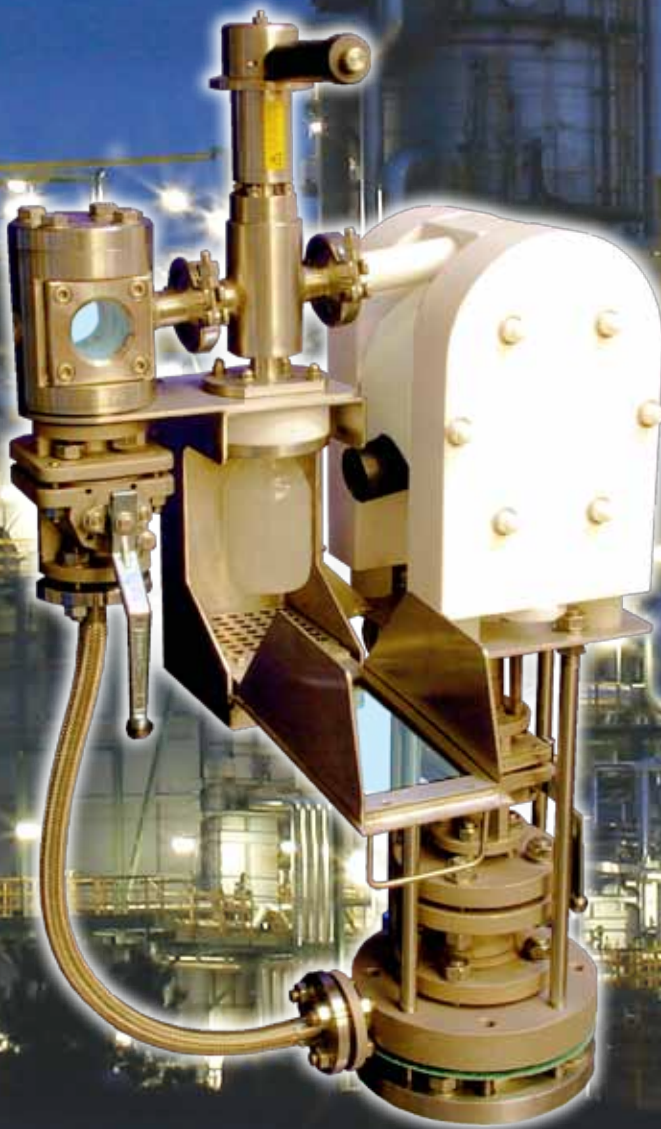




the corrosion expert

# Sampling Systems

Safe and representative  
Sampling Systems



CRP is a world leader in the design and manufacture of safe and representative sampling systems for use in Pharmaceutical, Chemical, Food and Beverage, Biotechnology, Pulp and Paper, Petrochemical & Semiconductor industries.

We offer a wide range of sample dispensing options and secondary containment solutions to suit the process. All levels of sophistication are available from simple manual sampling to remote automated sampling and analysis systems. All our sampling systems are designed with operator and environmental safety as the primary consideration

Toxic, flammable and corrosive medias are safely sampled using systems with all wetted parts in PTFE, PFA, Hastelloy® and other exotic materials. Sampling systems are also available in unlined 316L stainless steel for less corrosive duties.

We pride ourselves on "the first sample being the right sample."

## CRP

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Across the complete spectrum of the process industry from pharmaceutical to petro-chemical the taking of samples has become more important. The reasons for taking samples are many and varied and include: confirming that a chemical reaction has been completed, checking that a product has the correct physical or chemical composition, requiring a sample to archive or checking that a delivery is to the agreed specification.

The key to achieving the above is to ensure that the sample taken is representative of the material sampled. Very often poor sampling systems have what are referred to as “dead legs”. These are places between the sample point and the dispensing point that may contain sample material from the last or previous batches. This can result in the wrong sample or a need to run product to waste until one is confident that the right material is being sampled. This of course can be expensive and awkward.

Next from a sampling perspective it is necessary to consider the specific properties of the sampled materials. Are they viscous, abrasive, corrosive, gaseous, explosive, radioactive, flammable etc. Again the design of the valve, how the sample is taken, dispensed and contained is critical to getting a piece of equipment that functions well and the operators are happy with.

Just as important as the need to create a sampling device that functions well is the need to consider operator and environmental safety. This is where the device is designed to minimise the need for personal protective equipment, making this the second line of defence rather than a primary need. From the environmental perspective one can consider the need for secondary containment in the event of a spillage or extraction of vapours to a site scrubbing system.

To address these twin needs of function and safety CRP has developed a comprehensive range of equipment for representative sampling of liquids, gases and powders from a wide range of process equipment. The standard range of equipment will allow samples to be taken in the majority of circumstances, but when the demands of the application are special CRP has a wealth of experience and a skilled engineering team on hand to develop a customised solution.

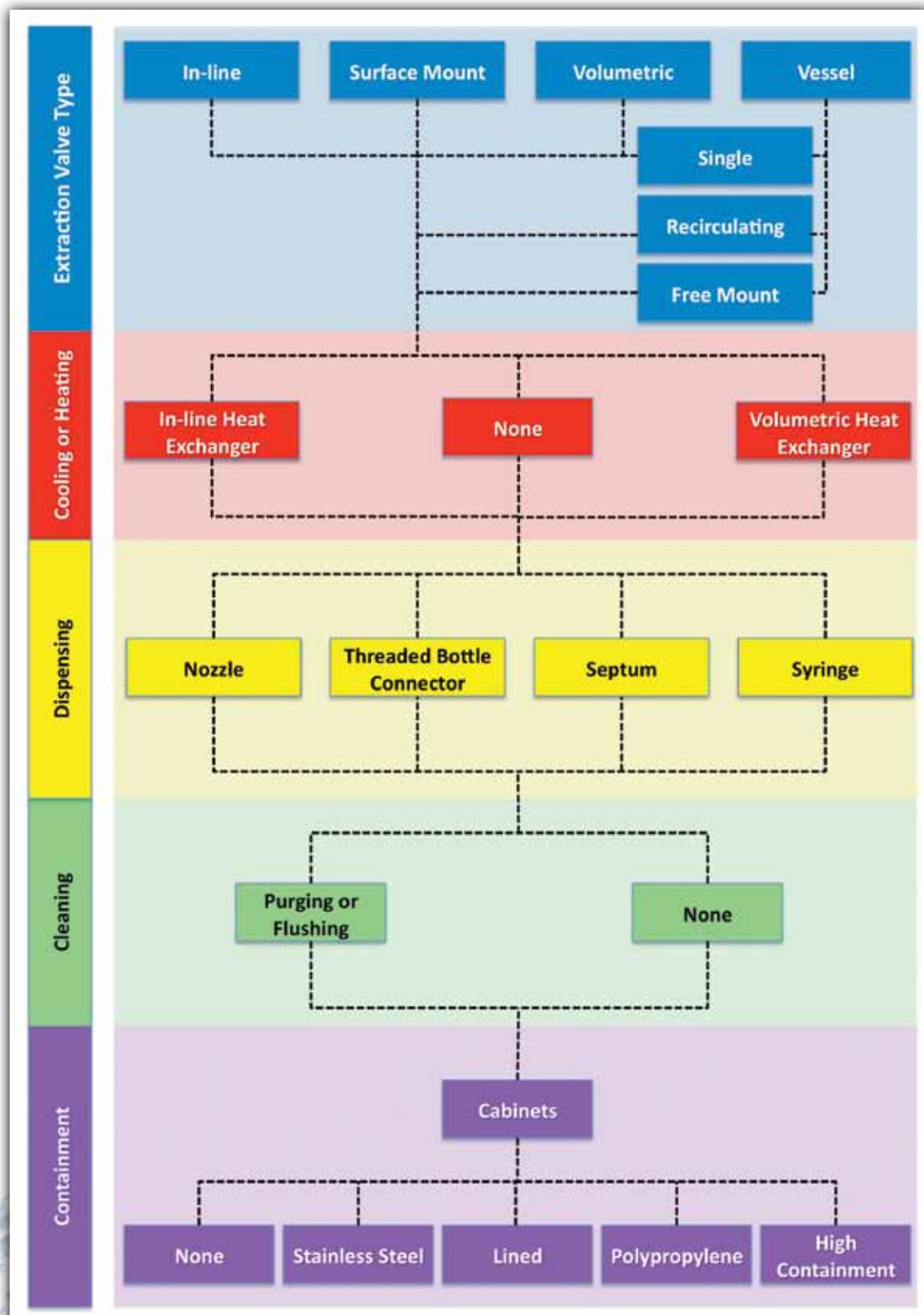
CRP manufacture all of their own products and in particular has in-house PFA moulding expertise to enable bespoke designs to be quickly turned into products offering the highest levels of corrosion resistance.

