighten the Locking Collar by turning the Socket Cap Screws clockwise to prevent the IAS™ Sampler from sliding back in the pipeline or in the way of the Full-Opening Ball Valve.
7. Close the Full-Opening Ball Valve.
8. Remove the IAS™ Sampler from the Full-Opening Ball Valve.

FIG. 3-15



MAINTENANCE

During normal operation of the KAM® IAS™ Sampler, some seals will wear. In order to ensure continuous accurate sampling, KAM CONTROLS recommends replacing the seals on your IAS™ Sampler every six (6) months. High levels of sediment may reduce required time for seal replacement.

A complete kit with all the IAS™ Sampler O-rings, seals, etc. can be ordered by contacting KAM CONTROLS at sales@kam.com, by calling +1 713-784-0000 or faxing your request to +1 713-784-0001.

For instructions on changing seals, see the IAS™ Seal Replacement manual.

FIG. 4-1 Seal Kit for Insertion Models

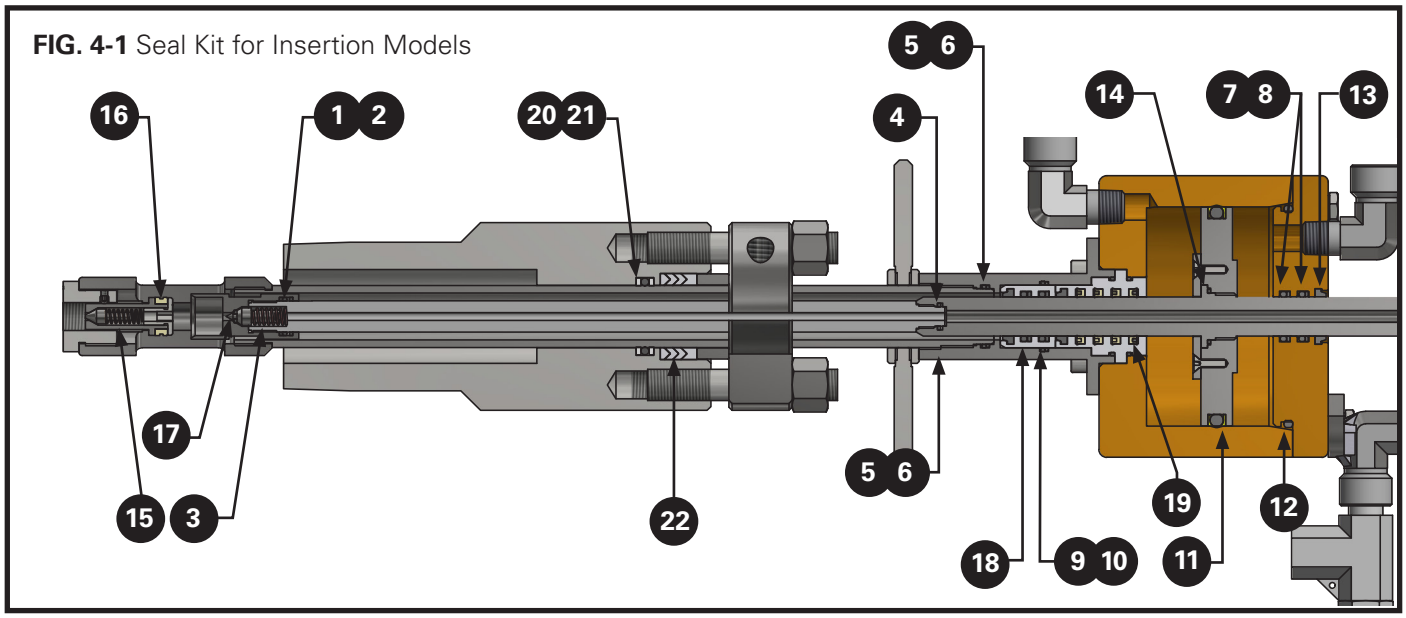


TABLE 4-1 Seal Kit 360440 Insertion Models

ITEM	DESCRIPTION	PART #	QTY
1	2-014 O-ring	150014	1
2	2-014 Backup ring	151014	2
3	Check Spring	360425	1
4	2-011 O-ring	150011	1
5	2-020 O-ring	150020	1
6	2-020 Backup ring	151020	1
7	2-114 O-ring	150114	2
8	2-114 Backup ring	151114	2
9	2-022 O-ring	150022	1
10	2-022 Backup ring	151022	1
11	PSP338 Piston Seal	153040	1
12	2-234 O-ring	150234-N70	1
13	Wiper Seal SH959	153010	1
14	2-018 O-ring	150018-N70	1
15	Suction Spring	360390	1
16	Bottom Seal	360410	1
17	2-004 O-ring	150004	1
18	IAS Seal Bushing #2 Assembly	360466	1
19	IAS Seal Bushing Assembly	360467	1
20	2-214 O-ring	151214	1
21	2-214 Backup ring	150214	2
22	V-Groove Packing	153020	1

