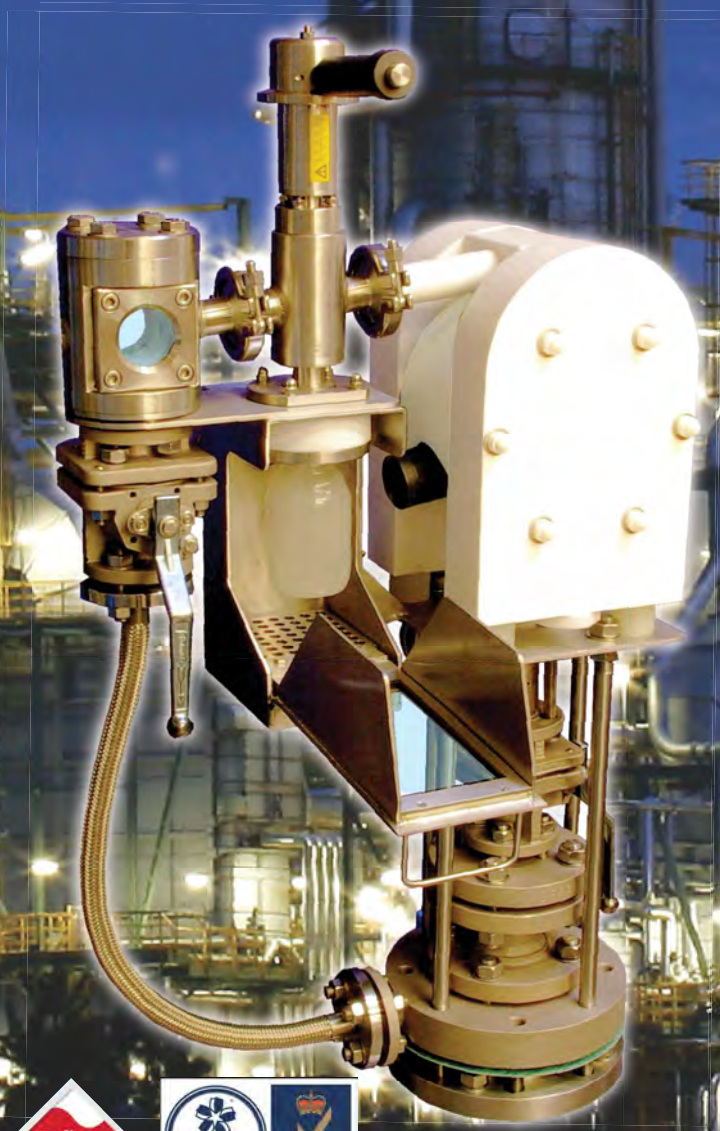




the corrosion expert

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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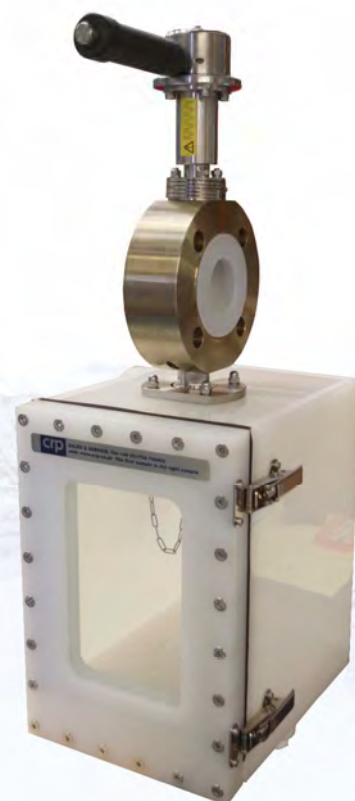
Across the complete spectrum of the process industry from pharmaceutical to petro-chemical the taking of samples has become more important. The reasons for taking samples are many and varied and include: confirming that a chemical reaction has been completed, checking that a product has the correct physical 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 to provide representative samples from all types of processes and industries.



CRP manufacture a standard range of equipment with a modular design which will allow samples to be taken in the majority of circumstances, typically these would be from process pipelines, using our inline sampling valves, or from a reactor vessel with our vessel mounted samplers which can utilise vacuum or the pressure within the vessel to take a sample or can be supplied with integral diaphragm pump to circulate the vessel contents through the sampling system before dispensing the sample.

