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JISKOOT

Series 210 Cell Sampler

User Manual

Manual H05, Rev. 12

Important Safety Information

Symbols and Terms Used in This Manual

WARNING

This symbol identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

CAUTION

This symbol indicates actions or procedures which if not performed correctly may lead to personal injury or incorrect function of the instrument or connected equipment.

Note	Indicates actions or procedures which may affect instrument operation or may lead to an instrument response which is not planned.

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Document Revision History

12	Updated instructions and illustrations based on revised SD models and field service comments	B. Antoine	P.Whittle	08 Mar 2018
11	Revise Section 9 - Testing, Add Addenda 16 & Addenda 17 Update Tech Support information	N. McGee	P.Whittle	26 Mar 2014
10	Reformatted and Illustrations Addenda 16 & Addenda 17 Update Tech Support information updated	N. McGee	P.Whittle	22 Apr 2010
9	Spares Kit for HP version corrected. Deleted solenoid port references in installation drawing, as dependent on type of solenoid used.	P.Whittle	M.A.Jiskoot	21 Apr 2006
8	Check Valve and Relief Valve settings clarified	P.Whittle	M.A.Jiskoot	15 Feb 2006
7	Installation drawing added. Company name changed to Jiskoot Ltd.	P.Whittle	M.A.Jiskoot	20 Oct 2005
6	Maintenance procedures revised and updated. Part Numbers revised	P.Whittle	M.A.Jiskoot	30 Jun 2003
5	Fully Revised and updated. For Cell Samplers fitted with Back Pressure Regulator (BPR) – refer to Issue 4 Handbook	P.Whittle	M.A.Jiskoot	21 Jan 1999
Issue	Description of Change	Issued	Approved	Date

Manual No. H05, Rev. 12
March 2018

Table of Contents

1 Introduction

Figure 1.1 - Series 210 cell sampler

Truly representative sampling of crude oils and other hydrocarbons cannot be achieved by a single product in isolation. A well-designed system and operating procedures as laid down in the Sampling Standards ISO 3171, API 8.2, and IP 476 are mandatory.

As a part of a well-designed sampler system, the JISKOOT Series 210 Cell Sampler extracts a sample from liquids flowing in a small pipeline or bypass. Primarily designed for applications where air pressure provides the motive power, the 210 Cell Sampler is normally installed into a 1-in bypass loop installed off the main pipeline. Options include a sampler for use in 2-in pipelines and a hydraulically-operated sampler for use with a hydraulic power pack for installations with no air supply.

The Series 210 Cell Sampler extracts 1-cc samples from crude oil, refined hydrocarbons (including non-lubricating products), and non-corrosive chemicals. The sampler operates in a 3 to 50 Bar(g) pressure, a product temperature range of –20 degC to 100 degC, and on viscosities 0.5 to 5000 cSt in an ambient temperature range of –20 degC to 40 degC. To meet specific site requirements, conversion kits to change existing samplers to the 2-cc sample size (refer to **Section 14**) are available.

The performance and seal life of the Series 210 Cell Sampler depends on the process pressure, viscosity and outlet configuration, including the tubing, valves, and sample collection pressure in the sample receivers. Consult Cameron for optimal configuration.

The Series 210 Cell Sampler is designed to provide outstanding service if correctly installed, used, and maintained and if the effects of the process conditions (temperature, pressure, wax/pour point, sediment, etc.) are considered.

The cell sampler's bypass configuration allows the sampler to be located anywhere in the line, rather than being restricted by the position of the main pipeline's offtake. It facilitates easy isolation for maintenance and extremely low internal (retained) volume. The flow rate through the cell sampler/bypass loop is crucial to ensuring accuracy (see **Section 7** for installation details).

The Sampler minimises and simplifies maintenance by allowing changes to be made without disrupting the flow, as well as providing integrity against leakage under all circumstances.

The standard 210 Sampler is designed for wafer installation between a pair of 1-in ANSI Class 150, 300, or 600 raised-face flanges. Tested to full static flange rating pressure.

Other flange sizes may be available to special order as are cell samplers for spool mounting and higher process ratings.

The Series 210 Cell Sampler is available in five variants:

- **210 Standard.** Air-actuated cell sampler.
- **210 HP.** Air-actuated cell sampler for high-pressure (ANSI Class 900) applications or where there is low air pressure [<5 Bar(g)].
- **210 EH.** Series 210 cell sampler fitted with an electro-hydraulic (EH) actuator.
- **210 SD.** Air-actuated cell sampler for use under the most demanding process conditions, such as process fluids with high concentrations of particulates.
- **210 HT.** Air-actuated cell sampler for use in high and low temperature environments.

Note	To ensure that correct options are quoted when requesting assistance or spare parts, please provide each device's cell sampler model and serial number.

The disassembly/reassembly instructions described herein are for the 210 Standard, except where otherwise noted. Primary differences between pneumatic, electro-hydraulic, and high-pressure samplers are found in the actuator assembly.

2 Operating Instructions

Install the 210 cell sampler in accordance with the installation details provided in **Section 7** and connect the sampler to a suitable sample collection system.

Operating the sampler requires a regulated 5 to 8 Bar(g) [70 to 120 psi(g)] air supply. A signal is required to energise the sampler solenoid and actuate the sampler at the required intervals. Any pipeline conditioning facility must be active to ensure a representative product is available to the sampler. Sampler model 210 EH requires a hydraulic power pack to provide the pressure source.

Control of the sampler, including change-over of sample receivers, is determined by the sampler control system type being used.

3 Glossary of Special Terms

Grab. The action of taking an individual sample (1- or 2-cc) from the pipeline.

4 Utilities Reference Table

Air Supply (pneumatic samplers only)		4 to 10 Bar(g) [40 to 145 psi(g)]
Air Consumption	210 Standard	0.8 m^3/hr or 0.47 scfm [5 Bar(g) at 30 grabs/min]
	210 HP	1.67 m^3/hr or 1.0 scfm [5 Bar(g) at 30 grabs/min]
Solenoid Voltages	AC	100 to 254 Volts (50/60 Hz)
	DC	24 VDC
	Power Consumption	10 W
Solenoid Energisation Time	Pneumatic	250 ms
	210 EH	500 ms
Maximum Sampling Rates	210 Standard	120 grabs/min
	210 HP	50 grabs/min
	210 EH	30 grabs/min
	210 EH-HP	15 grabs/min

5 Complete Functional Description

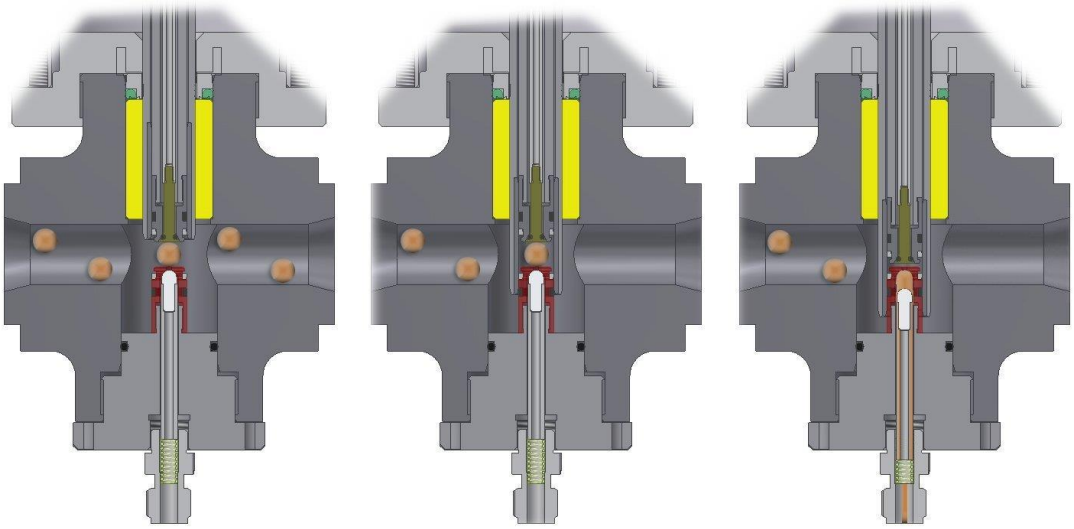


Figure 5.1 - Series 210 Cell Sampler 3-step operation

The Series 210 Cell Sampler operates on a standard 3-step principle, using an air- or hydraulically-actuated piston to provide the motive power.

In the idle (deenergised) state, air pressure is applied to the bottom of the actuator housing through Port B, holding the capture tube and the sample tube at the top of their stroke and allowing process product to flow through the cell sampler body [**Figure 5.1** (left)].

When the external sampler solenoid is energised, air pressure is applied to Port A, forcing the piston down. Pressure from the piston's underside is naturally vented through the valve to atmosphere. The downward movement of the combined piston and capture tube pass over the lower capture tube seal, trapping 1- to 2-cc product samples, as shown in **Figure 5.1** (middle).

In the third step, the continued downward motion collects and pulls the catch plate, drawing the sample tube and the capture tube downward. The captured sample compresses the check valve and spring and is ejected through the centre of the bottom plug to the sample receptacle, as shown in **Figure 5.1** (right).

When the sampler solenoid is deenergised, air is vented from the top of the actuator housing and applied to the underside of the piston, returning the capture tube and sample tube to their starting position. The spring returns the check valve and any vacuum being relieved via a breaker incorporated in the sample tube. As the product continues to pass through the cell body, the sampler is ready for the next grab.