Please use this guide as a starting point and call us or your local distributor to discuss your requirements.



# Liquid and Gas Sampling Flowchart

Below is a step by step guide to the key selection choices when choosing a “standard” sampling system. This logic is followed in the succeeding pages.



The In-Line sampling valve provides a safe and simple to operate product for taking a representative sample from either a horizontal or vertical process pipeline. With the addition of other equipment for treating, dispensing and containing the sample it forms the core of a robust and versatile system. It is available both as a stainless steel PFA lined product for corrosive applications and in a stainless steel version for other duties.

## Technical Specification

PFA Lined Sampling Valve [SDIL 400]	
Design	Wafer pattern to suit ASME 150, ASME 300, PN 10/16
Size	1in, 1.1/2in, 2in, 2.1/2in, 3in, 4in, 6in DN25, DN40, DN50, DN65, DN80, DN100, DN150
Performance	-29°C to 180°C, Full Vacuum to 10 bar g
Wetted Materials	PFA, PTFE, Chemraz® Perfluoroelastomer
Body Material	Stainless Steel Grade 316 to ASTM A276
Installation	Mounted for sampling from a horizontal or vertical pipeline
Options	
Materials	Lined in Static-dissipating PFA
Valve	Kalrez® Perfluoroelastomer tip seal for abrasive/crystalline media

Unlined Sampling Valve [SDIL 300]	
Design	Wafer pattern to suit ASME 150, ASME 300, PN 10/16
Size	1/2in, 3/4in, 1in, 1.1/2in, 2in, 2.1/2in, 3in, 4in, 6in DN 15, DN20, DN25, DN40, DN50, DN 65, DN80, DN100, DN150
Performance	-29°C to 200°C, Full Vacuum to 16 bar g. (ASME 300 Full Vacuum to 24 bar g)
Wetted Materials	Stainless Steel Grade 316 to ASTM A276, PTFE, Chemraz® Perfluoroelastomer
Body Material	Stainless Steel Grade 316 to ASTM A276
Installation	Mounted for sampling from a horizontal or vertical pipeline
Options	
Materials	Body in Hastelloy® C276, Monel and other alloys
Design	ASME/DIN Flanges, Tri-clamp or other connections

## Function

The valve functions with a twin action handle. The handle is pulled out against a spring force enabling it to be pushed down over a lip on the top cap. This downward motion opens the valve again working against a spring force. As soon as the handle is released from whatever position it is in, it will spring back to the closed position. The handle may be fitted with a padlock as part of a safe operating regime or alternatively the valve can be fitted with an actuator to enable remote operation.

## Features

- No dead legs within the valve and a short distance between the sample and dispensing points giving representative sampling.
- A stroke adjuster enabling the valve to be set for a suitable flow of liquor given its line pressure and viscosity.
- A tried and tested stem seal system that has proven itself in test over 20,000 cycles at elevated temperatures and in over 20 years of applications.
- Both the PFA lined and stainless steel versions are FDA compliant.

## SDIL 400



PFA Lined Sampling Valve



Sampling Valve with Cabinet



Actuated valve combined with pneumatic bottle sensor

## SDIL 300



Unlined Sampling Valve



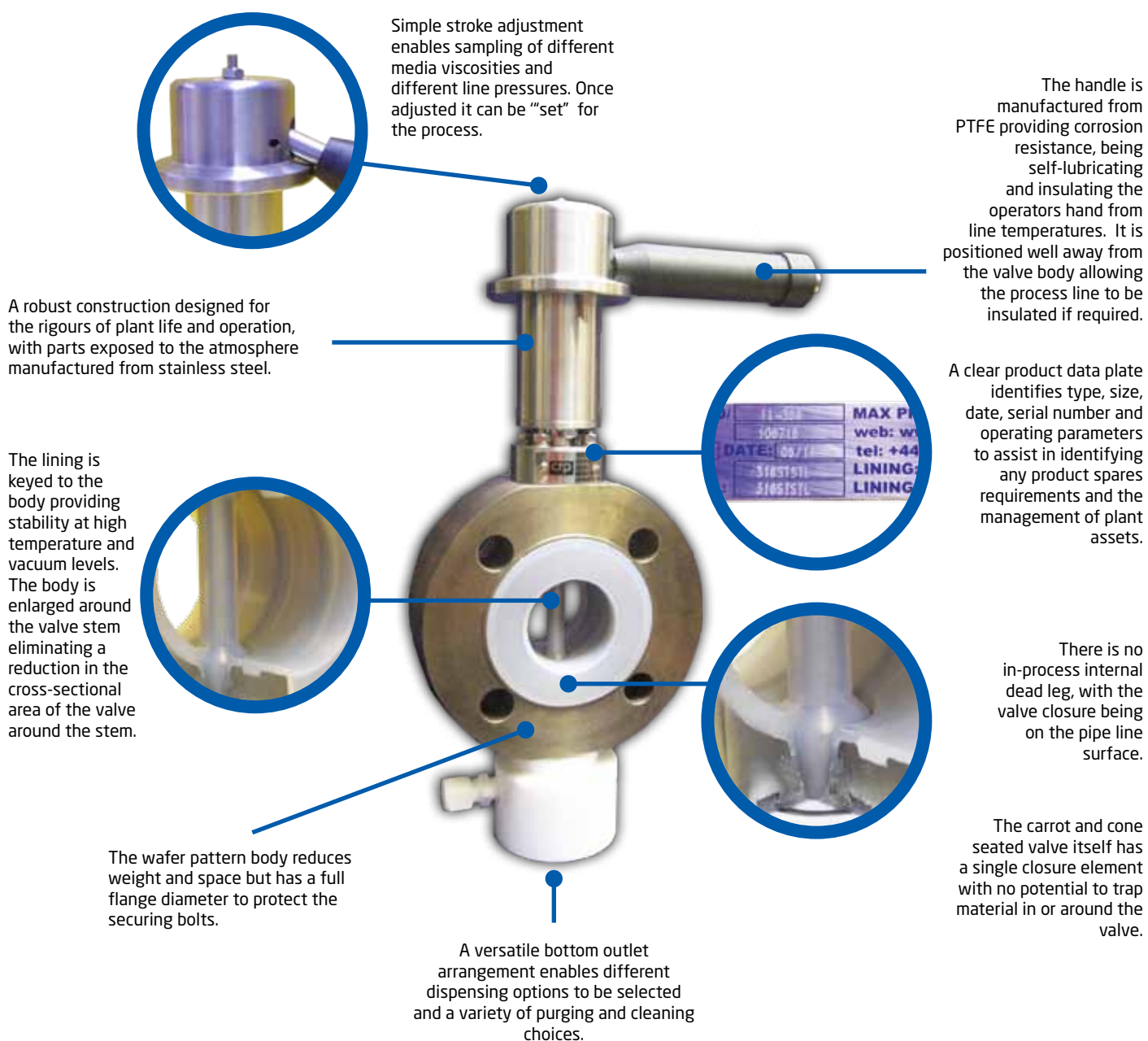
Flanged Unlined Sampling Valve



# Key Performance Features

The heart of any sampling system is the valve itself. The valve has been designed to be strong and withstand the rigours of plant use and exposure. Its function is simple and gives a truly representative sample.