The surface mounted sampler is used to obtain a sample from the side or base of a vessel or from a large diameter pipeline.



However CRP are always presented with new challenges and when the demands of the application are special, CRP have a wealth of experience and a skilled engineering team on hand to develop a customised solution with an extensive back catalogue of bespoke sampling equipment.

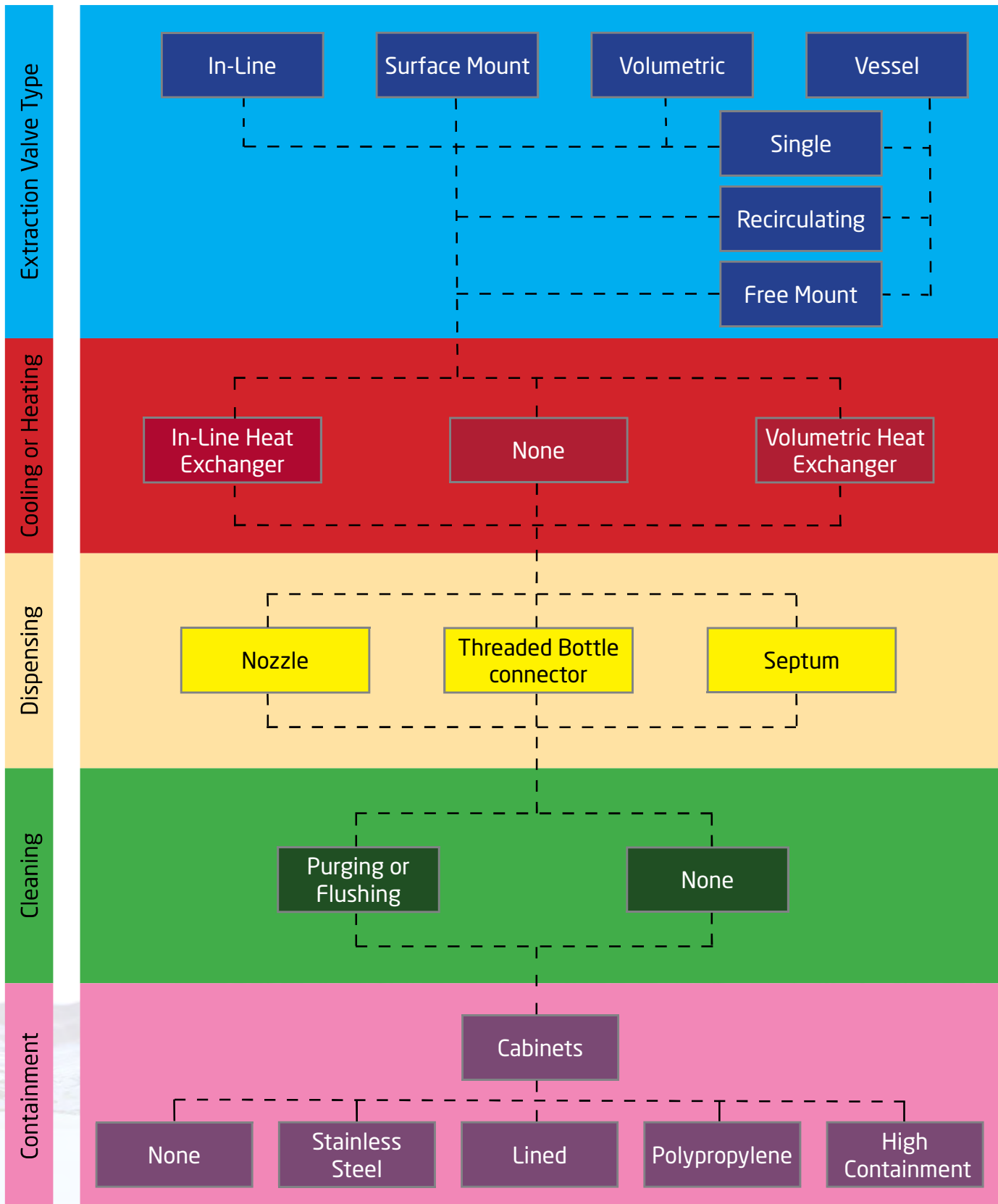
CRP manufacture all of their own products and in particular has in-house PFA moulding expertise to enable bespoke designs to be quickly turned into products offering the highest levels of corrosion resistance.