6 General Assembly and Bill of Material

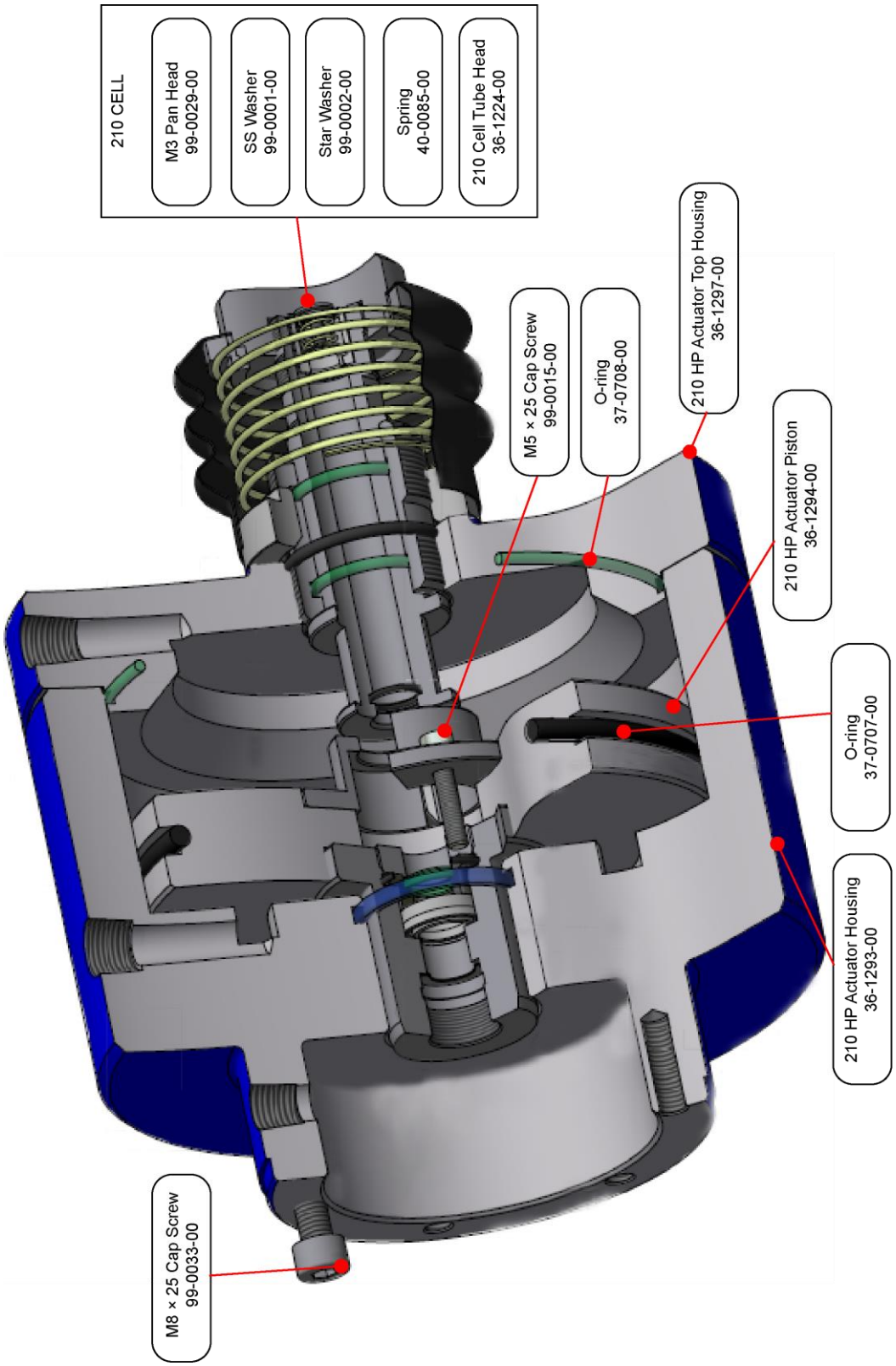


Figure 6.1 - 210 HP sampler actuator

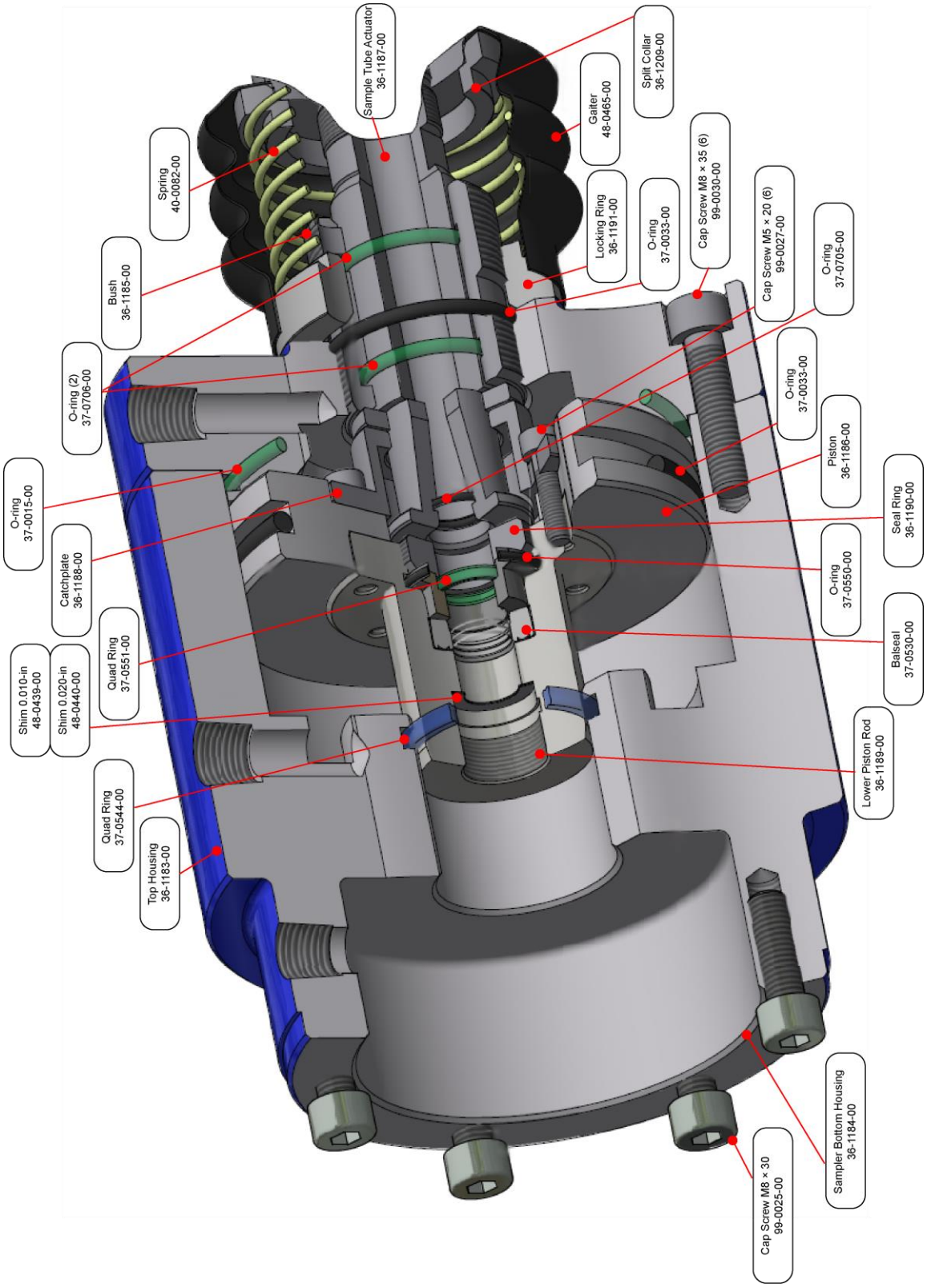


Figure 6.2 - 210 Standard sampler actuator

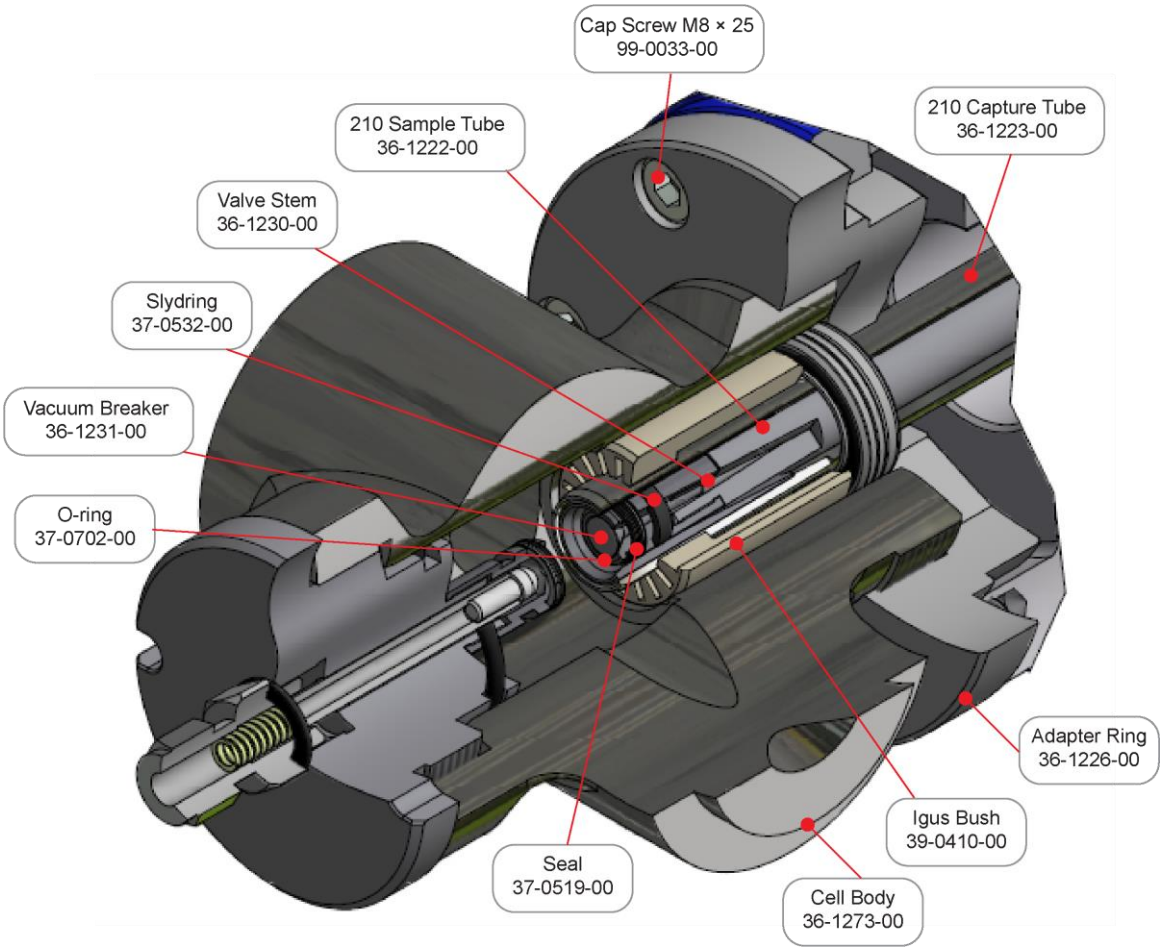


Figure 6.3 - 210 Standard sampler body assembly

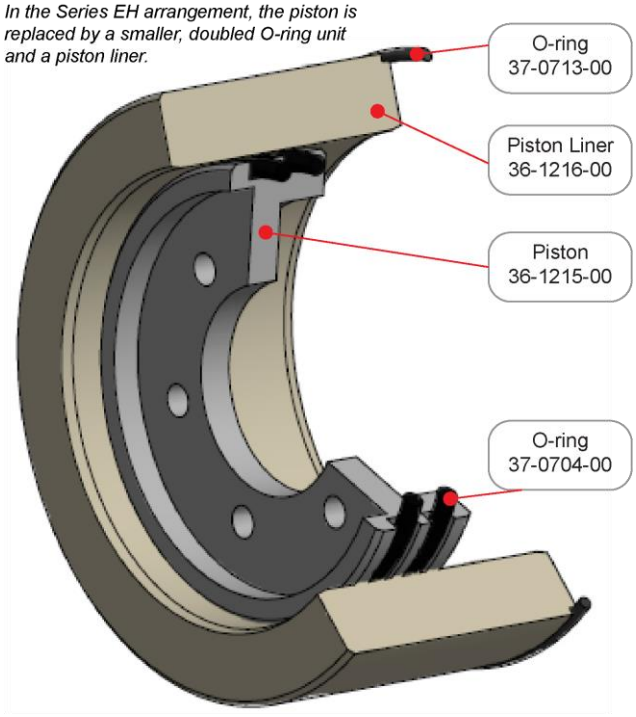


Figure 2.4 - 210 EH sampler actuator components

7 Installation Details

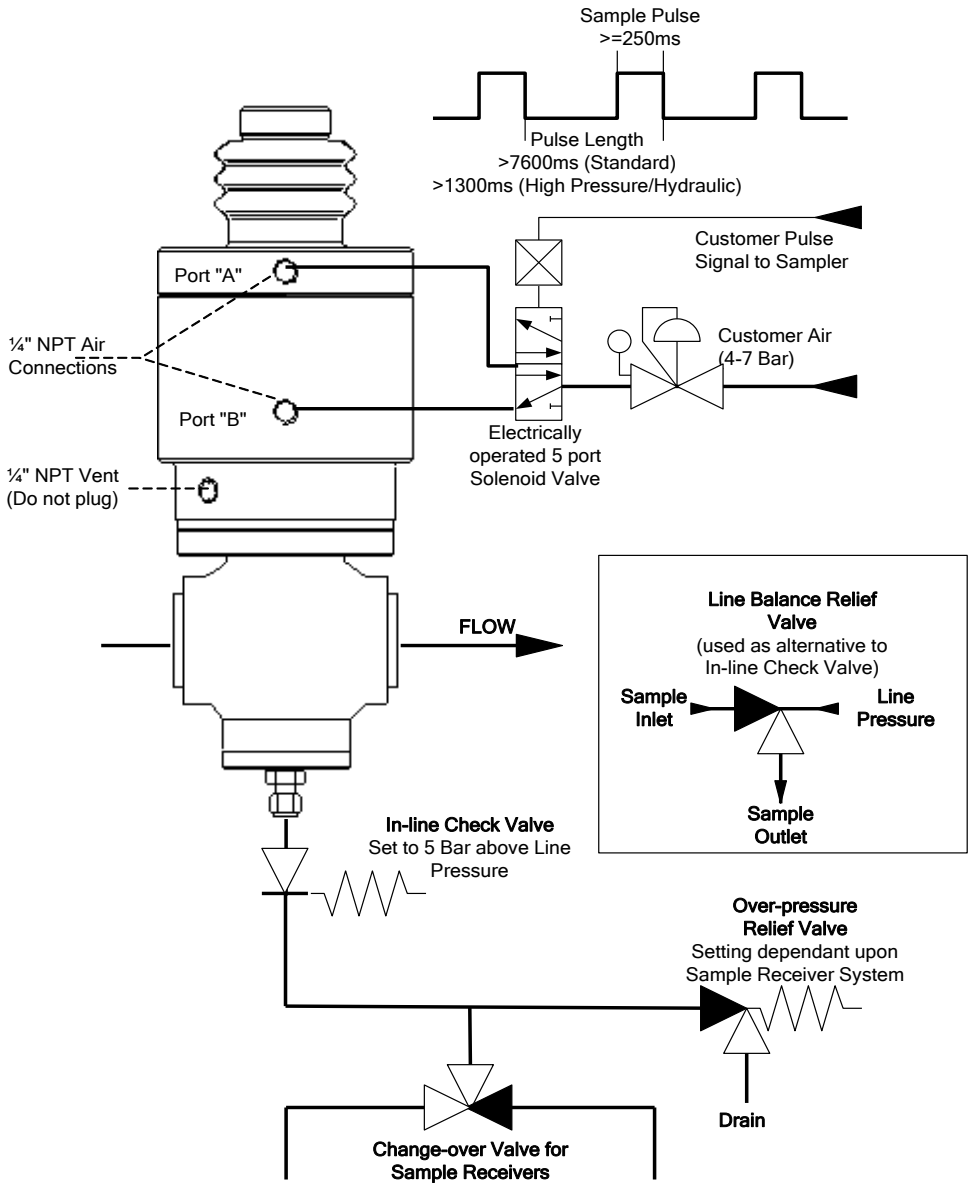


Figure 7.1 - 210 Sampler typical installation

The Series 210 Standard cell sampler is designed to be bolted as a wafer between a pair of 1-in ANSI Class 150, 300, or 600 raised-face flanges, and can withstand static pressure testing to full flange rating. Alternative flange sizes and finishes may be supplied to suit specific applications. To prevent water traps, the axis of the outlet pipe connection should be horizontal or downward facing. The flow through the bypass loop and cell sampler MUST be adequately mixed for the properties of interest. Where sampling for water content, it is recommended that a minimum flow velocity within the cell sampler plus 1 m upstream exceeds 3.5 m/s (6 m^3/h).

A sampler solenoid valve MUST suit the specific application. The valve requires connection to suitable supplies via glands and cables appropriate to the area classification.

Note	A correctly rated fuse MUST be included in the solenoid valve supply circuit.

A regulated air supply MUST be connected to the solenoid and the normally-energised outlet MUST be connected to Sampler Port B. The normally-deenergised solenoid port MUST be connected to Sampler Port A. The solenoid exhaust port(s) may be piped away or fitted with silencers as required. (During electro-hydraulic applications, the solenoid is incorporated into the hydraulic power pack.)

If required, the actuator bottom port (drain cavity) may be connected to a closed drain or a pressure switch.

The 1/4-in Swagelok sampler outlet port (located in the bottom plug) MUST be connected to the sample receiver system using 1/4-in or 6-mm stainless steel tubing by an inline check valve or a JISKOOT line-balanced relief valve and a relief valve, as shown in **Figure 7.1**.

Note	Failure to fit an external check valve may result in the sampler continually discharging product from the outlet due to the line pressure exceeding the internal check valve setting.

The check valve will normally be set to 5 Bar above the maximum line pressure, allowing for any additional pressure increase created by thermal expansion when any isolating valves are closed and the for effects of trace heating and or solar energy. If the cracking pressure is set too low, the valve may open under adverse conditions, causing the sample receiver system to overfill and the sample to leak through the relief valve to atmosphere.

Where line-balanced, high-pressure sample receivers are being used (i.e. where the sample is being collected at, or close to line pressure), and the installation uses the Swagelok R3A or any similar valves unaffected by back pressure, to avoid placing unnecessary load on the sampler seals, the check valve should be set to operate at 1 Bar. If the valve is found to lift and fill the sample receiver due to pressure surges, this setting may be increased slightly.