## PFA Lined Sampler [SDIL 400]



# Key Safety Features

The valve is designed with operator safety first and foremost.

The handle is a fail safe "dead man's handle" with a powerful spring to ensure closing the valve upon release.

The handle also requires two specific actions to operate, preventing accidental opening.

A static-dissipating PTFE handle retains its looks after many years of service, does not corrode and prevents temperature transmission from the process to the operator.

Once stem adjustment is set, it can be locked off for safe day to day operation.

A padlock can be fitted to the handle to enable the device to be incorporated in permit to work routines and prevent unauthorised operation.

The valve is equipped with a PTFE and Chemraz<sup>®</sup> stem seal pack that has been tested over 20,000 cycles without leakage and has never failed in 20 years of product supply. You can be assured of no leakage to atmosphere.

Surface mount samplers are designed for mounting onto the side or base of a vessel or large pipeline. In the case of a pipeline this has the advantage of the sampling valve not being line size specific and for vessels eliminates the need to sample from the top of the vessel where space and nozzles are usually limited.

## Technical Specification

Connection	Flanged ASME 150, ASME 300, PN 10/16, Tri-Clamp and others
Size	1 in. DN25 and larger
Performance	-29°C to 200°C, Full Vacuum to 1.6 bar g. (ASME 300 Full Vacuum to 24 bar g)
Wetted Materials	Stainless Steel Grade 316 to ASTM A276, PTFE, Chemraz® Perfluoroelastomer
Body Material	Stainless Steel Grade 316 to ASTM A276
Installation	Mounted for sampling on the side or underneath a vessel or pipeline
Options	
Materials	Body in Hastelloy® C276, Monel and other alloys
Treatment	Flush connection
	Sample cooling or heating
Function	Pneumatic Actuation

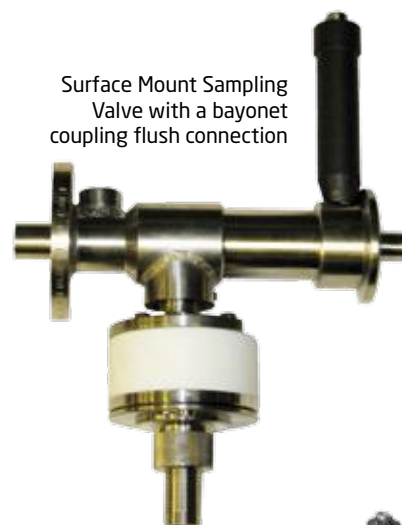
## Function

The valve functions as the In-Line sampling valve with a twin action handle. The handle is pulled out against a spring force enabling it to be pushed down over a lip on the top cap. This outward motion opens the valve, again working against a spring force. As soon as the handle is released from whatever position it is in, it will spring back to the closed position. The handle may be fitted with a padlock as part of a safe operating regime or alternatively the valve can be fitted with an actuator to enable remote operation.

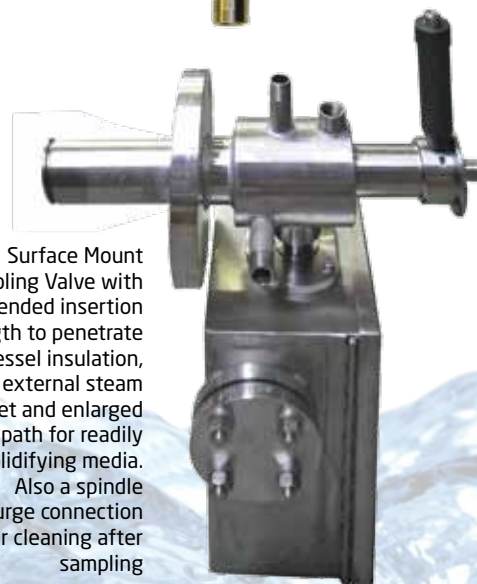
## Features

- There is a carrot and cone valve with action of the handle pushing the carrot into the vessel, so there is no dead leg on the valve entry.
- There is however a need for the liquor to pass along the valve body to exit the vessel and this creates a small dead leg. CRP can provide a flushing or purging system to clean this between samples.
- A stroke adjuster enabling the valve to be set for a suitable flow of liquor given the vessel or pipeline pressure and viscosity.
- A tried and tested stem seal system that has proven itself in test over 20,000 cycles at elevated temperatures and in over 20 years of applications.

Surface Mount Sampling Valve with a bayonet coupling flush connection



Surface Mount Sampling Valve with extended insertion length to penetrate vessel insulation, an external steam jacket and enlarged flow path for readily solidifying media. Also a spindle purge connection for cleaning after sampling





## Volumetric Sampling Valve

This device is an In-Line sampling valve and has a role as either an uncomplicated sampling device - requiring a simple 180° turn of the handle to dispense and reset the valve - or as a valve capable of sampling product under vacuum. The sample amount is determined by operating the valve a number of times which fills and empties a closed end cup which is within a ball.

### Technical Specification

Connection	Flanged ASME 150, PN 10/16
Size	1 in, 2 in, 3 in. DN25, DN50, DN80
Sample Size	15, 45 or 90ml.
Performance	-29°C to 180°C, Full Vacuum to 19 bar g
Wetted Materials	PFA, PTFE
Body Material	DCI to EN-GJS-400-LT (GGG 40.3)
Installation	Mounted for sampling from a horizontal or vertical pipeline
Options	
Materials	Lined in Static Dissipating PFA
	Unlined in Stainless Steel Grade GX6CrNiMo1810 (1.4408)
Function	Pneumatic Actuation

Actuated Valve

PFA Lined Valve for a horizontal pipeline

Unlined Stainless Steel Valve



# Vessel Sampling - Single Sampler

This vessel mounted sampling system is designed to be connected to a dip pipe entering the top of a vessel. The sample is drawn up into the sampling valve by means of site vacuum or an eductor generating a local vacuum.

## Function

The valve functions with a small bore PTFE tube running down the centre of the dip pipe. Above this is an isolation valve followed by a sample outlet valve. The sample valve is connected to a cabinet with an outlet and typically a PTFE threaded bottle connector. Above the sample valve is a sight glass sized for the sample size and fitted with a floating ball to prevent sample liquor being drawn down the vacuum line. Finally above this is a manifold typically supplying wash liquor, vacuum and nitrogen. With the isolation valve and vacuum valve open a sample can be drawn up into the sight glass. The vacuum valve can be closed and the sample blown back into the vessel using the nitrogen supply. This can be done two or three times to ensure that the sample will be representative. Once a suitable sample is in the sight glass the isolation valve can be closed and the sight glass slightly pressurised with nitrogen. This can then be dispensed via the sample valve. Any remaining sample can be blown back into the vessel and the sight glass and sample valve cleaned with wash liquor. Finally nitrogen can be blown through the complete assembly to leave the system ready for the next sample.