We hope this guide is useful to you in aiding you to select the best representative sampling solution for your process.

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, FFKM 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	FFKM 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, FFKM 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 25 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

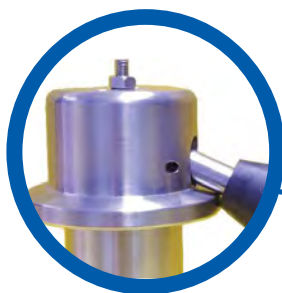
Flanged Unlined Sampling Valve



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.

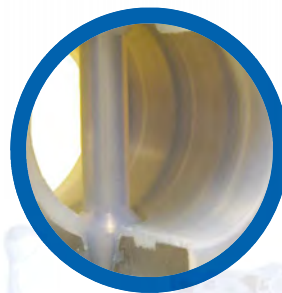
PFA Lined Sampler [SDIL 400]



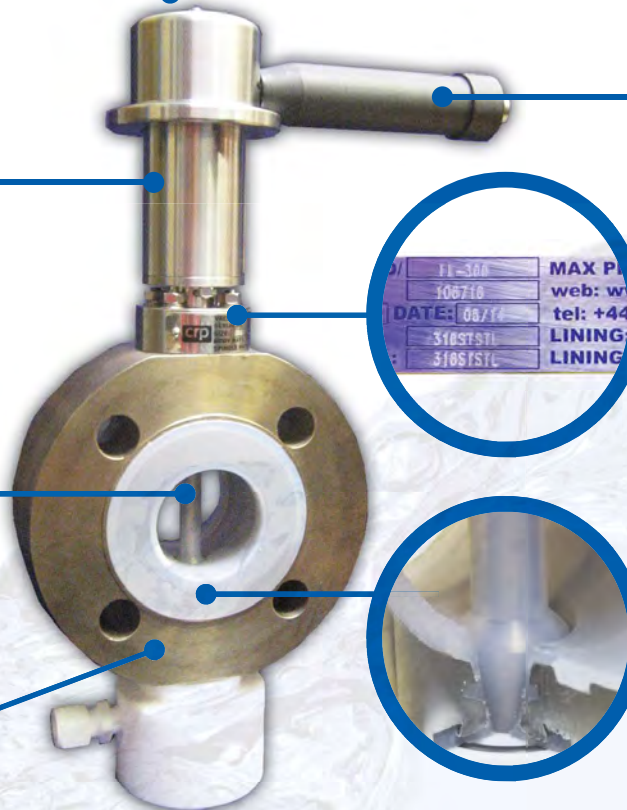
Simple stroke adjustment enables sampling of different media viscosities and different line pressures. Once adjusted it can be "set" for the process.

A robust construction designed for the rigours of plant life and operation, with parts exposed to the atmosphere manufactured from stainless steel.

The lining is keyed to the body providing stability at high temperature and vacuum levels. The body is enlarged around the valve stem eliminating a reduction in the cross-sectional area of the valve around the stem.



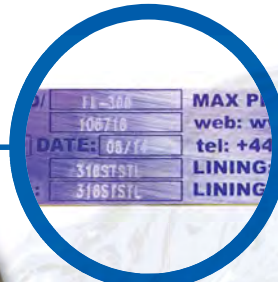
The wafer pattern body reduces weight and space but has a full flange diameter to protect the securing bolts.



A versatile bottom outlet arrangement enables different dispensing options to be selected and a variety of purging and cleaning choices.

The handle is manufactured from PTFE providing corrosion resistance, being self-lubricating and insulating the operators hand from line temperatures. It is positioned well away from the valve body allowing the process line to be insulated if required.

A clear product data plate identifies type, size, date, serial number and operating parameters to assist in identifying any product spares requirements and the management of plant assets.



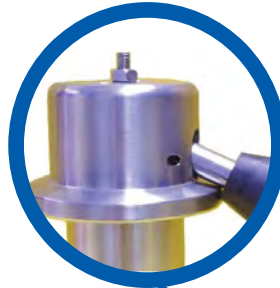
There is no in-process internal dead leg, with the valve closure being on the pipe line surface.

The carrot and cone seated valve itself has a single closure element with no potential to trap material in or around the valve.

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.

