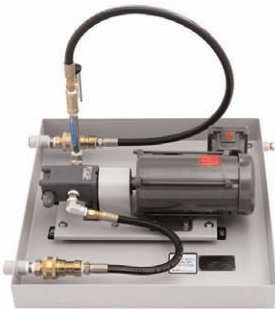


Sampler Products

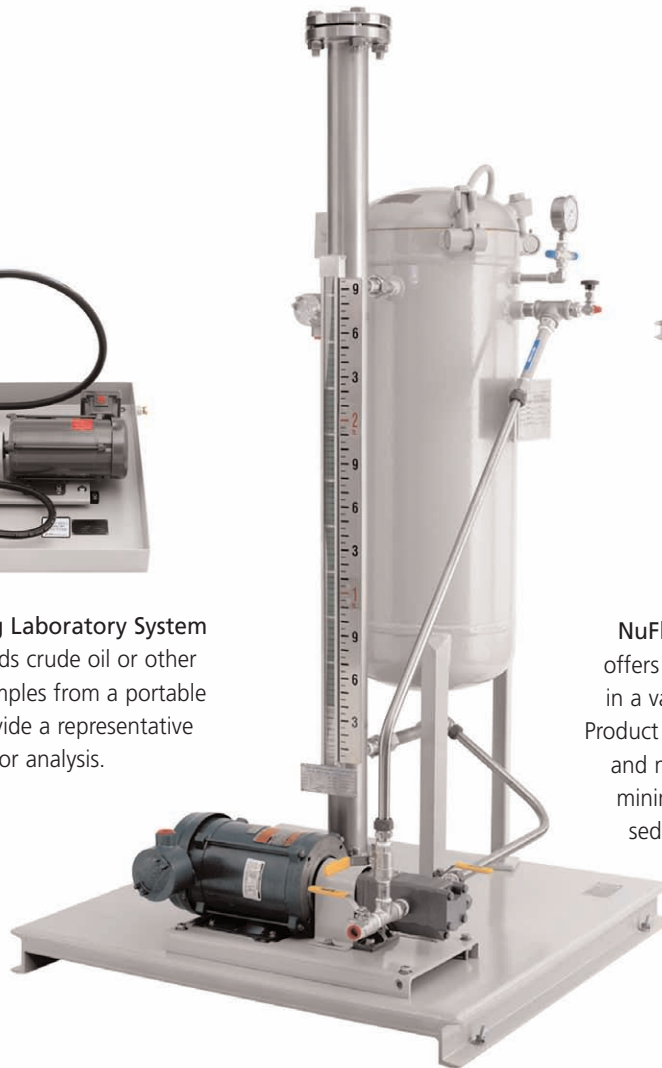
CLIF MOCK™

True Cut™ Mixing & Circulation Systems

*Laboratory Mixing System, Stationary Circulation Systems
and Portable Receptacles*



The M20-3 Mixing Laboratory System thoroughly reblends crude oil or other low-vapor fluid samples from a portable receptacle to provide a representative sample for analysis.



NuFlo Measurement Systems offers portable sample receptacles in a variety of sizes and materials. Product can be collected, transported, and mixed in a single receptacle, minimizing light ends and basic sediment and water content.

CMC Circulation Systems allow operators to collect, store, and mix crude oil and other low-pressure sampled product in a single receptacle, minimizing the loss of light ends.

True Cut™ M20-3 Laboratory Mixing System

Crude oil samples separate during transport from the field to the laboratory and must be reblended to provide a representative sample for analysis. The M20-3 Mixing System is designed to thoroughly mix crude oil or other low-vapor fluid samples from a portable receptacle.

The M20-3 Mixing System consists of an explosion-proof motor, gear pump, and inline static mixer, mounted inside a 24-in. x 24-in. carbon steel drain table. The drain table has a baked-on epoxy finish for exceptional durability and corrosion resistance. Flexible suction and discharge hoses with quick-disconnect couplings allow for quick and easy connections to portable receptacles.

The M20-3 Mixing System is ideal for use with True Cut portable receptacles, and is easily adapted for use with other industrial portable receptacles.