The relief valve fitted to the sample line protects the sampler in the event of the sampler being operated against a blocked sample line (e.g. without a sample receiver being fitted or with a full sample receiver). This relief valve should be within the maximum pressure rating of the receiver system, but may need to be increased slightly to allow for momentary pressure surges as the sample is being taken.

Ensure that lengths of tubing connecting the sampler to the receiver system are kept to a minimum to minimise "dead" i.e. trapped volume (long lengths of tubing also create extra back pressure and premature seal wear), and that the sample travels downhill at a minimum angle of 15 degrees from the sampler outlet to the receiver to avoid water traps. The sample outlet piping may require heat tracing to prevent blockage. The sampler control system must supply a minimum 250-ms pulse to the sampler solenoid valve to ensure sufficient time for the sampler to complete a full stroke at each actuation. In most systems, using 500-ms of air is normal). The actuator should dwell momentarily at the bottom of its travel before the solenoid is deenergised and the sampler returns to its 'rest' state.

8 Maintenance and Troubleshooting

8.1 Health and Safety Precautions

The Series 210 Cell Sampler may be used in applications involving hazardous products. Avoid contamination by any product trapped within the internal components that may be released as the sampler is stripped down.

8.2 Weekly Maintenance

Regular maintenance is limited to draining excess moisture from the air filter/regulator. For EH applications, check the level in the hydraulic oil reservoir on the hydraulic power pack.

8.3 Annual Maintenance

The Series 210 Cell Sampler is designed to operate continuously for approximately 1,000,000 grabs or 12 months before a major overhaul; however, this service interval is affected by the product type being sampled, particularly the amount of particulate matter (such as sand). When used in crude oils with high levels of sediment or in mixed carrier shipments, the maintenance interval may be shortened. The service intervals should be determined from the experience gained on the application.

The sampler should be removed from the pipeline and taken to a clean area for servicing.

Use soft vice jaws whenever components need to be held. All components, particularly those with sealing faces, should be thoroughly cleaned of dirt and other contaminants by degreasing and drying before reassembly.

Part No 3J-45-0127-00 (special tool kit) is available to assist in fitting some components and seals. Failure to use the correct tools may damage seals and other components, and directly affect the future performance of the sampler.

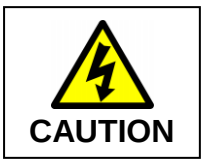
8.4 Overhaul Instructions

Upon satisfactory reassembly, hydraulically-actuated (EH) cell samplers may be tested using compressed air or gas instead of hydraulic oil.

See **Section 12** for details of spare kits and the special tools required to overhaul all variants of the cell sampler.