FIG. 4-2 Seal Kit for Flow Through Models

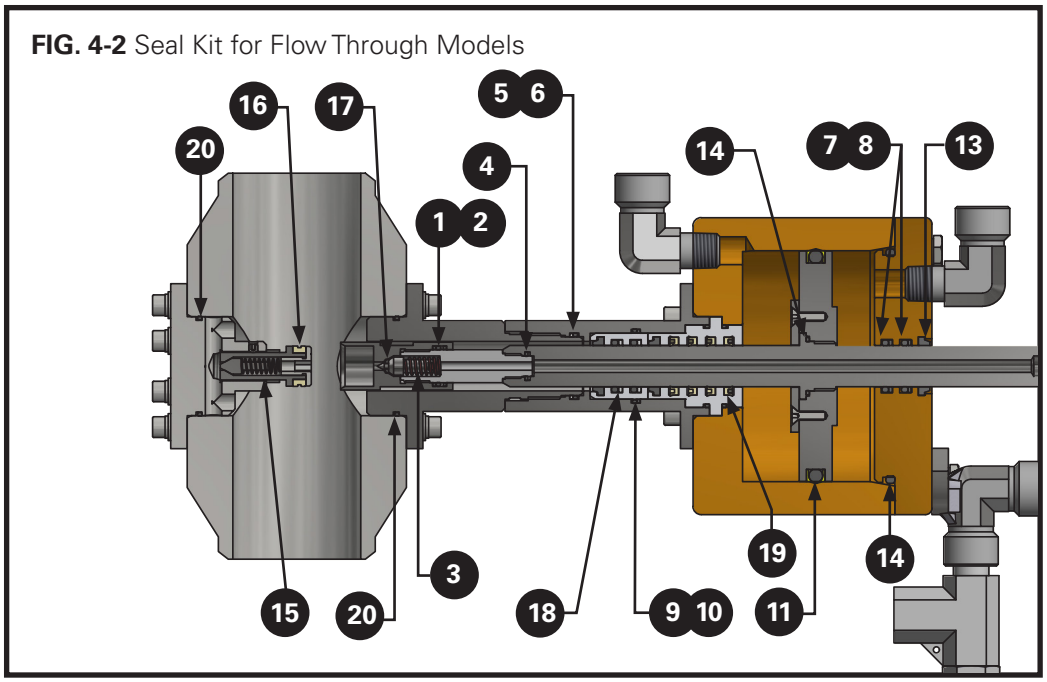


TABLE 4-2 Seal Kit 360441 Flow Through Models

ITEM	DESCRIPTION	PART #	QTY
1	2-014 O-ring	150014	1
2	2-014 Backup ring	151014	2
3	Check Spring	360425	1
4	2-011 O-ring	150011	1
5	2-020 O-ring	150020	1
6	2-020 Backup ring	151020	1
7	2-114 O-ring	150114	2
8	2-114 Backup ring	151114	2
9	2-022 O-ring	150022	1
10	2-022 Backup ring	151022	1
11	PSP338 Piston Seal	153040	1
12	2-234 O-ring	150234-N70	1
13	Wiper Seal SH959	153010	1
14	2-018 O-ring	150018-N70	1
15	Suction Spring	360390	1
16	Bottom Seal	360410	1
17	2-004 O-ring	150004	1
18	IAS Seal Bushing #2 Assembly	360466	1
19	IAS Seal Bushing Assembly	360467	1
20	2-028 O-ring	150028	2

TROUBLESHOOTING

PROBLEM	SOLUTION
Poor sample draw or no sample.	Check the Spring inside Sample Piston and the O-ring on the Bottom Stop. Replace if broken or worn.
Oil in air lines.	Usually, this means that the Seals inside the Seal Bushings are worn out. Perform standard maintenance (seal replacement). If problem persists, the Piston Tube may be scratched and will need to be replaced.
Piston's not moving.	Check air supply and Solenoid Valve.
Oil leaking through Seal Housing.	Perform standard maintenance (seal replacement).
Sampler is actuating but there is no sample output.	Replace the Bottom Seal. This is especially necessary if the sampler has more than 6 months of operation (complete seal replacement is strongly recommended).
The sampler is overfilling the Sample Receivers or the sampler doesn't stop outputting samples.	The line pressure is higher than the cracking pressure of the PRV. Please follow instructions on page 11 of this manual to adjust the PRV cracking pressure correctly.