PFA Lined Vessel Mounted Single Sampler

## Technical Specification

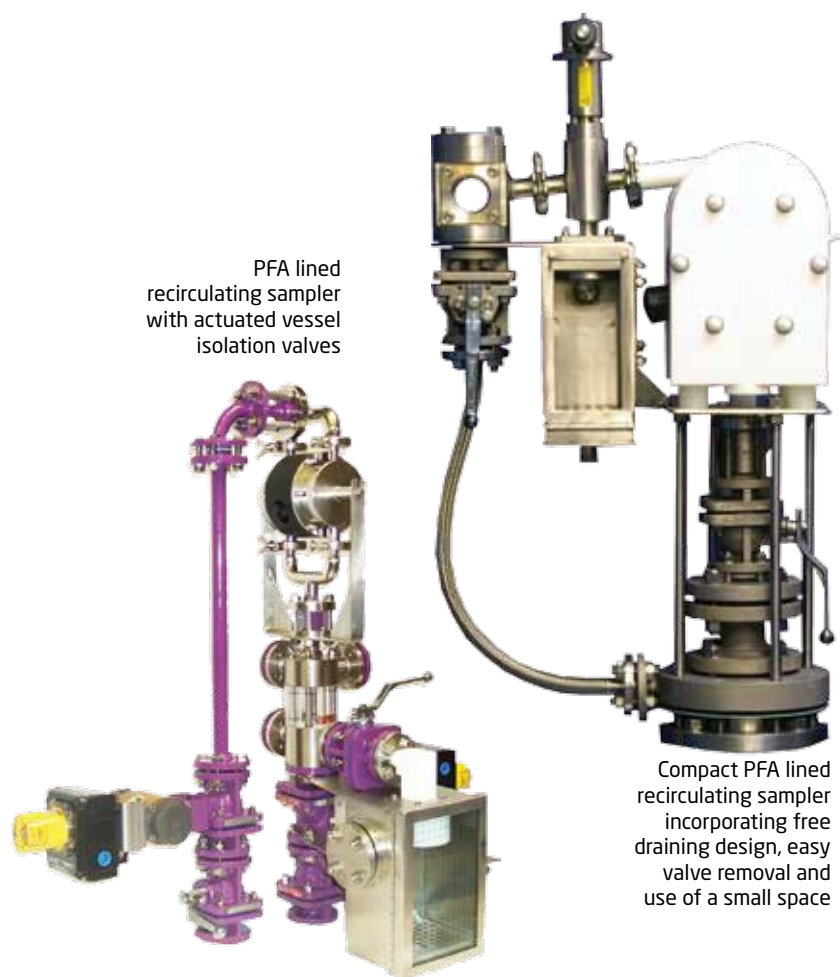
Connection	Flanged to suit vessel dip pipe
Size	To suit vessel dip pipe
Performance	-29°C to 180°C, Full Vacuum to 10 bar g (dependent upon valve selection)
Wetted Materials	PFA, PTFE, Chemraz® Perfluoroelastomer, Borosilicate Glass
Body Material	Generally Stainless Steel Grade 316 to ASTM A276
Sample Bottle Vent	To atmosphere
Overfill Security	Floating Ball Check Valve
Options	
Sampling Sight Glass	Volume adjusted for sample size
Service Valve	As standard Atomac AKH2 (PFA Lined), but solid PTFE ball valves, diaphragm valves etc. are available
Sample Valve	As standard CRP In-Line sampling valve, but ball or diaphragm valves are available
Materials	Lined in Static-dissipating PFA
Valve Function	Spring return handles or actuated valves
Vacuum Generation	Eductor where no site vacuum is available
Instruments	Temperature and/or pressure gauge, pH probes
Sample Bottle Vent	Return to sampling sight glass or customer scrubber
Overfill Security	A secondary catchpot for any oversampling
Purging	Nitrogen purging between sampling sight glass and safety shield to prevent misting

# Vessel Sampling - Recirculating Sampler

A recirculating sampler creates a process liquor flow up a dip pipe through a pump, past an In-Line sampling valve and sight glass and returns the liquor to the vessel. Once the flow is established, the sample can be drawn off at any time as the sample will be representative. CRP's standard design is a compact sampler constructed to minimise the area required above the vessel and completely drain back into the vessel. However many alternative designs are produced to suit customer specific needs.

## Function

Both isolation valves are opened and the pump is set running. Depending on the configuration the pump is stopped and the inlet isolation valve closed or the system is left running. The sample is taken and the system is then purged with nitrogen, cleaned with a wash liquor and nitrogen.



## Technical Specification

Connection	Flanged to suit vessel dip pipe
Size	To suit vessel dip pipe
Performance	-29°C to 180°C, Full Vacuum to 10 bar g (dependent upon valve and pump selection)
Wetted Materials	PFA, PTFE, Chemraz® Perfluoroelastomer, Borosilicate Glass
Body Material	Generally Stainless Steel Grade 316 to ASTM A276
Options	
Sample Valve Location	Mounted on outlet side of pump for sampling whilst running
Pump	As standard in Virgin PTFE, can be static dissipating or metallic construction. Can be ATEX compliant
Service Valve	As standard Atomac AKH2 (PFA Lined), but solid PTFE ball valves, diaphragm valves etc. are available
Sample Valve Materials	As standard CRP In-Line sampling valve, but ball or diaphragm valves are available
Valve Function	Lined in Static-dissipating PFA
Instruments	Spring return handles or actuated valves
Sample Bottle Vent	Temperature and/or pressure gauge, pH probes
Overfill Security	Return to sampling sight glass or customer scrubber
Purging	A secondary catchpot to collect any oversampling
	Nitrogen purging between sampling sight glass and safety shield to prevent misting



Free Mount Samplers are small lightweight mobile units ideal for laboratory use or small scale pilot plants. They can be wall or stand mounted and are suitable for vessels at ambient pressure and temperatures below 100°C.

## Function

From the valve closed position, the vacuum and nitrogen lines are connected to their services and the vessel connection made to the dip pipe. A sample bottle is fitted and the service and vessel isolation valves are opened and the sampling valve is turned to the "PURGE BOTTLE" position. This fills the bottle with nitrogen. The valve is turned to the "PURGE BACK TO VESSEL" position and this flushes the line to the vessel with nitrogen. Then turn to "SAMPLE" and a sample is drawn into the bottle. When complete turn back to "PURGE BACK TO VESSEL" to flush the vessel line with nitrogen. The valve is returned to "PURGE BOTTLE" and then closed.

## Technical Specification

<b>Design</b>	Can be made to connect to any equipment
<b>Size</b>	To suit customer process
<b>Performance</b>	-5°C to 100°C, Full Vacuum to atmospheric/slight positive pressure
<b>Wetted Materials</b>	PTFE, Chemraz® Perfluoroelastomer
<b>Construction</b>	Multiway solid PTFE valves with bottle connector(s) beneath. Valves mounted beneath a stainless steel or polypropylene mounting bracket. Nitrogen, vacuum and vessel connections via PTFE compression fittings
<b>Options</b>	
Seeding	Variant for vessel seeding
Dispense	Either threaded bottle connector or septum sampling
Instruments	Temperature and/or pressure gauge
Overfill security	A secondary bottle to collect any oversampling



Free Mount septum sample valve with wall bracket



Free Mount floor standing sampler with secondary overfill bottle



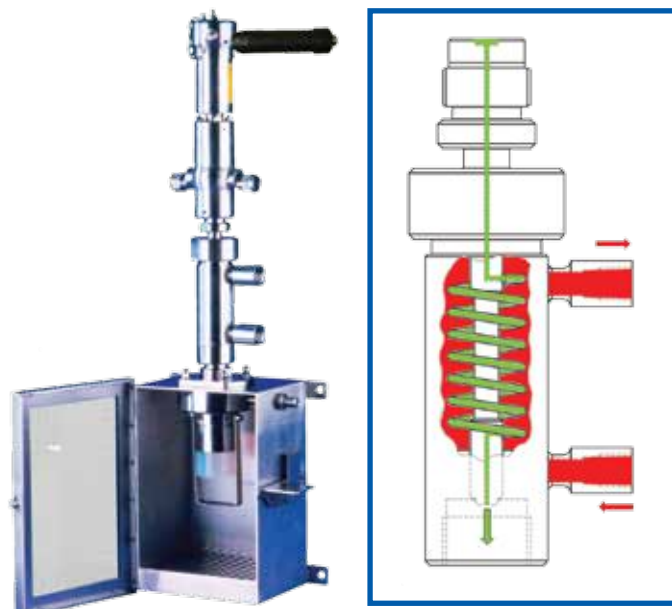
Free Mount septum sample valve with process connections running in stainless steel conduit

In some applications the sampling media may be at a temperature (low or high) at which it is unsafe to dispense, or may have properties that require that the sample is maintained at a certain temperature. For such duties a heat exchanger can be supplied.