Separate details are given for overhaul of individual sub-assemblies and replacement of the sample tube seal. The item numbers in brackets in each section relate to the item numbers of the components shown on the drawing given at the beginning of that section. The item numbers of the components for all the standard versions are identical. The complete overhaul should be carried out in the following order:

1 Remove and overhaul the bottom plug sub-assembly (**Section 8.6**).
2 Remove and overhaul the actuator sub-assembly (**Section 8.7**).
3 Overhaul the main body (**Section 8.7.1** through **Section 8.7.8**).
4 Reassemble the actuator and bottom plug sub-assemblies to the main body (**Section 8.8** and **Section 8.9**).



Use soft vice jaws whenever components need to be held. All components, particularly those with sealing faces, should be thoroughly cleaned of dirt and other contaminants by degreasing and drying before reassembly. If any of the sliding surfaces are damaged, leakage will occur from the seals.

All joints, O-rings, and moving parts MUST be lubricated on assembly using a general-purpose grease, such as Castrol Spheerol B2 or an equivalent lithium-based water-resistant grease. To prevent seizure, we recommend that all screwed components are lubricated with copper grease on assembly.

8.5 Torque Settings

The following torque settings should be used in the reassembly of the sampler:

Screw Location	Size	Torque
Bottom actuator housing to adaptor ring	M8 * 25mm cap head	25 N.m/18.4 ft.lbf
Lower piston rod to capture tube		75 N.m/55.3 ft.lbf
Sample tube actuator to catch plate	M5 * 20mm cap head	10 N.m/7.4 ft.lbf
Actuator top to bottom housing	Pre-August 1992 M6 * 25mm cap head	15 N.m/11.1 ft.lbf
	Post-August 1992 M8 * 30mm cap head	25 N.m/18.4 ft.lbf
Sample tube head to sample tube actuator		60 N.m/44.3 ft.lbf

8.6 Bottom Plug Sub-assembly

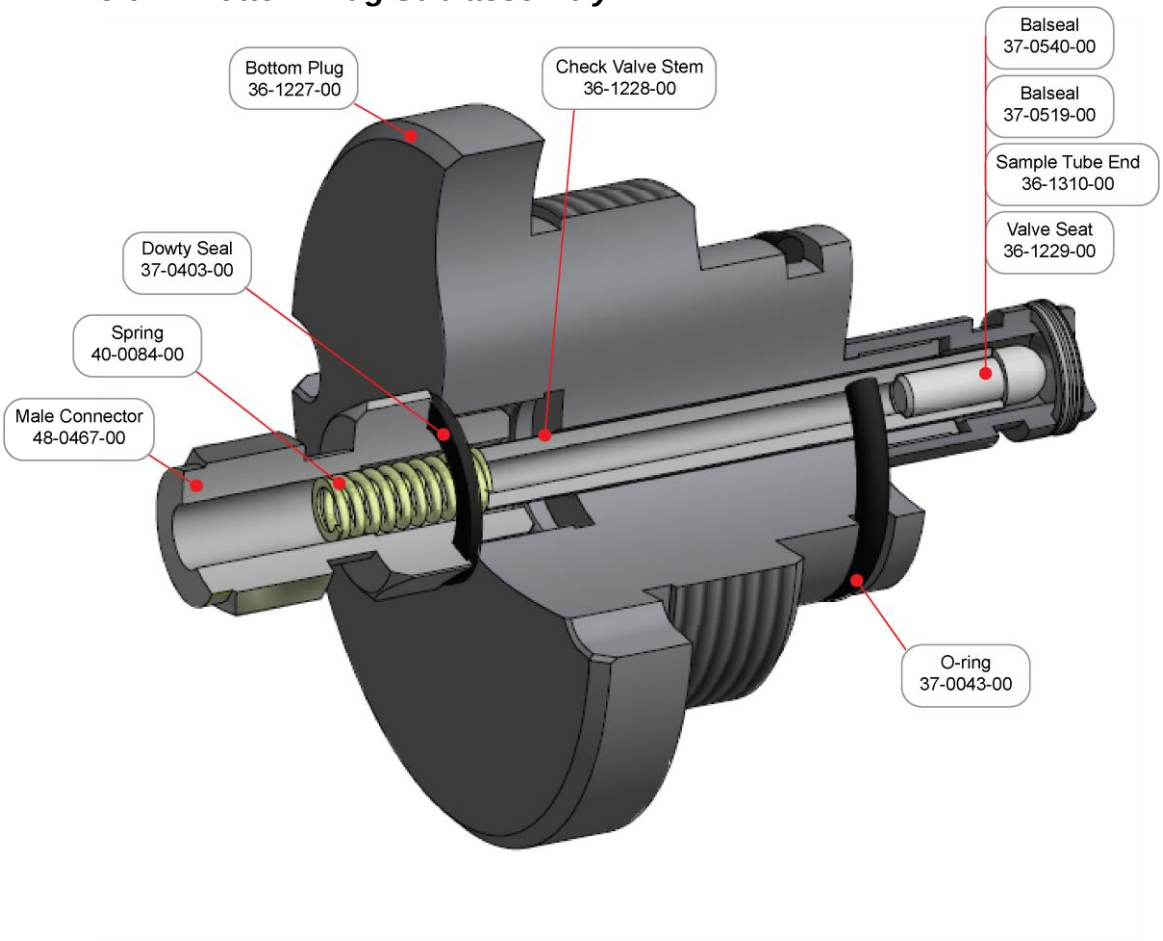


Figure 8.1 - Bottom plug assembly

Note	For a 1-cc sample volume, the Balseal part number is 3J-37-0519-00. For a 2-cc sample volume, the Balseal part number is 3J-37-0540-00.

Using ‘C’ Spanner (Tool ‘A’), unscrew and remove the bottom plug from the bottom of the main body.

Unscrew and remove the sample outlet connector and the Dowty seal from the bottom plug.

Remove the spring, valve stem, and check valve tip.

Replace the valve tip using a twisting motion.

Remove the O-rings, thoroughly clean the O-ring grooves and bodies, and refit with greased O-rings.

Place the Balseal over the Balseal loading mandrel and use Special Tool ‘G’ to push the seal approximately halfway down the mandrel's length to expand the lip seal so it will fit over the bottom plug.

Apply the seal sizing tool to the Balseal.

Remove the seal from the mandrel and fit to bottom plug, ensuring the Balseal is fitted with the seal spring toward the head of the bottom plug.

Using fingers, reshape the Balseal into the groove and then place the Balseal assembly Special Tool ‘J’ over the bottom plug (tapered end first) to set the Balseal to the required size. Leave for 3 to 5 minutes, then remove the Balseal sizing tool and check Balseal for damage.

Reassemble the check valve and valve tip to the bottom plug, replace with new spring and Dowty washer, then reaffix the sample outlet connector.

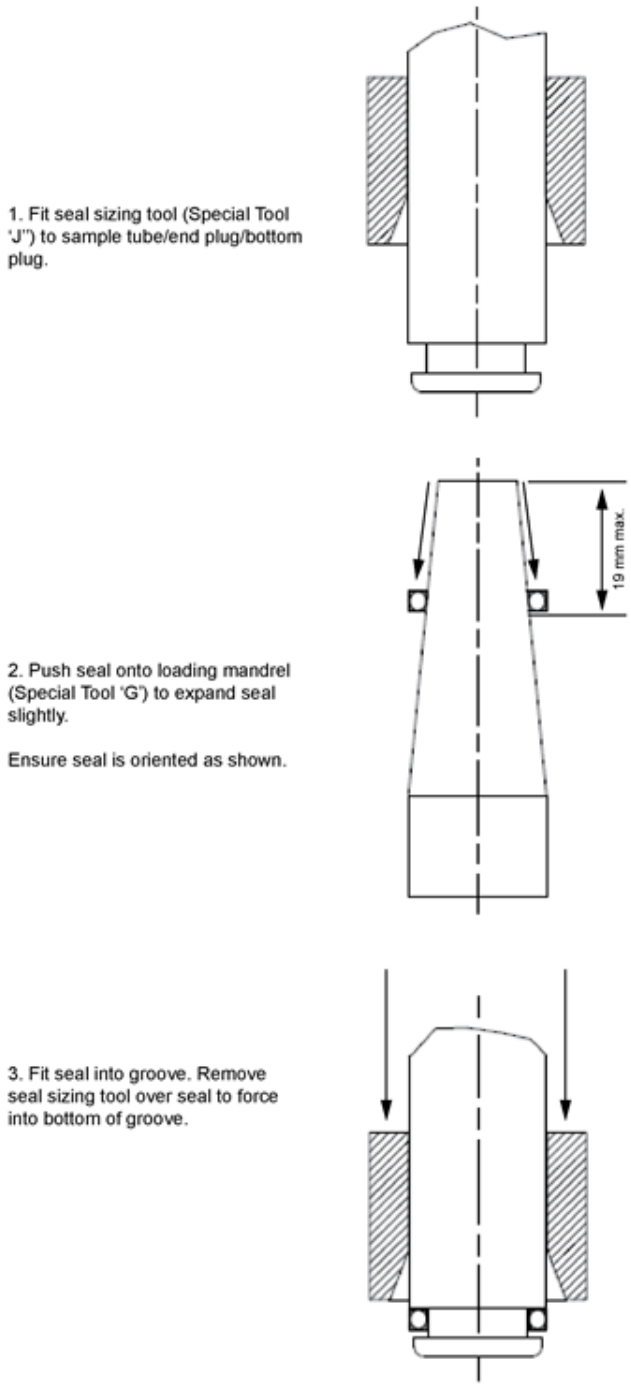


Figure 8.2 - PTFE seal fitting procedure

8.7 Actuator Sub-assembly

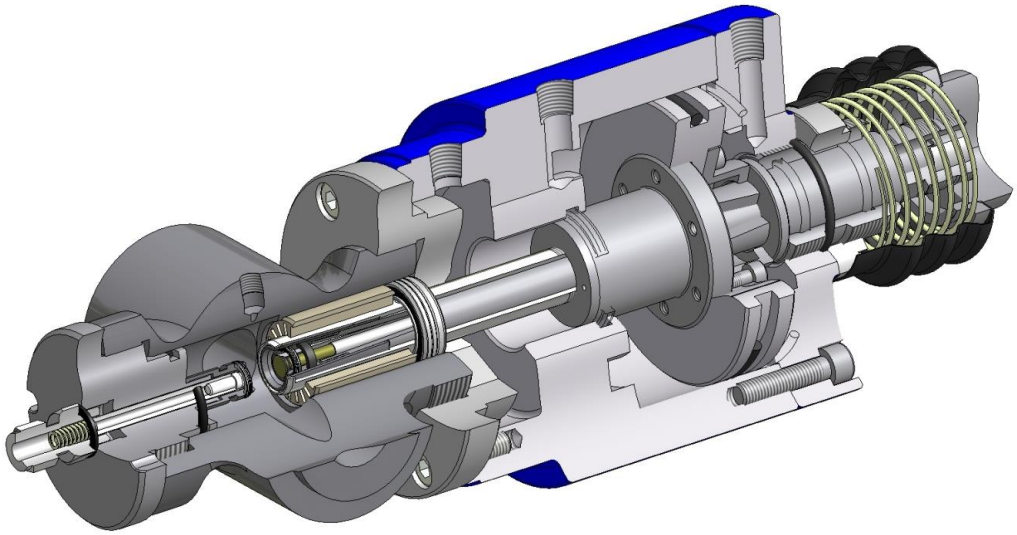
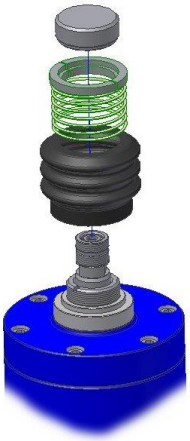