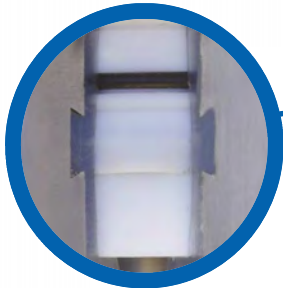


The handle also requires two specific actions to operate, preventing accidental opening.

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.



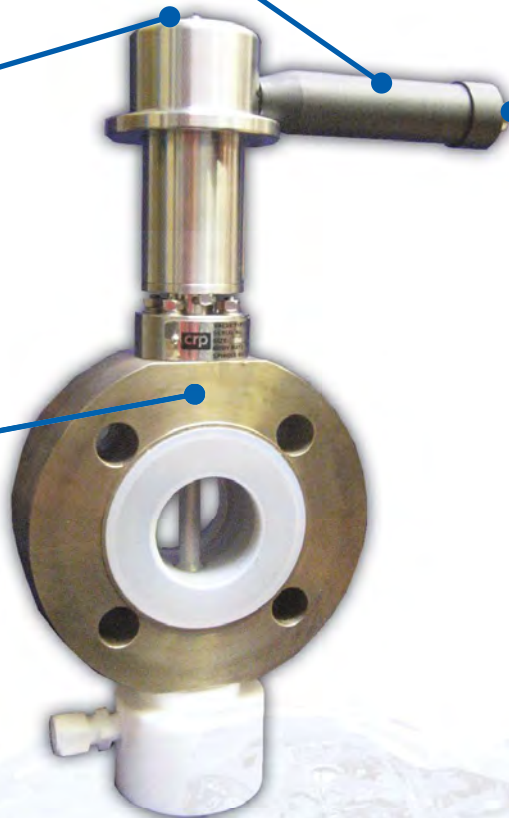
Once stem adjustment is set, it can be locked off for safe day to day operation.



The valve is equipped with a PTFE and FFKM stem seal pack that has been tested over 20,000 cycles without leakage and has never failed in 25 years of product supply. You can be assured of no leakage to atmosphere.



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



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	1in. DN25 and larger
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, FFKM 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

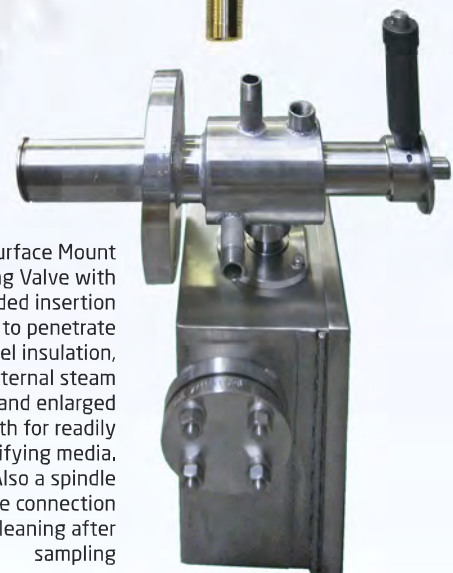
The valve functions as the In-Line sampling valve with a twin action handle. The handle is pulled out against a spring force enabling it to be pushed down over a lip on the top cap. This outward motion opens the valve, again working against a spring force. As soon as the handle is released from whatever 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

- The central piston pushes into the liquid stream, so there is no dead leg on the valve entry.
- Integral purge to flush the sampler clean 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 25 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	1in, 2in, 3in. 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