## In-Line Heat Exchanger

The sampled material passes through a small bore tube which in turn is jacketed in cooling/heating water. The length of the tube and water flow rate can be adjusted to provide different amounts of cooling or heating. The heat exchanger can also be supplied with the ability to be purged and flushed for cleaning. This device is not suitable for samples with entrained solids or those that solidify easily or are very viscous.

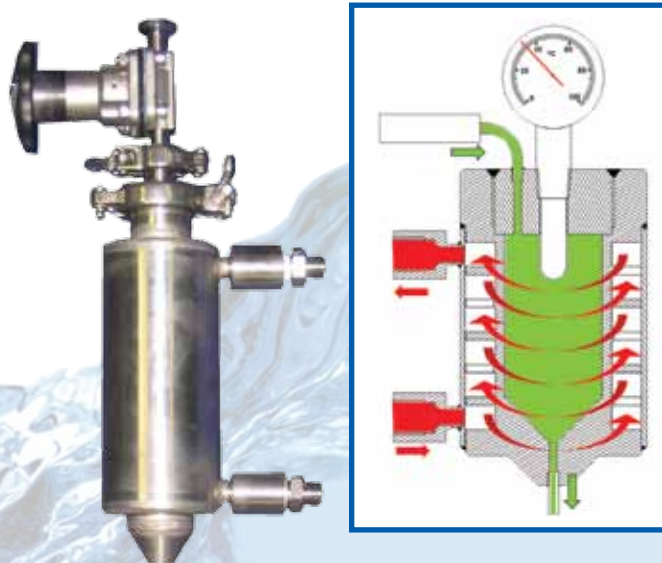
In-Line Heat Exchanger with In-Line Sampling Valve and Swagelock type process connections



## Volumetric Heat Exchanger

The volumetric heat exchanger is positioned below the sample valve, with a further valve before the dispense point. This allows the sample to be drawn into the heat exchanger and allowed to cool or be heated. The chamber volume is designed to suit the sample requirement. A temperature gauge can be used to precisely heat or cool the sample. These are usually operated with cooling/heating water, but air cooling can also be used. These can also be fitted with a purge/flush for cleaning and if necessary for pressurising the sample in order that it may be dispensed.

Volumetric Heat Exchanger with tri-clamp connections



Once one has collected the sample it is necessary to put it into some sort of container to transfer it for analysis. This dispensing choice is a function of the type of liquid or gas and the degree of containment required from a safety and environmental perspective. The options below are presented in ascending levels of safety. Dispensing should always be considered in conjunction with a cabinet.

## Nozzle

This design is infrequently used because of the ease of spillage and lack of operator protection, but if the media is non-hazardous it can be a less expensive option or when used in conjunction with a cabinet it can be useful for seeing liquid levels when one is sampling into an opaque container such as a metal bottle or tin.

## Threaded Bottle Connector

This is by far the most widely used dispensing option and can be used in conjunction with a cabinet. The bottle connector is manufactured in PTFE with a vent to enable the bottle to degas when being filled. The most popular bottles have an industry standard GL45 thread, but there are many bottle thread types and connectors can be manufactured to suit the customer's bottle.

### Options include:

- Twin threads allowing two bottle sizes to be used.
- A PTFE plug and chain to act as a secondary seal and a drip catcher.
- A Ball Check Valve on the bottle vent to allow sampling both under positive pressure and vacuum.
- Pneumatic bottle sensor preventing operation if a bottle is not present.
- A mechanical bottle interlock providing an extra seal between the bottle and sample valve which only opens through the action of fitting the bottle.
- A bayonet coupling hose connector allowing the wash liquor to be piped directly to drain.
- Spring operated bottle holders to allow easy placement, often combined with a rain cover when used outside without a cabinet.

## Septum

Septum dispensing requires bottles with a PTFE faced silicone rubber septum seal. Two needles (one for bottle venting and one for dispensing the sample) puncture the septum and the sample is dispensed into a bottle held in place with a stirrup. CRP needles are designed with a point rather than the hypodermic style to prevent the needle becoming blocked with a core of rubber and damaging the septum cap. The septum bottle is pulled from the needles and the silicone seal serves to wipe the needles clean. The septum self seals and enables the bottle to be transported safely. This represents a higher level of containment than bottle sampling and removes the need for fitting lids.



Needles as standard are manufactured in Hastelloy® C276 but also in a range of exotic alloys, with different bore diameters to suit the sample. Where space constrains the needle sizes, a single needle with a gutter is available.





Syringe sampling provides the highest level of operator isolation from the liquor and is also suitable for sampling gases. Essentially an In-Line sampling valve acts as a docking device into which the syringe is fitted and enables the valve to be opened. Uniquely with this design there is no pressure increase within the syringe during its removal from the valve. Upon taking the sample the syringe can be removed, automatically closing the valve. The syringe can then be taken to the laboratory for dispensing. A single syringe can function with a number of sampling points.

## Function

The valve section of the unit is permanently fitted to the pipe to be sampled from. The operator removes the protective tip cover from the base of the valve and the cover from the syringe and fits the syringe with a 180° turn of the handle. The bayonet fitting locks the syringe in place and both opens the syringe tip and the valve. Internal pressure pushes liquor or gas into the syringe. When the desired sample has been taken the operator disconnects the syringe with the handle which closes the syringe and valve, refits the covers and takes the sample for analysis.

## Technical Specification

<b>Design</b>	Wafer pattern to suit ASME 150, ASME 300, PN 10/16
<b>Size</b>	1 in, 1.1/2in, 2in, 2.1/2in, 3in, 4in, 6in [PFA Lined Valve] As SDIL300 for Unlined DN25, DN40, DN50, DN65, DN80, DN100, DN150 [PFA Lined Valve] As SDIL300 for Unlined Valve
<b>Sample Size</b>	50, 100ml.
<b>Performance</b>	-5°C to 100°C, to 5 bar g
<b>Wetted Materials Valve</b>	PFA, PTFE, Chemraz® Perfluoroelastomer Valve spindle Hastelloy® C276
<b>Wetted Materials Syringe</b>	Hastelloy® C276, PTFE, Chemraz® Perfluoroelastomer, Borosilicate Glass
<b>Installation</b>	Mounted for sampling from a horizontal or vertical pipeline
<b>Options</b>	
Materials	Valve in Stainless Steel Grade 316 to ASTM A276 Syringe Unit in Hastelloy® C276 Syringe Unit fully metallic without Borosilicate Glass
Sample	Other sample sizes possible