Figure 8.3 - Actuator sub-assembly

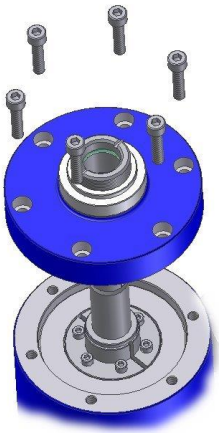
8.7.1 Removal of Sample Tube Head



Remove the gaiter to expose the spring and actuator.

Hold the sample tube actuator with a 19-mm (3/4-in) A/F open-ended spanner and loosen the sample tube head using a suitable ‘C’ Spanner. Remove the sample tube head, collet, and spring. Examine the spring and discard if corroded.

8.7.2 Removal of Actuator Top



Remove the six M8 screws attaching the top actuator housing.

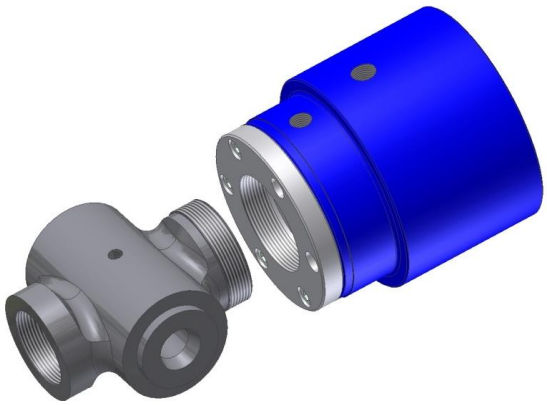
Remove the top housing, including the sealing bush and locking ring.

Note	The locking ring on top of the actuator must not be disturbed. If the bush is moved, the grab size of the sampler will be altered. See **Section 16**.

8.7.3 Removal of Piston and Sample Tube Assembly

Lift out the complete piston and sample tube assembly.

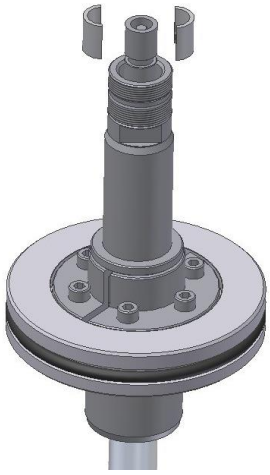
8.7.4 Removal of Actuator and Adapter Ring



Fit the 1/4-in NPT Tommy Bar (Tool ‘P’) into the lower (vent) 1/4-in NPT port in the actuator bottom housing. Loosen the actuator sub-assembly from the cell body by gently tapping Tool ‘P’ using a soft-faced hammer. The actuator sub-assembly unscrews in a counter-clockwise direction when viewed from above.

Note	The lower actuator location ensures that the ports will face in the original direction on reassembly.

8.7.5 Overhaul of Piston/Sample Tube Actuator/Lower Piston Rod Assembly



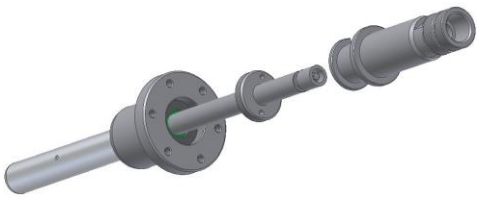
Hold the lower piston rod in a protective soft jaw and use a suitable rod of soft material (such as Delrin) to push the bottom end of the sample tube approximately 20-mm (0.79-in) inside the capture tube. This will expose the split collets at the opposite end of the sample tube.

Remove the two halves of the split collet and any shims fitted underneath it. Retain shims for reassembly.

Note	For Standard EH actuators with piston liner, refer to Figure 6.4 for an illustration of the required assembly.

Remove the six M5 screws, releasing the two halves of the catch plate and the piston from the lower piston rod.

Remove the catch plate and piston. Remove the sample tube actuator from the sample tube and replace the internal O-ring (3J-37-0705-00).

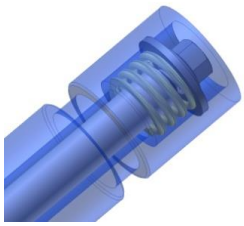


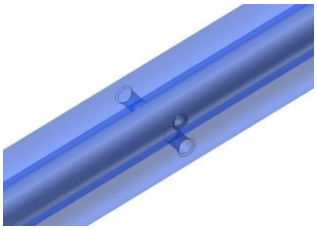
Using the nut peg spanner (Tool ‘E’), unscrew and remove the seal nut from the lower piston rod.

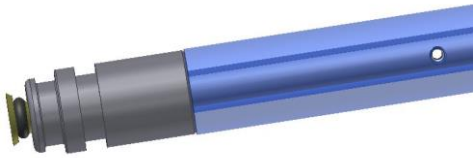
Remove the sample tube by pushing the top end of the sample tube down. Remove and discard the seal and Slydring.

Remove the seals, seal ring, and O-ring from the lower piston rod.

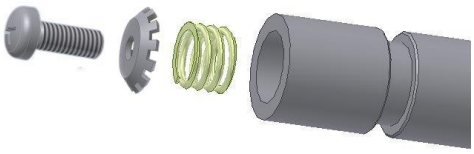
Use a screwdriver in the M3 cheese head screw, rotate, and depress the vacuum breaker stem so that the hole in the sample tube aligns with the hole in the vacuum breaker stem.







Use a 1.5-mm drill (or thumb pin) through the holes to hold the assembly while unscrewing and removing the M3 screw, star washer, and spring.



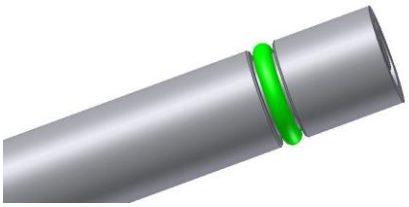
Remove the 1.5-mm drill (or thumb pin) from the sample tube and withdraw the vacuum breaker stem/valve assembly through the bottom of the sample tube. Remove the O-ring from the vacuum breaker valve.

Note	If the seal is metal-to-metal, there will be no O-ring to remove.

Clean all components. Examine all tubes and sealing surfaces for wear, scratches, and straightness. Any components with damage in the sealing area must be replaced.

Note	If the capture tube is to be replaced, a complete sub-assembly (Part No. 3J-36-5000-00), including the lower piston rod, must be obtained from Cameron.

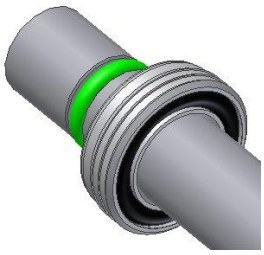
Reassemble in reverse, all parts being cleaned, inspected, and freshly greased to aid assembly. Installer must grease all O-rings associated with the capture tube. Reassembly should ONLY be conducted by competent trained personnel. Reassembly should ideally be in a clean environment, with reference to direction of sealing faces and realignment of actuator.



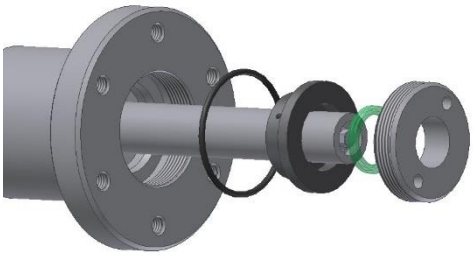
Fit O-ring (Part No. 3J-37-0709-00; colour used to indicate position ONLY) supplied in the spares kit to the sample tube collet groove to prevent damaging the seal as it is pushed over the groove. Note that this part is placed here for installation purposes only and will be discarded.

Insert the sample tube into the lower piston rod/capture tube assembly, grease, and carefully position the new seal in the seal recess. Use the assembly tool (Special Tool 'L', shown in yellow below) to push the seal into position.

Fit the new seal (Part No. 3J-37-0730-00) onto the sample tube from the top. Ensure that the seal is fitted with the seal spring facing downwards, as indicated.



Remove and discard the O-ring (Part No. 3J-37-0709-00).



Fit O-ring (Part. No. 3J-37-0550-00), seal ring (Part No. 3J-36-1190-00), seal (Part No. 3J-37-0551-00), and seal nut. Tighten using nut peg spanner (Tool 'E').

8.7.6 Reassembly of Piston/Catch Plate/Actuator Assembly

Refit piston and piston O-ring (Part No. 3J-37-0033-00) to lower piston rod with new cap screws, ensuring piston is facing the correct way.

Fit new O-ring to bore of the sample tube actuator.

Refit sample tube actuator and catch plate assembly to the piston rod assembly using new cap head screws. Tighten to the torque specified in **Section 8.5**.

Note	Care must be taken when pushing the sample tube actuator over the sample tube.

Tighten the M5 * 20 cap head screws to the torque specified in **Section 8.5**.

8.7.7 Lower Sample Tube Seal

Place the seal over the seal loading mandrel (Special Tool ‘G’) and push down approximately half the mandrel's length to expand the lip seal to fit over the sample tube.

Transfer the seal from the mandrel and fit to sample tube ensuring the seal is fitted with the seal spring facing towards the end of the sample tube.

Using fingers, reform the seal into the groove and then place seal assembly tool (Special Tool ‘J’) over the end plug (tapered end first) to set the seal to the required size. Leave for 3 to 5 minutes. Remove seal sizing tool and check seal for damage.

This process should be done in an identical manner to the seal fitting procedure shown in **Figure 8.2**.