Specifications

Explosion-Proof Motor

- 0.5 hp (other hp available)
- 115/230 VAC (other voltages available)
- 7.4 amps at full load of 115V;
3.9 to 3.7 amps at full load of 230V
- single phase, 60 Hz
- 1725 rpm
- 56 frame size
- rated for 40°C (104°F) at ambient conditions

Static Mixer

- 1/2-in., stainless steel

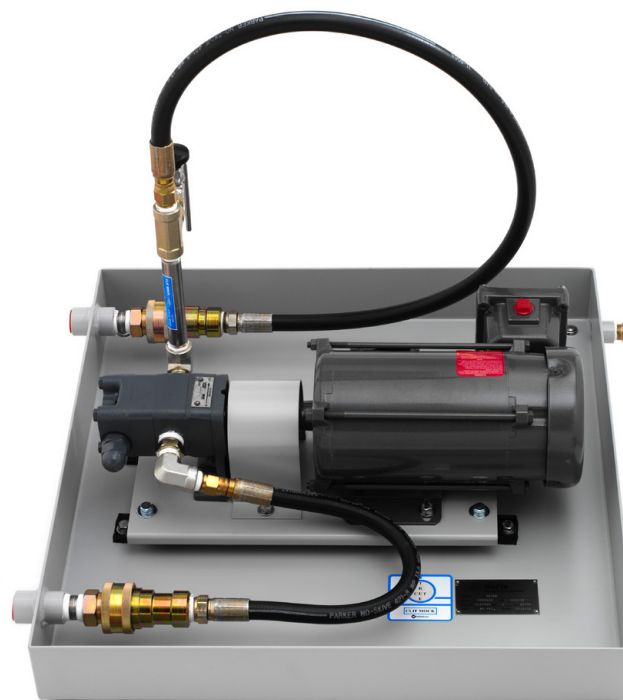
Gear Pump

- 3/4-in. port, standard
- 5 gal/min capacity at 0 psig backpressure
- 100 SUS fluid viscosity
- 1750 gal/min maximum speed
- 350 psi maximum output
(internal pressure relief valve set at 100 psi)
- UL-approved

Sample Draw-Off Valve with Spigot

On/Off Switch for Motor Control

- per customer specification



*M20-3 Mixing System and portable receptacle
custom-packaged in an enclosure*

True Cut™ CMC Circulation Systems

True Cut CMC Circulation Systems allow operators to collect, store, and mix crude oil and other low-pressure sampled product in a single receptacle, minimizing the loss of light ends. Designed for use with a True Cut “C” Series Sampler, the circulation systems consist of a stationary sample receptacle, an integrated, skid-mounted gear pump and a motorized circulating and mixing system.

The circulation systems are well suited for supporting LACT units, pipeline sampling, truckloading/discharge, refinery sampling, shiploading/discharge, and production platform sampling.

The CMC systems’ large-capacity receptacles are ideal for long sampling periods.

Two models—the CMC-500 and the CMC-250—offer the operator a selection of receptacle designs.

The CMC-500 Circulation System offers unmatched durability and performance, featuring a carbon steel receptacle available in 5-, 10-, 20-, 30-, and 40-gallon capacities. It is rated for pressures up to 60 psig.

The CMC-250 Circulation System combines functionality and economy in a 304 stainless steel receptacle available in 5-, 10-, 20-gallon capacities. It is rated for pressures up to 140 psig.

Specifications

The following table lists standard and optional features for the CMC-500 and CMC-250 circulation systems. An “X” indicates a standard feature.

Feature	CMC-500	CMC-250
High level shutoff	X	X
Sightglass for monitoring fluid levels	X	Option
Full-opening cam-lock lid for easy cleaning	X	
Reverse bevel closure for a tight seal	X	
Inline static mixer	X	X
Level gauge	X	X
Pressure gauge	X	X
Relief valve	X	X
Sample draw-off valve with spigot	X	X
ASME code	Option	X
316 stainless receptacle	Option	
Severe duty	Option	Option
Multiple tank units	Option	Option
Armored sight glass	Option	Option
Heat tracing	Option	Option
Special coatings	Option	Option
Special paint	Option	Option

Every detail for achieving overall sampling accuracy has been addressed in the design of these systems, in accordance with API Chapter 8, Section 2, ISO 3171, ASTM and IP6.2 standards.

A 3/4-in. stainless steel inline static mixer in the circulating piping assures uniform water droplet size in the mixing process. An internal spray bar washes the wall of the tank and circulates sediment from the bottom, and the smooth surface of the receptacle’s interior and all piping helps eliminate water and sediment traps. Standard tubing is 3/4-in. pipe with carbon steel fittings; 316 stainless tubing is optional.

Custom enclosures designed to meet all certification requirements (including heat tracing) are also available.



CMC-500 Circulation System with carbon steel receptacle; (CMC-250 with stainless steel receptacle also available)

Explosion-Proof Motor

- 0.5 hp (other hp available)
- 115/230 VAC (other voltages available)
- single phase, 60 Hz
- 7.4 amps at full load of 115V; 3.9 to 3.7 amps at full load of 230V
- 1725 rpm
- 56 frame size
- rated for 40°C (104°F) at ambient conditions

Gear Pump

- 3/4-in. port, standard
- 5 gal/min capacity at 0 psig backpressure
- 100 SUS fluid viscosity
- 1750 gal/min maximum speed
- 350 psi maximum output (internal pressure relief valve set at 100 psi)
- UL-approved

True Cut™ Portable Sample Receptacles

True Cut Portable Sample Receptacles are designed to meet or exceed all API, ISO and ASTM industry standards. The receptacles help ensure proper handling of crude oil and other petroleum products. Samples are collected, transported, and mixed in one receptacle, helping to eliminate the loss of light ends and minimize basic sediment and water content.