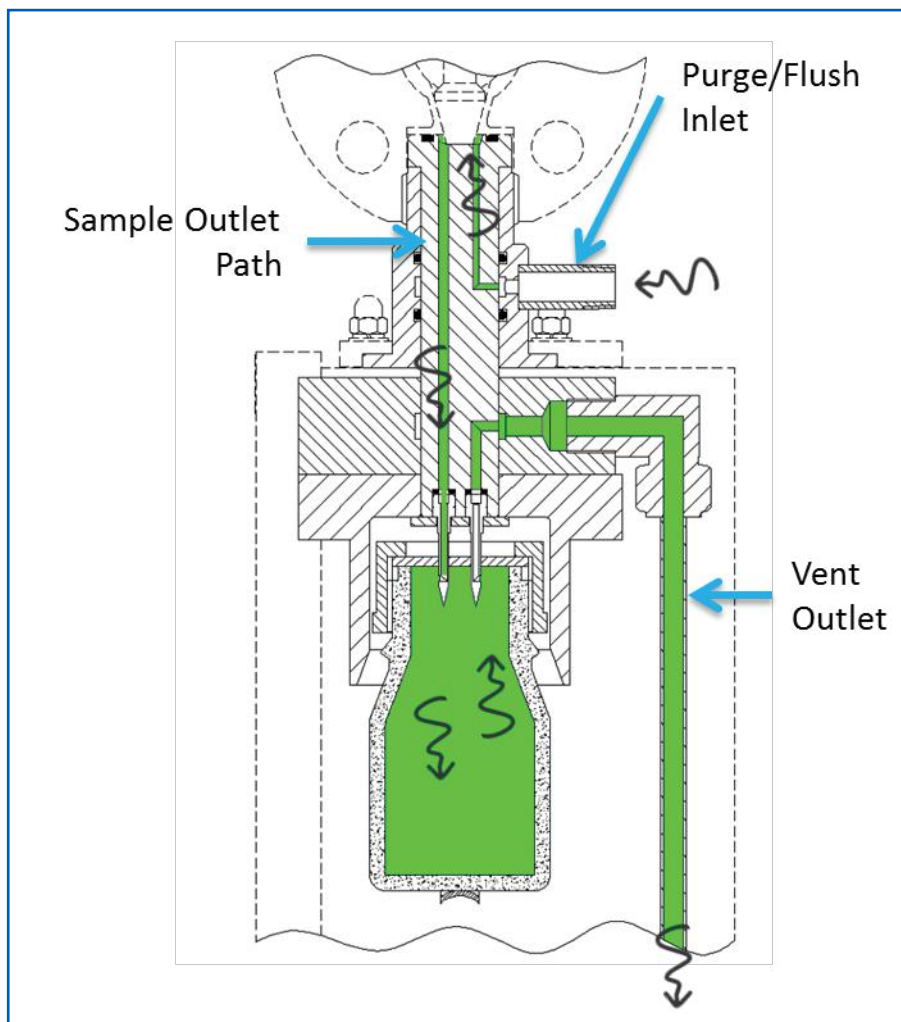


## Purging or Flushing

Whilst In-Line sampling valves are ideal from the perspective of not having deadlegs between the sealing element and the contained fluid, inevitably there is a small dead leg between the sealing element and the sample bottle. The impact of these dead legs is minimised by keeping the outlet bore small and length short and by using PTFE for the wetted components. In the majority of cases these design features mean that there is no significant sample to sample cross contamination. However in some circumstances it is necessary to clean the sample outlet area between samples. To achieve this one can either purge this with a gas and/or flush with a liquor.

With both surface mount sampling valves and vessel sampling single samplers, their design means that the distance between the sample sealing element and the sample outlet is larger than on an In-Line sample valve. Hence on these types of samplers, purging or flushing is a more usual requirement.

Purging and flushing are the ability to blow nitrogen (typically) or wash liquor respectively through the outlet region of the sampler. With an In-Line sampling valve, this is typically achieved by additional drillings in the dip tube to the tip of the valve to allow the nitrogen and/or wash liquor to be pumped to the valve outlet and thence to the sample bottle. It should be noted that this also allows sample bottles to be prefilled with nitrogen or other inert gas if it is important that the sample doesn't come in contact with air. On surface mount sampling valves an additional drilling is added into the valve body to give access for the nitrogen/wash liquor to the valve sealing element and the outlet flow path. On vessel samplers an additional flanged connection is provided for the nitrogen/wash liquor.



A safety cabinet provides both primary and secondary containment around the sampling point, thereby reducing levels of operator personal protective equipment and it enables local extraction of any vapours and minimises the chance of spillage.

Robust cabinet design in 3mm 316 stainless steel to protect the sampling point in the most aggressive environments - keeping it clean and away from sources of day to day mechanical damage.

A large clear viewing area through laminated glass allows dispensing away from operator contact.

The door is designed for single handed gloved operation with a large easy functioning handle.

The banded area has a drain connection to run any spillage to the site waste system.

A large banded area is provided within the cabinet (300ml) for secondary containment in case of spillage.

The door is designed for airflow into and through the cabinet, past the sampling point and off the plant extraction system.





## Cabinet Options

The standard stainless steel cabinet can be manufactured to house large or small collecting vessels, or provide room for two containers to be kept within the cabinet. Cabinets can also be manufactured in polypropylene or ETFE coated in order to protect from aggressive external environments or the spillage of corrosive materials within the cabinet.



Non-standard sizes and shapes



ETFE Coated Cabinet



Polypropylene Cabinet with GRP Reinforcement

## Internal Geometry Option

- Tun dish base
- Larger bunded area
- Removeable spill tray
- Spray bars for cabinet flush
- Larger extraction or drain connection
- Extraction for bottle venting



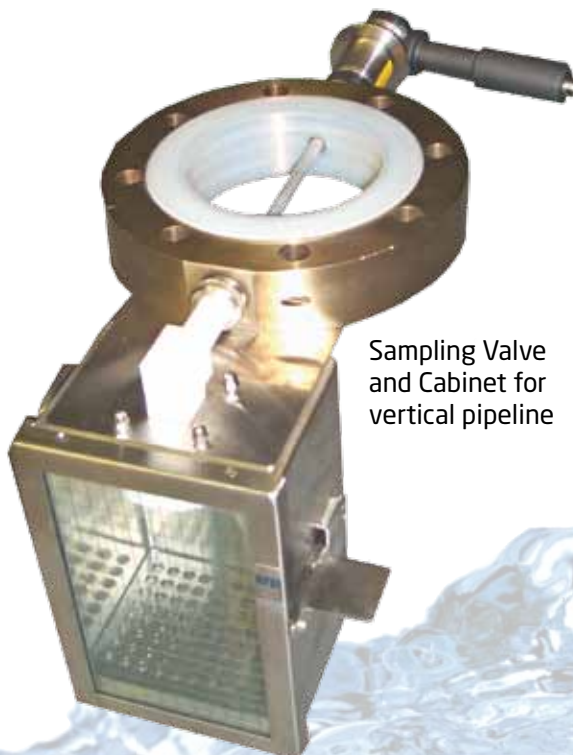
Tun Dish

## External Geometry Options

- Glove Ports
- Alternative window materials
- Rear, top or side windows
- Other handed door
- Lockable door
- Key operated door interlock
- Mounting for vertical pipeline