Fit the new Slydring (Part No. 3J-37-0541-00) by wrapping it round its groove in the sample tube until it's diagonally cut ends meet.

Refit the split collet to the sample tube. Push the split collet down into the recess in the top of the sample tube actuator. To avoid potential damage to the device, ensure that all the original shims are refitted *under* the split collet.

Note	Electro-hydraulic (EH) samplers have two O-rings fitted to the piston. There is also one O-ring sealing liner fitted to the actuator O-ring liner (Part No. 3J-37-0713-00) and fitted to the actuator bore.

Note	Severe Duty (SD) samplers have a quad ring (Part No. 3J-37-0544-00) fitted to the piston. This must be done before inserting the piston into the casing

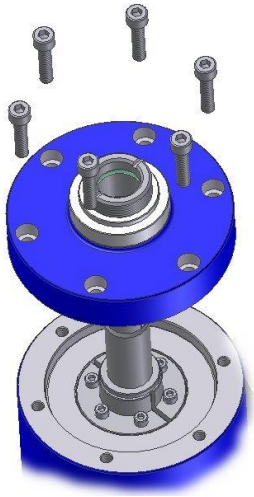
8.7.8 Reassembly of Piston and Sample Tube Assembly

Confirm replacement of O-rings in the bore of the sealing bush and the top housing.

Liberally grease the internal surface of the sealing bush, the sample tube actuator, and the internal bore of the top and bottom housings.

Slide the piston and sample tube assembly into the lower actuator body, followed by replacing the complete top housing, aligning the actuator ports.

Fit six of M8 * 35 cap head screws (Part No. 3J-99-0030-00) and tighten to specified torque.



8.8 Reassembly of Sample Tube Head

Fit greased washer (Part No. 3J-99-0001) to top of sample tube.

Screw sample tube head (Part No. 3J-99-0002-00) to sample tube actuator and tighten.

Replace the gaiter and spring. Hold the sample tube actuator with a 19-mm (3/4-in) A/F open-ended spanner, and using a suitable ‘C’ spanner, tighten the sample tube head.

Reassemble the sample tube head collet and allow the spring to seat then form the gaiter back to cover the spring and tube head. Secure the gaiter with a cable tie.

Note	Test the plunger in the up and down positions using air in the hydraulic fittings to ensure that the plunger operates correctly.

8.9 Reassembly of Plug to Main Body

For the Series 210 Severe Duty (SD) cell sampler, replace all O-rings and chevron cups and install the chevron seal holder.

After chevron seal holder installation, apply copper grease to the threads of the bottom plug and main body. Refit any shims found when the bottom plug was removed. Screw the bottom plug sub-assembly into the main body of the sampler and tighten using the ‘C’ Spanner (Tool ‘A’).

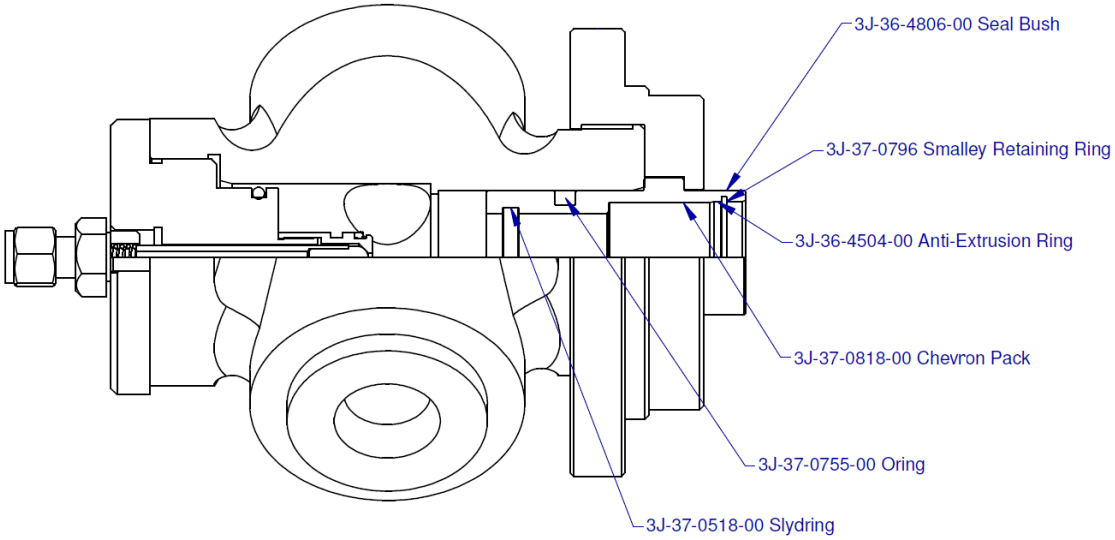


Figure 8.4 - Annotated cross-section of Series 210 Severe Duty cell sampler

9 Testing

Where a test facility is available, the Sampler should be pressure tested and recalibrated before returning to service.

9.1 Witness Testing Before Returning Sampler to Service

In the absence of a test facility, the sampler sealing and grab integrity may require witness testing after service and before reinstallation.

Ensure the external check valve has been serviced and that the sampler and the pressure relief valve are rated to correct system pressure.

The sampler is capable of developing very high sample discharge pressures. Therefore, this test must be carried out with great care.

The sampler is capable and operates over a wide range 3.45 to 155.13 Bar(g) [50 to 2250 psi(g)]. The following procedure is generic for all variations of the Series 210 cell sampler.

A) Bench testing: Blank off one side of the sampler with a blind flange, charge the cell body with suitable fluid (water or hydraulic oil), and secure second blind flange. Continue to **Section 9.2**.

B) System testing: Ensure the sampler is depressurised.

9.2 Test Equipment

All equipment, including interconnecting pipe work or flexible hose, should be inspected and validated for the required test pressure.

Assemble a ‘test rig’ (see **Figure 9.1**), comprising a ‘T’ fitting with the correctly-rated pressure relief valve (PRV) (see table below the illustration of the test configuration) and needle control vent valve. Connect the ‘test rig’ to the sample outlet port of the sampler, and drain to suitable receptacle.

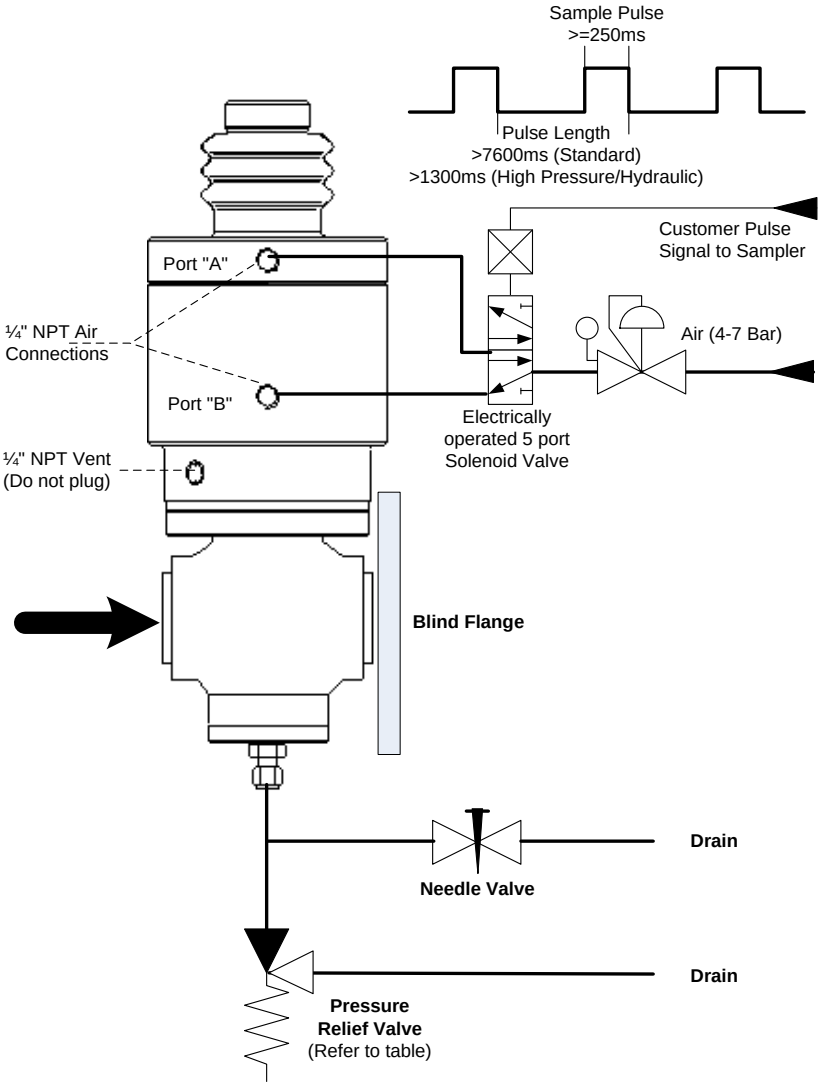


Figure 9.1 - Test configuration

Ensure the pressure relief valve is rated to correct system pressure and the outlet is connected to a suitable receptacle.

Note	The pneumatic or hydraulic actuator pressure setting is correct at 5 to 8 Bar(g).

Operate the sampler as described in **Section 5** in single grab sequence until the sample grab is forced through the pressure relief valve. This will validate the process grab is operating and sealing correctly.

The sampler incorporates an internal non-return valve set nominally at 20 Bar(g). The external check valve prevents oil seepage under operating conditions.

Upon satisfactory testing, isolate the sampler and open the needle control valve to relieve the pressure on the ‘test rig.’

10 Troubleshooting/Frequently Asked Questions

WARNING

Before undertaking any of the following checks, ensure that the sampler outlet is unblocked and connected to a suitable receptacle.

10.1 Sampler Does Not Operate

Are all actuator and electrical connections secure and correct?

Is the actuator pressure indicated on the air regulator or the hydraulic power pack discharge pressure gauge is between 5 and 8 Bar(g)? — Readjust as required.

Is the sampler controller demanding a grab? Are any interposing relays operating satisfactorily?

Is the solenoid being energised? — Check solenoid fuse and operate manually where solenoid has manual override facility. Ensure that the electrical pulse signal supplied to the solenoid valve is the correct duration (min. 500 ms for air, min. 1 sec for hydraulic applications).

Does the sample tube head move slightly? — The sample outlet may be obstructed. Check that external check valve setting and ensure the line to the sample receiver is not blocked.