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

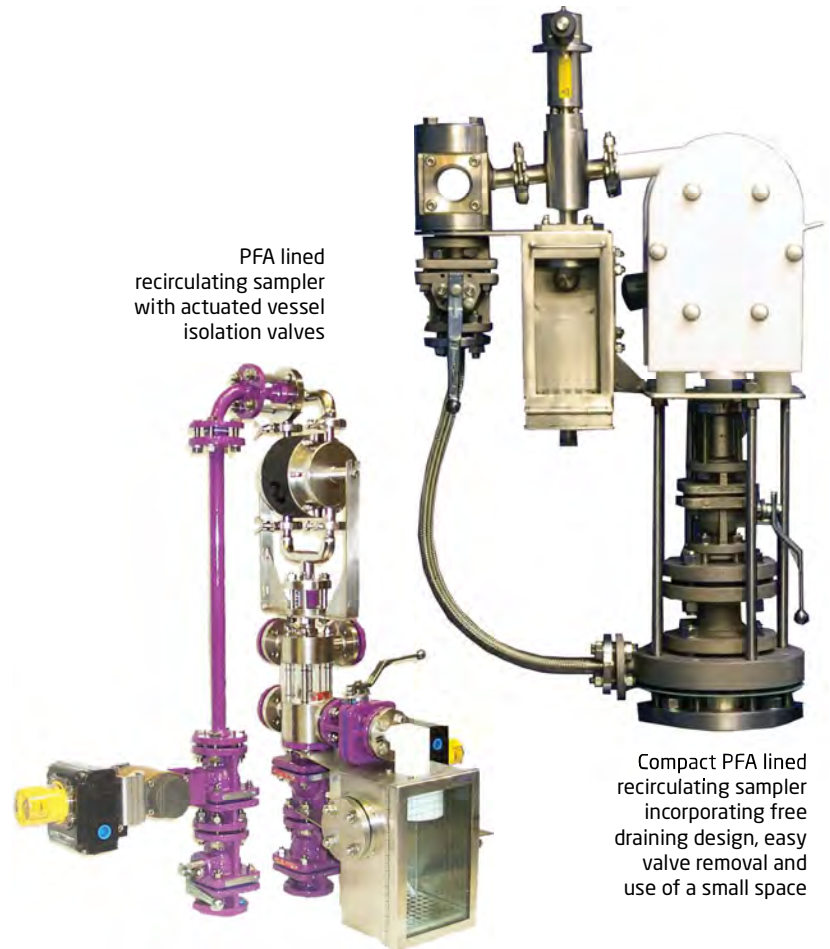
Connection	Flanged to suit vessel dip pipe
Size	To suit vessel dip pipe
Performance	-29°C to 180°C, Full Vacuum to 10 bar g (dependent upon valve selection)
Wetted Materials	PFA, PTFE, FFKM Perfluoroelastomer, Borosilicate Glass
Body Material	Generally Stainless Steel Grade 316 to ASTM A276
Sample Bottle Vent	To atmosphere
Overfill Security	Floating Ball Check Valve
Options	
Sampling Sight Glass	Volume adjusted for sample size
Service Valve	As standard PFA Lined 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, FFKM 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 PFA Lined ball valve, but 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
Instruments	Temperature and/or pressure gauge, pH probes
Sample Bottle Vent	Return to sampling sight glass or customer scrubber
Overfill Security	A secondary catchpot to collect any oversampling
Purging	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

Design	Can be made to connect to any equipment
Size	To suit customer process
Performance	-5°C to 100°C, Full Vacuum to atmospheric/slight positive pressure
Wetted Materials	PTFE, FFKM Perfluoroelastomer
Construction	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
Options	
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



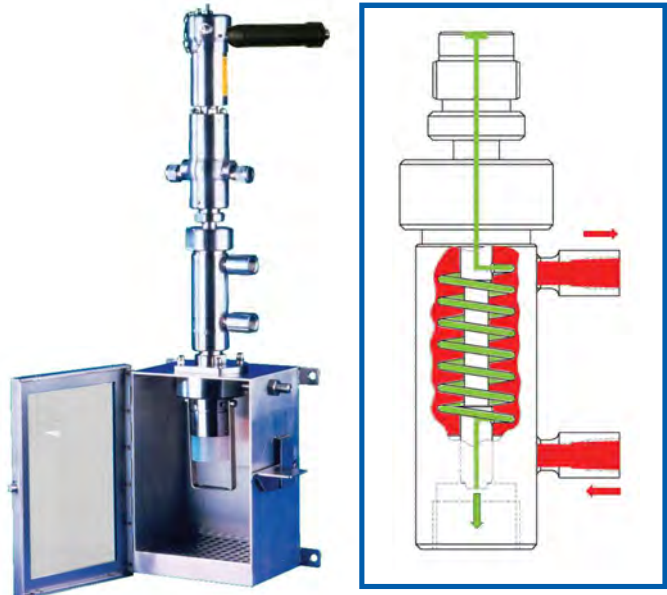
Free Mount septum sample valve with process connections running in stainless steel conduit

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.