Cabinet with glove ports and padlockable latch



Sampling Valve and Cabinet for vertical pipeline



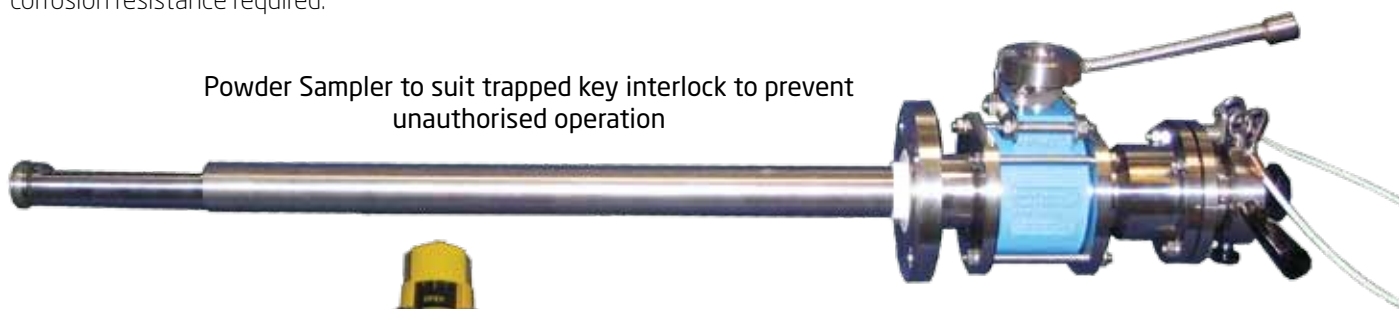
Trapped key interlock

Due to the variable nature of powders, a wide variety of bespoke powder samplers can be offered to deal with wet sticky powders, light free flowing powders, powders in filter driers, and powders falling through ducting.

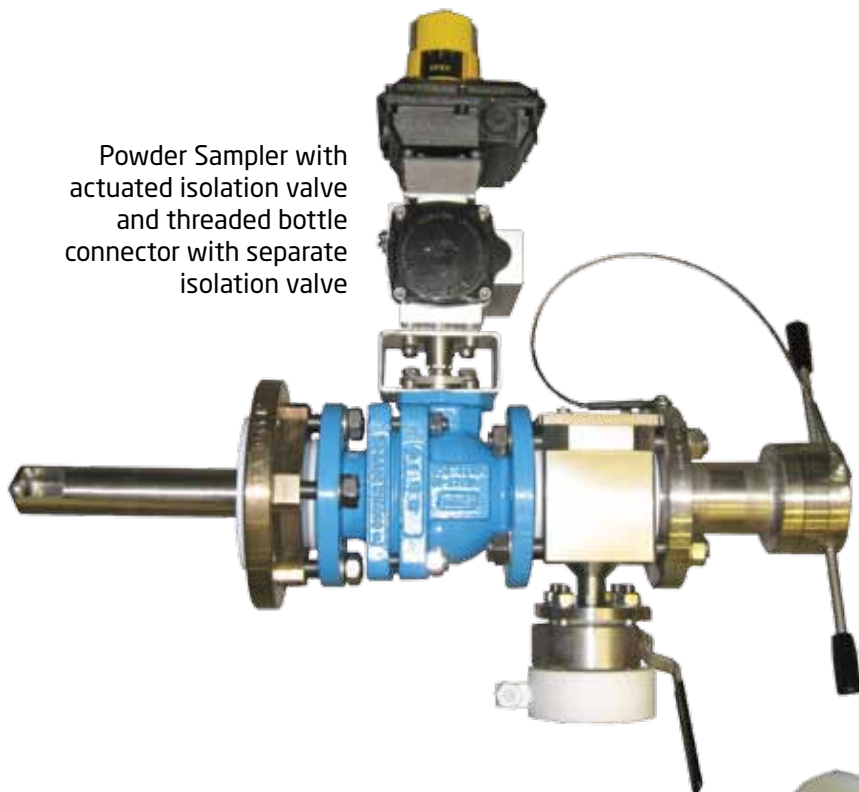
Different levels of containment can be offered to provide appropriate levels of operator protection, depending upon the powder being handled. Similarly many variants of interlocking can be offered to suit customer requirements.

Typical materials of construction are stainless steel, PTFE/PFA, Hastelloy® or other exotic metallics, depending upon the level of corrosion resistance required.

Powder Sampler to suit trapped key interlock to prevent unauthorised operation



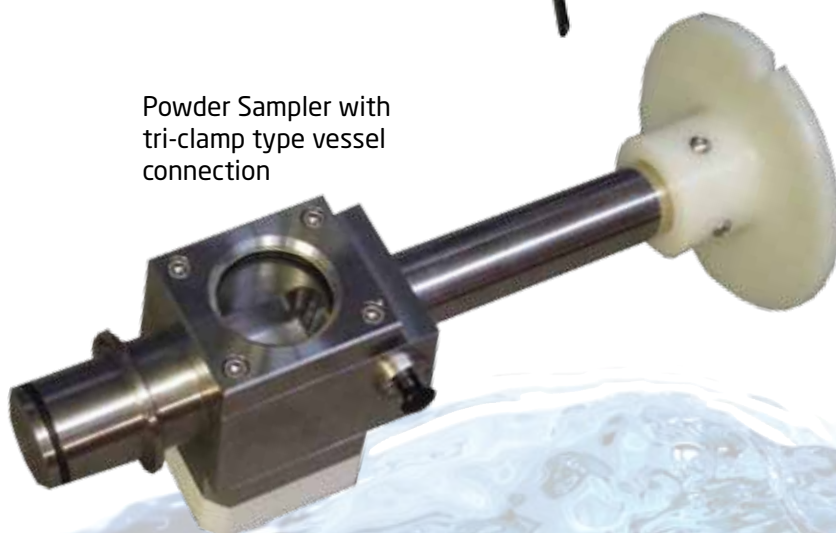
Powder Sampler with actuated isolation valve and threaded bottle connector with separate isolation valve



Powder Sampler for sampling from falling stream of powder, with knuckle jointed thief to minimise retracted thief length



Powder Sampler with tri-clamp type vessel connection





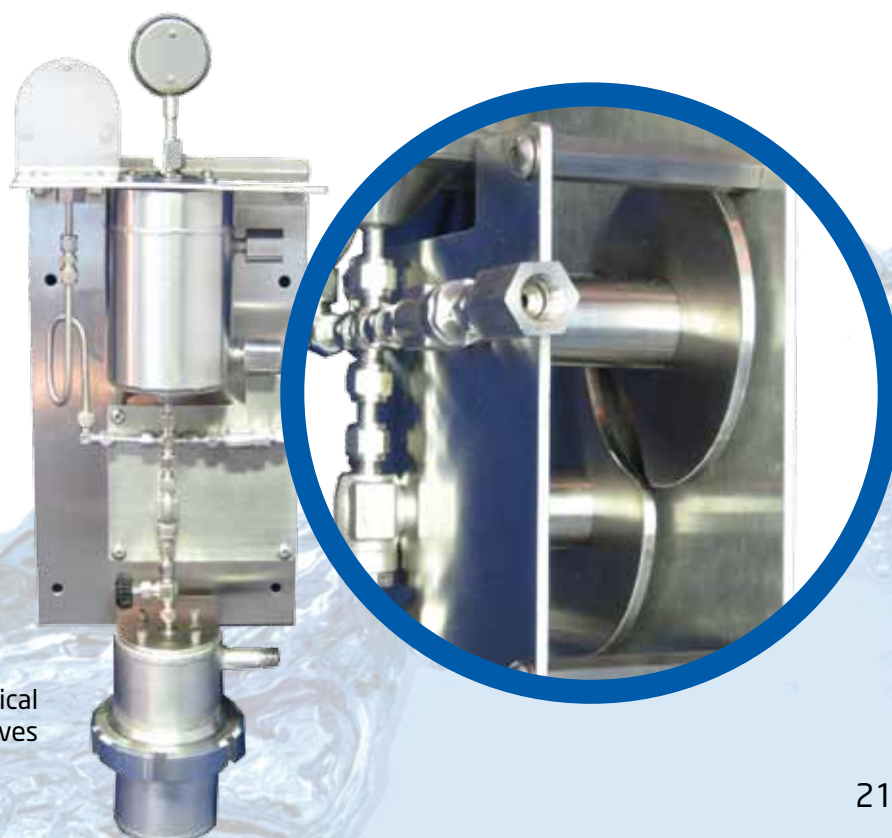
# High Pressure and Temperature Sampling

CRP manufactures bespoke high pressure and temperature sampling systems to address very specific sampling requirements from customers in pharmaceutical research, fine chemical production, petrochemical, oil drilling fluids etc. Each application has specifics including process conditions, the process fluid or gas, compatible construction materials and the standards and legal framework to comply with. Some examples are detailed below and overleaf.