This receptacle also features a mechanical shut-off that stops flow into the tank when the fluid level approaches full capacity. Other designs offer only an alarm.

The all-stainless-steel receptacles provide years of dependable service.



Specifications

- available in 5-gallon, 2-gallon, and 1-gallon sizes
- 304 A.S.M.E. stainless steel receptacle rated for 140-psi pressure (316 stainless steel is available on request)
- easy-open, leak-proof inspection lid
- 1/2-in. female and male quick-disconnect coupling for connection to the sample inlet
- two 3/4-in. male quick-disconnect couplings for connection to a mixing system
- 316 stainless steel relief valve (5-psi standard; other pressure ratings available upon request)
- 316 stainless steel vacuum valve (1-psi standard)
- mechanical high-level shutoff
- level gauge
- internal stainless steel mixing tube
- containers available in various materials

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CLIF MOCK™

True Cut™ "C" Series Samplers

For more than three decades, the electrically powered C Series inline sampler has been one of the most accurate and reliable methods of extracting a product sample from a pipeline for basic sediment and water (BS&W) analysis.

C-Series Probe

The C-Series isokinetic inline sampling probe (shown assembled with a controller) requires neither air nor hydraulics to capture samples. Rather, the probe is actuated by an electrical pulse from a controller, and uses existing pipeline pressure to fill the sample chamber with product. When the probe is actuated, a sample chamber opens, allowing process fluid to flow through the chamber. As the window rotates, the sample is captured in its natural state and fed by pipeline pressure to a receptacle. By ensuring that the process fluid is well-mixed and homogenous prior to sampling, and using a sampling process that collects the sample directly from the flow stream without changing the linear velocity or direction of flow, the customer is assured of obtaining a representative sample.



The C Series sample probe is available in two models:

- The C21 probe collects one sample (1.5 cc) per each 360° rotation.
- The C22 probe collects two samples (3 cc) per each 360° rotation.

Each model is available in two operating pressure ranges (see Specifications table below). A "V" is used to identify low-operating-pressure probes. All C Series probes are suitable for sampling in 2-in. to 48-in. pipelines.

Tanker loading/
unloading systems

Truck terminals

Pipeline measurement

Refineries/pipelines

LACT units

Loss control

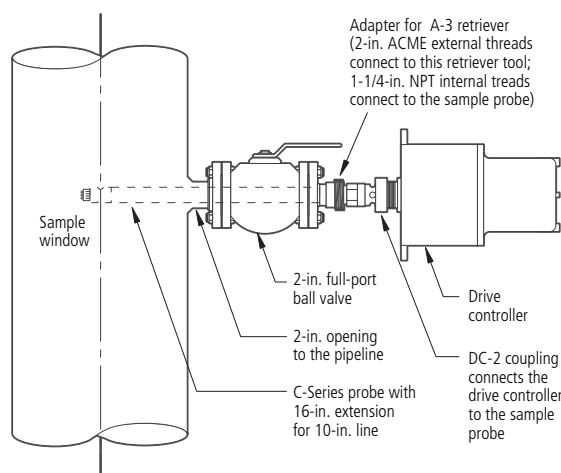
Custody transfer points

Petrochemical plants

Process vessels

Barge facilities

H₂S service



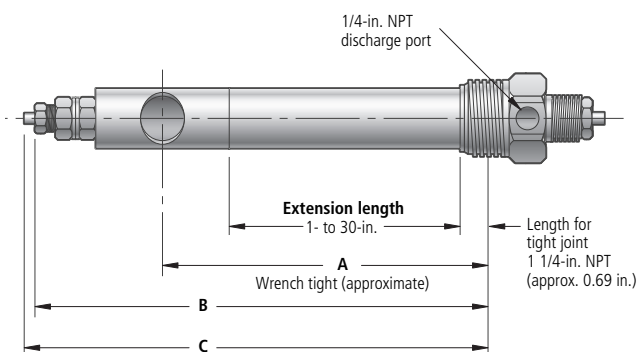
The probe can be easily and safely installed in the pipeline and removed from pressurized pipelines using a customized retriever tool and a pipe connection adaptor. See Installation Accessories for more information.