Incorrect reassembly? — Compare assembly to drawings.

10.2 Sampler Operates but Does Not Produce a Sample

Are all valves open and is there fluid in the pipeline?

Is the actuator pressure correct? — If the pressure is too low, the actuator will not stroke fully. Verify that the actuator stroke is correct. The sample tube head should move approximately 19 mm (75 in).

Are there signs of degradation in the process grab seals, anti-vacuum breaker O-ring, or internal non-return valve? — Such signs can cause a reduction or loss of sample grab volume. Refer to **Section 9.1** to ensure that they are sealing correctly.

10.3 Sampler Fails to Take Adequate Sample

Is the actuator pressure, indicated on the air regulator or hydraulic power pack discharge pressure gauge, between 5 to 8 Bar(g)? — Readjust as required.

Is sample receiver empty or is the sample outlet piping blocked through waxing?

Is the external check valve fitted to sampler outlet adapter set to 5 Bar above line pressure for normal low-pressure receiver systems and to 1 Bar where high-pressure sample receivers are being used?

Is the external check valve set with the correctly-sized spring for the system usage?

Check that the external relief valve fitted to the sample discharge lines is not passing.

Is the sampler controller (a) not demanding too fast a sample grab rate (max. 120 grabs/min) or (b) is the signal to the solenoid is too short and not allowing the actuator to travel to the full extent of its stroke?

If the above conditions are satisfactory, the sampler requires a change of internal seals.

10.4 Sampler Takes Excessive Sample

Is the external check/relief valve fitted to the sampler outlet adapter set to 5 Bar above line pressure for normal low-pressure receiver systems and set to 1 Bar where high-pressure sample receivers are being used?

Is the external check valve set with the correctly-sized spring for the system usage and is it not passing fluid when the sampler is not in operation?

If the above conditions are satisfactory, the sampler requires a change of internal seals.

10.5 Leaks from Actuator

Pneumatic or hydraulic motive power leaks from the actuator are rare. If these types of leaks are evident, the actuator O-rings are worn or damaged.

If there are leaks from the vent port, the sampler requires servicing.

10.6 Vibration

Vibration is unlikely to occur in cell samplers. If vibration is observed, contact Cameron and provide details as to configuration and site conditions.

11 Sub-Supplier Information

The following sub-supplied items are used in the 210 Cell Sampler:

- Sampler solenoid valve (selected to suit application-specific hazardous area requirements and power supply)
- Air regulator

Neither item contains any user-serviceable parts.

- Hydraulic power pack (EH versions)—Refer to H12 (Hydraulic Power Pack handbook).

12 Recommended Spares List

When requesting assistance or spare parts, please provide the sampler model(s) and serial number(s) to ensure that the correct options are supplied.

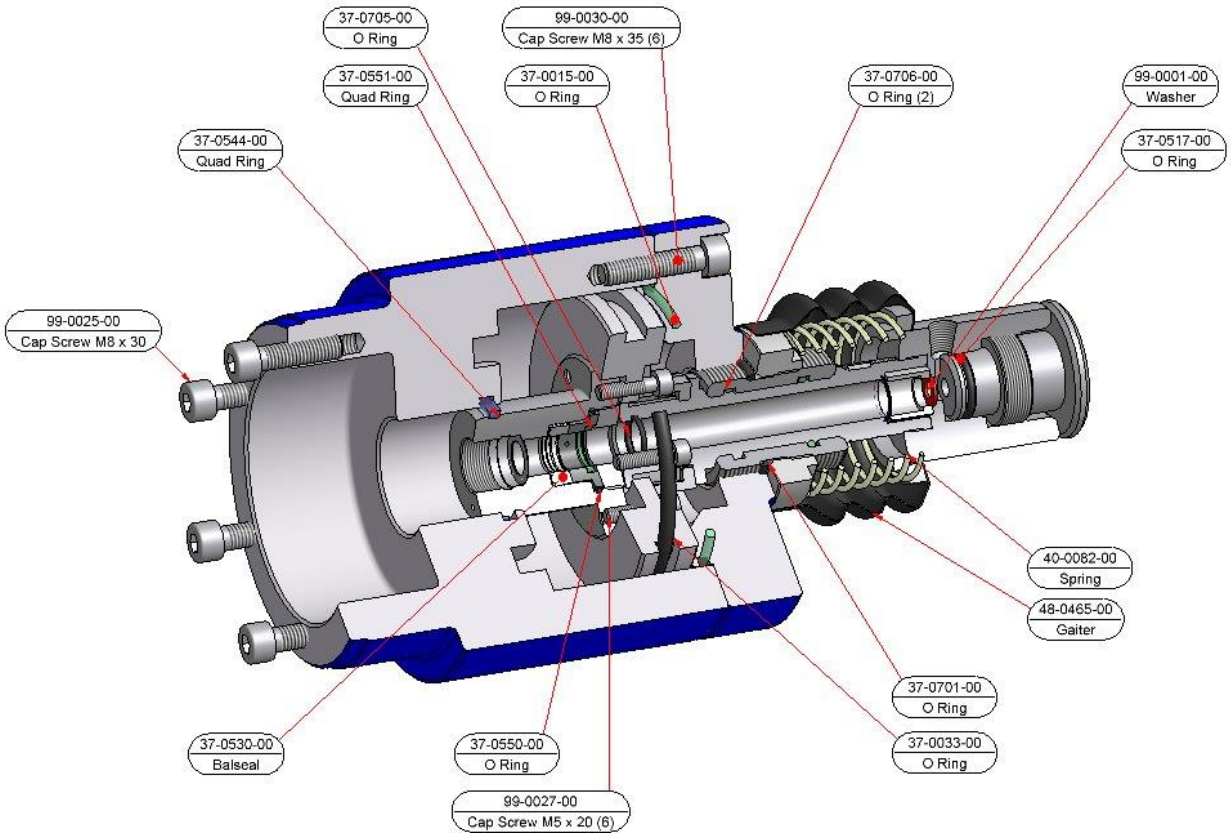


Figure 12.1 - Series 210 Standard cell sampler spare parts

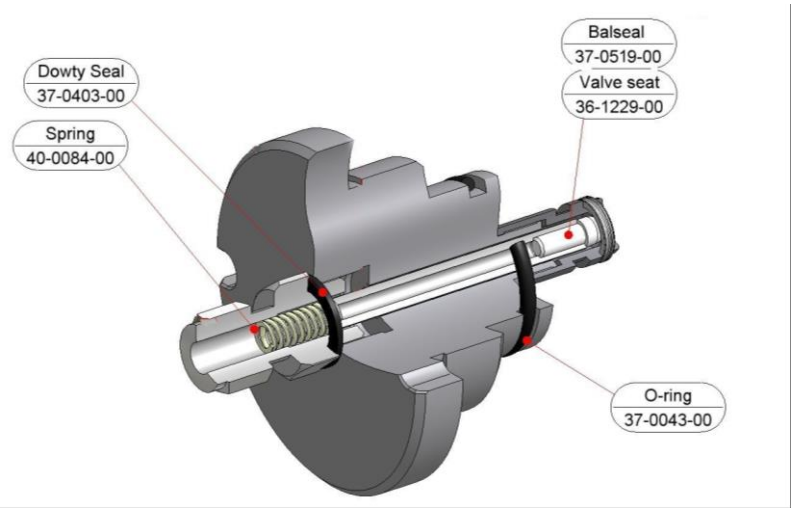


Figure 12.2 - Series 210 EH-HP cell sampler spare parts

12.1 Series 210 HP Cell Sampler Spare Parts Kit (3J-45-0176-00)

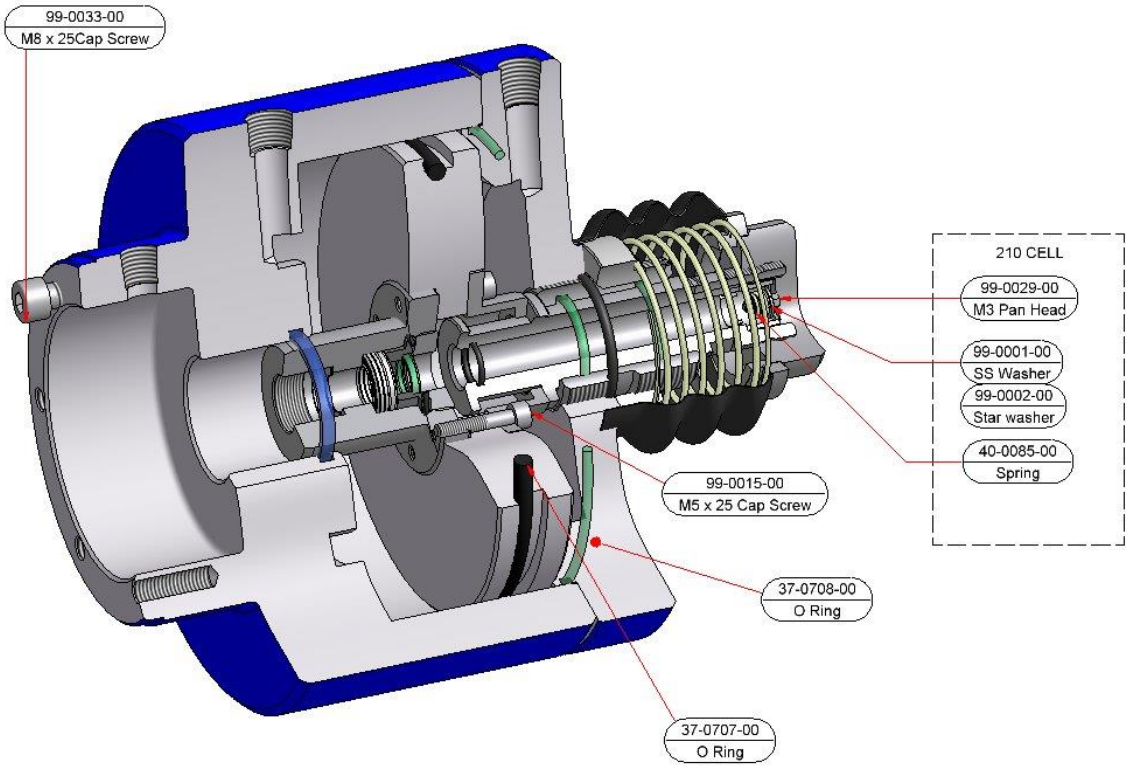


Figure 12.3 - Series 210 HP cell sampler spare parts

12.2 Alternative Seals for MTBE and Similar Applications

Part/Sub-assembly		Commissioning	1 Year Operation	2 Year Operation
Alternative 'Kalrez' Seals for MTBE and similar applications		1	1	1
Item No.	Description			
41	O-ring (Replaces 3J-37-0702-00)			
75	Check Valve Tip (Replaces 3J-36-1229-00)			