## Technical Specification

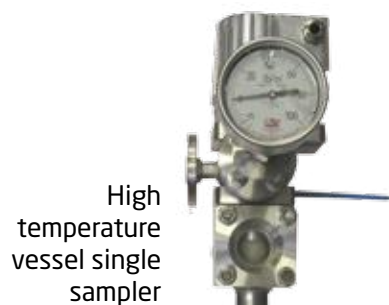
<b>Performance</b>	Temperature to 275°C, Pressure to 100 bar g
<b>Connection</b>	To suit customer requirements, but typically small sizes including Swagelok®, threaded, welded and flanged
<b>Wetted Materials</b>	Stainless Steel, Hastelloy®, Monel and other exotic metallics
<b>Other Materials</b>	Generally Stainless Steel Grade 316 to ASTM A276
<b>Safety Features</b>	
Interlock	Mechanical, trapped key and valve actuation interlock to prevent accidental pressure release
Heat Exchanger	To cool process media to safe levels
Jacket	Heating jacket to maintain process media temperature to prevent sample solidification
Gauges	Pressure and temperature gauges to give live sample condition
Insulation	Double skinning and thermal insulation to protect operators
Cabinet	Safety cabinet in case of sample container failure and protection from the external environment
<b>Sample Collection</b>	To suit customer requirements, but including sample bombs and sample bottles
<b>Typical Duties</b>	Sampling of process media with entrained gases, supercritical fluids and media with components prone to solidification
<b>Sample Location</b>	Process lines, vessels and bypass/mixing loops

This sampler was designed to take samples from a process line in a fine chemicals plant, running at 25 bar g and 250°C. The sample required cooling with a volumetric heat exchanger prior to dispensing. Pressure was reduced during dispensing using a flow control valve and the sample was collected in a bottle housed inside a mechanically strong vented metal housing in case of bottle failure. The sampler incorporated a system of mechanical interlocks between the inlet and outlet valves such that only one valve could be opened at a time.



**Sampler with mechanical interlocks between valves**

# High Pressure and Temperature Sampling

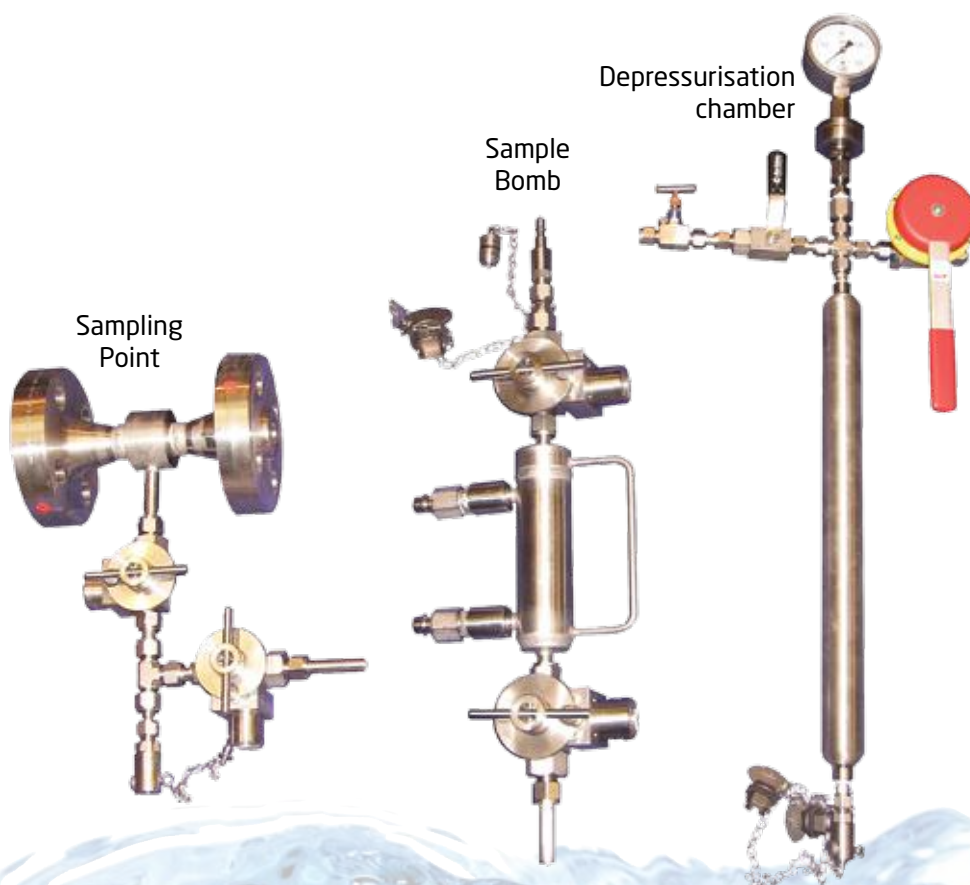


The customer required a vessel sampler to collect samples from a vessel of a chemical used as a downhole drilling liquid in oil exploration. Whilst the pressure requirement was modest, the temperature (275°C) necessitated the use of high temperature valves with graphite based seals and a floating ball check valve with a PEEK float. The sample itself was to be dispensed into a metal tin, requiring the use of specially shortened safety cabinet with a nozzle outlet so that the liquor level in the tin could be seen. Additionally the customer required that the sampler could be flushed clean through the safety cabinet and to drain, requiring the use of a tun dish base on the cabinet and a large hole in the centre of the cabinet base plate to allow the flush media through with minimum splashing inside the cabinet.



This system was for sampling a gas at 18.3 bar g and 42°C. The inlet on the left of the panel connected to a tee and routed back to the main feed line. When a suitable flow was established the tee was used to redirect the flow to a sample collection bag. This bag had its own isolation valves as well as their being valves on the supply to and from the bag. The pressure was stepped down before the sample was allowed into the bag.

The requirement was to design a sampling system to take samples of supercritical carbon dioxide, talc and several other minor components. The process conditions were 100 bar g pressure and 200°C temperature. The sample had to be cooled and depressurised using an expansion chamber, the carbon dioxide vented safely and the remaining material dispensed for analysis. To ensure safe operation, a system of trapped key interlocks was utilised. In addition, high pressure quick release couplings were used to allow the sample bomb to be transferred from the process line to the laboratory for discharge and analysis.



CRP has a wealth of experience in designing and building special sampling systems in collaboration with the customer. Below are a few examples of projects undertaken.



Free standing vessel sampling system for sampling unstable process liquor with self-draining, zero crevice design, and eductor to generate vacuum.



Lab scale unlined vessel sampling system with Swagelok type valves.



Portable tanker sampler to allow for easy collection of sample from tanker prior to accepting tanker contents onto site.



Actuated In-Line sample valve with DIN11851 end connections & triclamp sample outlet with purge connection.



Panel mounted In-Line sample valve with In-Line heat exchanger to cool process media prior to it arriving at the sample valve, and temperature gauge.



Seeding device to allow seeding material to be added to a vessel.





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