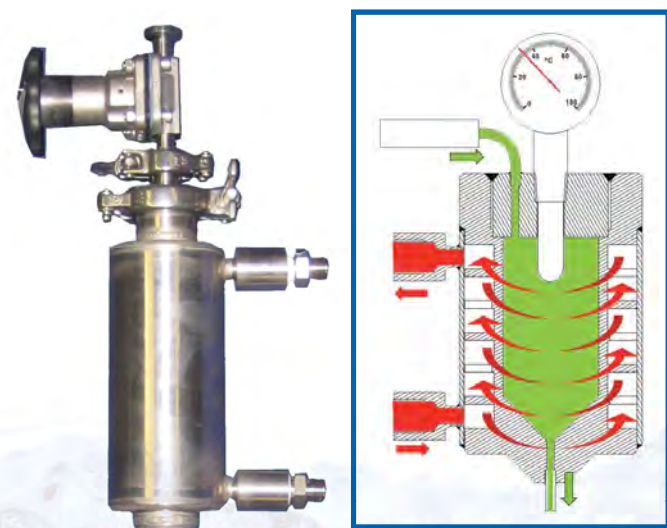
In-Line Heat Exchanger with In-Line Sampling Valve and Swagelok type process connections



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.

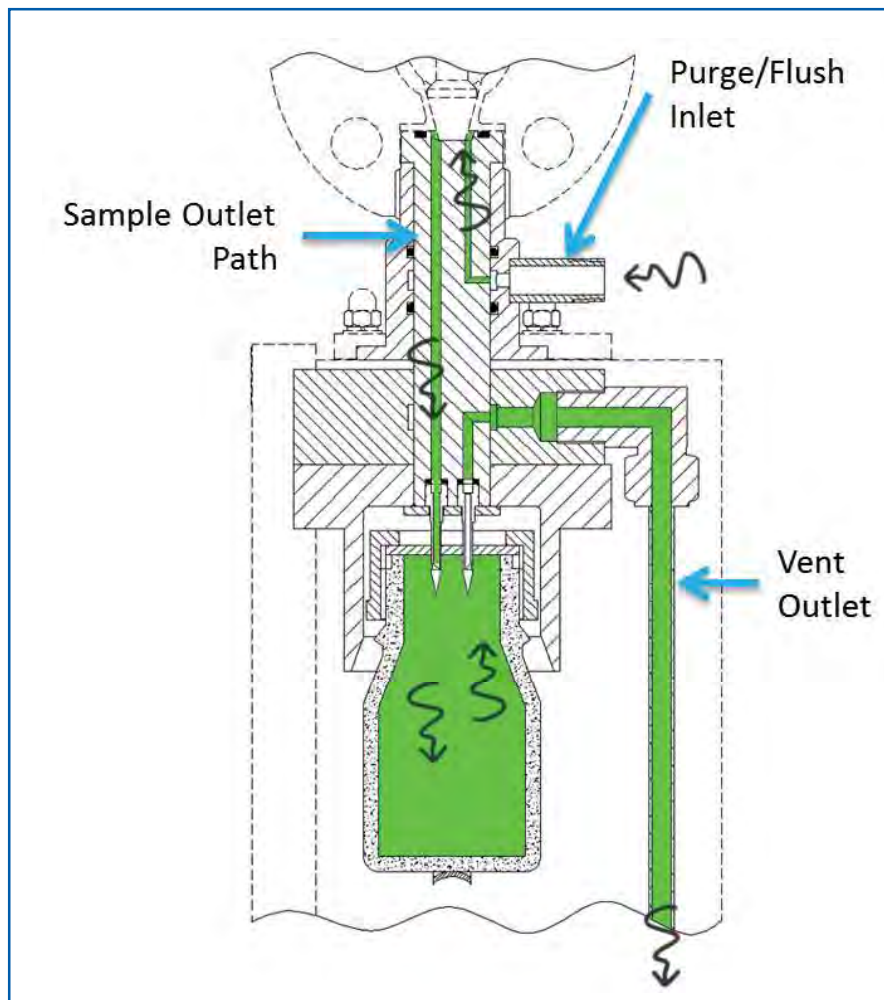


Needles as standard are manufactured in Hastelloy® C276 but also in a range of exotic alloys, with different bore diameters to suit the sample. Where space constrains the needle sizes, a single needle with a gutter is available.