12.3 Special Tool Kit (3J-45-0127-00)

Part/Sub-assembly		Commissioning	1 Year Operation	2 Year Operation
Special Tool Kit		1	—	—
Description	Part No.			
'C' Spanner (Tool 'A')	3J-36-2000-00			
Check Valve Nut/Lower Piston Rod Seal Nut Peg Spanner (Tool 'E')	3J-36-2004-00			
Tommy Bar (Tool 'F')	3J-36-2005-00			
Balseal Loading Mandrel (Tool 'G')	3J-36-2006-00			
Balseal Sizing Tool (Tool 'J')	3J-36-2017-00			
Upper Sample Tube Seal Assembly Tool (Tool 'L')	3J-36-2015-00			
Upper Capture Tube Seal Assembly Tool (Tool 'M')	3J-36-2016-00			
1/4-in NPT Tommy Bar (Tool 'P')	3J-36-2018-00			

12.4 Ancillary Equipment

Part/Sub-assembly	Commissioning	1 Year Operation	2 Year Operation
Solenoid Coil (to suit application)	—	1	1

13 Product Specific Drawings

Series 210 Standard Cell Sampler (typical)	17718
Seal Assembly Procedure	18098
Actuator Assembly	16213

14 Addenda – 2-cc Cell Sampler

The principle of operation of the 2-cc version is identical to the Standard 210 cell sampler, and achieves the increased sample size through the use of larger diameter capture and sample tubes and a modified pedestal on the bottom plug.

Overhaul of this sampler is performed as done for the standard unit, with the one exception – the capture tube seal is retained between the seal extension.

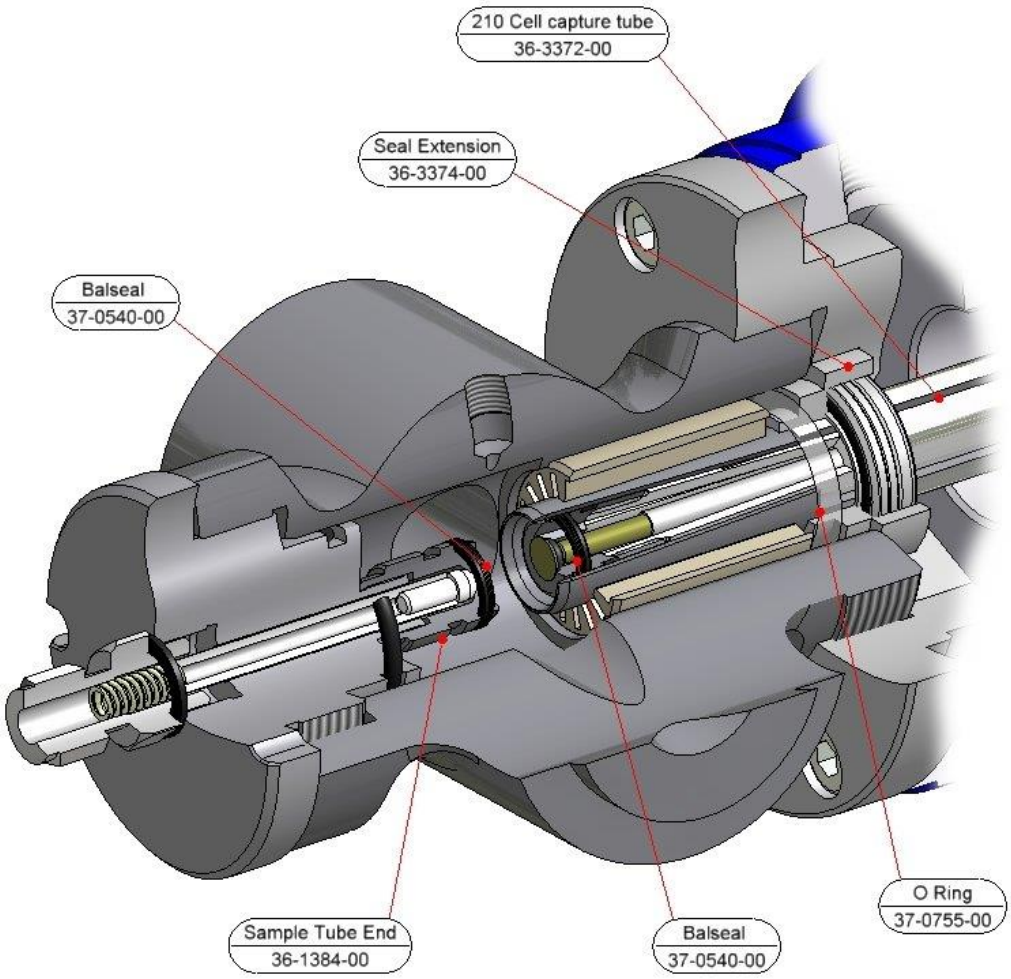


Figure 14.1 - Series 210 Standard Cell Sampler, 2-cc Version

15 Addenda – Series 210 Severe Duty (SD) Cell Sampler

The principle of operation of the SD cell sampler is similar the Series 210 Standard cell sampler, but has been developed specifically for the most demanding process conditions, where higher particulate concentrations are present.

The Series 210 SD cell sampler is fitted with a robust, wear-resistant, ‘SD’ coating on the capture tube, which provides extensive longevity over standard samplers when combined with the advanced seal cartridge.

The main seals for the Series 210 SD cell sampler have been upgraded and the vacuum breaker has been replaced with a maintenance-free seal-less valve seat.

Figure 15.1 illustrates the main components within an SD cell sampler.

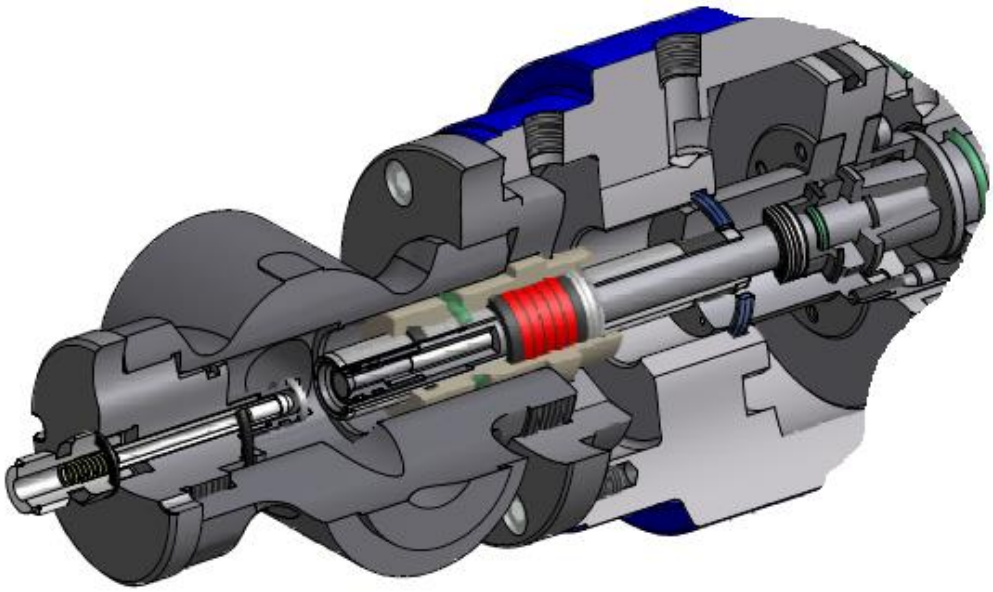


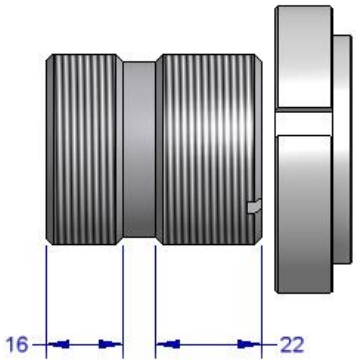
Figure 15.1 - Series 210 SD Cell Sampler, 1-cc Version

For further information on the Series 210 SD cell sampler variant, please refer to **Figure 8.4** in this manual or to the product data sheet.

16 Addenda – Grab Volume Adjustment

Variations – including seal material, assembly and setup for grab volume – remain similar for all Series 210 EH, HP and Standard cell samplers.

Note	Stroke length is calibrated during the sampler manufacturing process. Any attempt to adjust the grab volume or modify the position of the actuator bush should only be carried out after consultation with Cameron or in the presence of Cameron personnel.

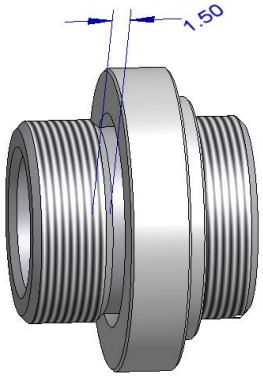


a) Grease all threads with Molykote 1000.

b) Align actuator bush with the longer thread facing the adjuster lock nut.

c) Screw the adjuster lock nut to the actuator bush.

16.1 Volume Grab Pre-adjustment



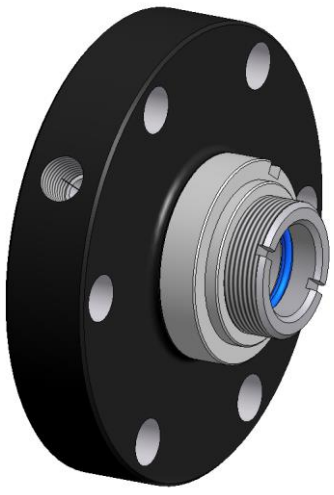
1-cc: Install the actuator bush O-ring and position the lock nut approximately 1.5 mm back from the undercut.

2-cc: Install the actuator bush O-ring and position the lock nut in line with the start of the 16-mm thread.

Screw the assembly into the top housing and tighten.

Install the O-ring within the actuator bush.

Install the O-ring within the top housing



17 Addenda – Series 210 High Temperature Cell Sampler

The High Temperature (HT) cell sampler operates similarly to the Series 210 cell sampler. However, a site-specific risk assessment and safety procedures must be in place to install and remove the sampler probe under elevated temperatures.

Refer to **Section 12**.

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