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 pre-filled 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.

Sample Containment

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

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

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



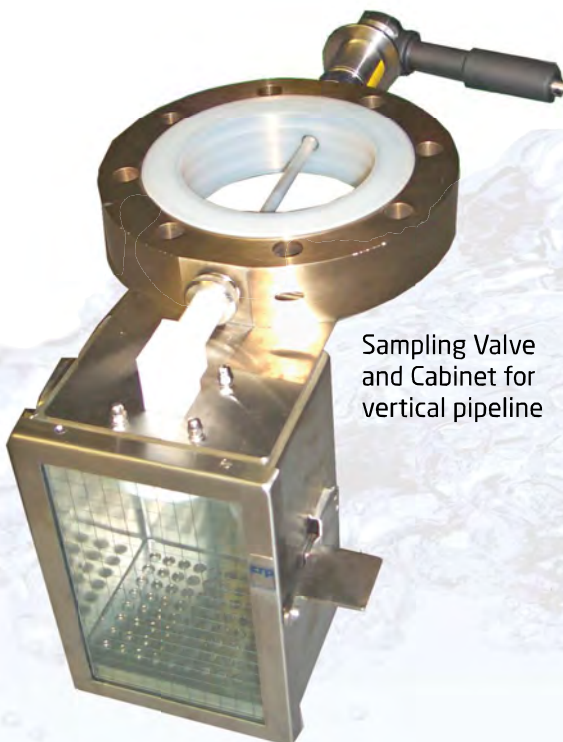
Tun Dish

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

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

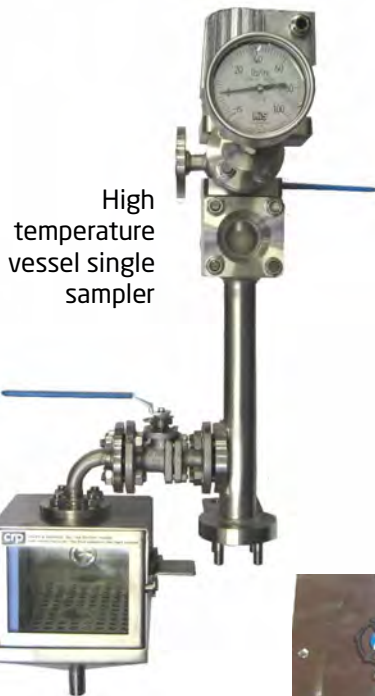
Performance	Temperature to 275°C, Pressure to 100 bar g
Connection	To suit customer requirements, but typically small sizes including Swagelok®, threaded, welded and flanged
Wetted Materials	Stainless Steel, Hastelloy®, Monel and other exotic metallics
Other Materials	Generally Stainless Steel Grade 316 to ASTM A276
Safety Features	
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
Sample Collection	To suit customer requirements, but including sample bombs and sample bottles
Typical Duties components	Sampling of process media with entrained gases, supercritical fluids and media with prone to solidification
Sample Location	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



High temperature vessel single sampler

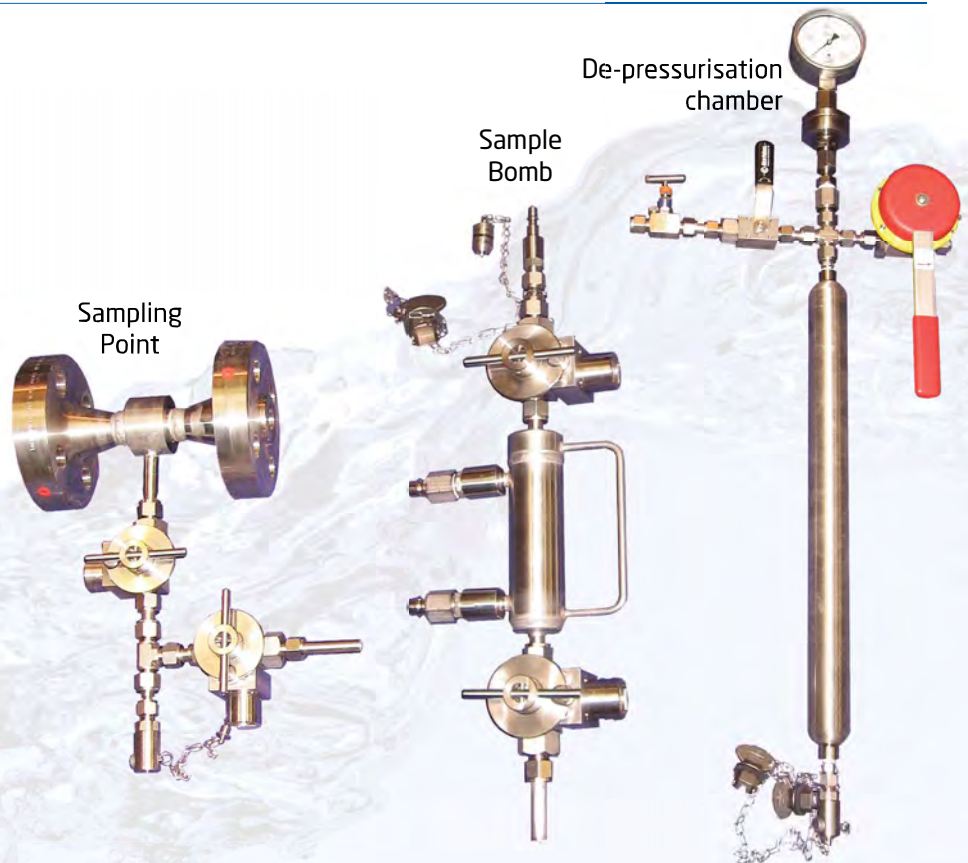
The customer required a vessel sampler to collect samples from a vessel of a chemical used as a downhole drilling liquid in oil exploration. Whilst the pressure requirement was modest, the temperature (275°C) necessitated the use of high temperature valves with graphite based seals and a floating ball 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.



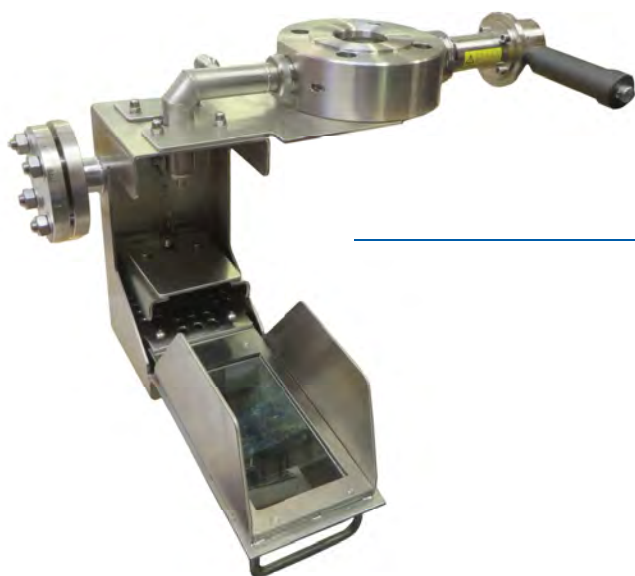
High pressure gas sampling

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.

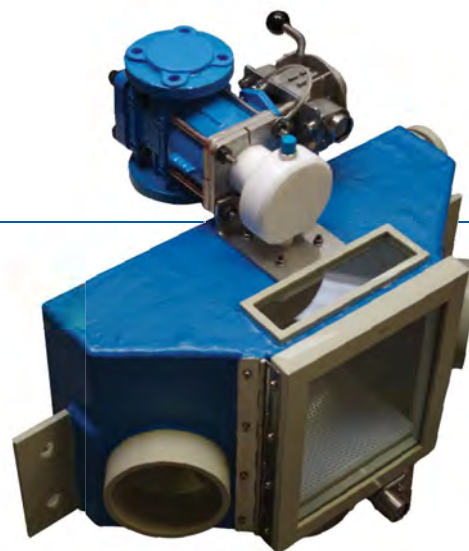
The requirement was to design a sampling system to take samples of supercritical carbon dioxide, talc and several other minor components. The process conditions were 100 bar g pressure and 200°C temperature. The sample had to be cooled and de-pressurised using an expansion chamber, the carbon dioxide 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. Here we show a few examples of projects undertaken.



Jacketed Sampler with purge for slurry.



Volumetric sampler with keyed interlock combined with locking door.



Pyrophoric liquid sampler.



Trolley mounted mobile sampler with recirculating pump.



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.



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