Specifications

Fluids Suitable for Sampling	Crude oil, refined hydrocarbons and non-corrosive chemicals with some degree of lubricity
Viscosity	12 to 54 API gravity (thicker product may require heating; see Cameron's Measurement Systems division for detailed instruction).
Maximum Operating Pressure	10 to 50 psi (C-21V/C-22V) 50 to 195 psi (C-21/C-22) 195 to 1500 psi (C-21/C-22 with pressure equalizing valve installed)
Actuation Method	Electrical (via controller)
Pipeline Size (in. ID)	2 to 48 in.
Sample Grab Size	1.5 cc
Sample Outlet Connection	1-1/4 in., standard (other sizes available)
Standard Materials	Meter body: 316 Stainless steel Seals: Buna, Viton, Teflon

Sampler Probe Dimensions

Extension Length (in.)	A	B	C
0 (Standard)	2.13	4.88	5.13
1	3.13	5.88	6.13
3	5.13	7.88	8.13
4	6.13	8.88	9.13
5	7.13	9.88	10.13
6	8.13	10.88	11.13
8	10.13	12.88	13.13
10	12.13	14.88	15.13
12	14.12	16.88	17.13
14	16.13	18.88	19.13
16	18.13	20.88	21.13
18	20.13	22.88	23.13
20	22.13	24.88	25.13
22	24.13	26.88	27.13
24	26.13	28.88	29.13
26	28.13	30.88	31.13
28	32.88	33.13	35.44
30	32.13	34.88	35.13



The length of the C Series probe must be carefully calculated to ensure that the window is positioned in the center third of the pipeline. C Series probes are available in lengths ranging from 5.13 in. (standard probe with no extension) to 35.13 in. The "B" measurement in the table above is used to determine the appropriate probe length for a given pipeline diameter.

For very small pipelines (2-in. to 4-in. diameters), an LA-22 adapter may be required for proper probe positioning. See LA-22 Adapter for details.

Receptacles

The C Series Sample Probe is compatible with a wide variety of receptacles, including the True Cut portable receptacles. See the Mixing and Circulation Systems data sheet for details.

Sample Probe Controller

The CD Series Sample Probe Controller controls the sampling frequency of C Series sample probes.

CD Series controllers are equipped with an internal 9-VDC motor that rotates the sample probe 180° between sample “grabs.” This design allows the C Series Sample Probe to take a sample with each 180° rotation. While the controller can be purchased without a sample probe, it is useful only when paired with a C-Series Sample Probe. The controllers are easily attached to the sample probe in the pipeline and require no other mounting hardware.

CD Series controllers are available in four different configurations for controlling the sampling process with pulse counts, timing, or pacing from a computer or PLC. One configuration can be used to trigger an alarm to signal a loss of power, loss of input signal or motor failure.

The control cards in CD-20 A and CD-30 A controllers each have four switches, which can be enabled to “read” flow in terms of pulse counts or time (seconds).

The CD-20 B controller is most often used where PLCs or computers are used to pace the controller. This unit enables one sample per pulse from a pre-scaled source. The CD-20 B also provides an electronic output signal to allow samples to be counted remotely or to verify motor rotation.

The CD-20 SFA has the added feature of a dry contact for a controller failure alarm. An alarm is activated if a sample command is not received within a preset period of time, the motor has not rotated within a preset period of time, and/or power is lost to the unit.



CD Series Controller Configurations

Model	Proportional to Volume Sampling	Proportional to Time Sampling	Scaleable Input	Pulse Output
CD-20 A	X	X	X	
CD-20 B	X	X		X
CD-20 SFA	X			X
CD-30 A	X	X	X	

Specifications

CD-20 A

- Pulse input configurable from 1 to 9,999 pulses
- Signal input is provided as a dry contact closure or a current-sinking device
- Preset timer configurable from 3 to 9,999 seconds
- 115 VAC, 230 VAC, 12 VDC, 24 VDC

CD-20 B

- One sample/contact closure from a computer, PLC, or other pacing device
- Electronic output signal for verifying motor rotation or obtaining a sample count
- Preset timer configurable from 3 to 9,999 seconds
- 115 VAC, 230 VAC, 12 VDC, 24 VDC

CD-20 SFA

- Signal input is provided as a dry contact closure or current-sinking device
- Signal outputs include a controller failure alarm that is activated in the event of loss of power, loss of input signal, or motor failure
- 115 VAC, 230 VAC, 24 VDC, 12 VDC

CD-30 A

- CSA certified for use in hazardous environments in the US and Canada: Class I, Div. 1, Groups C and D
- Pulse input configurable from 1 to 9,999 pulses
- Signal input is provided as a dry contact closure or current-sinking device
- Preset timer configurable from 3 to 9,999 seconds
- 115 VAC

Current Draw For CD Series Controllers

Model	Power	Stop Mode	Running Mode	Peak Motor (Turn On) Current
CD-20 A	115 / 230 VAC	70 mA	170 mA	300 mA
CD-20 B	115 / 230 VAC	60 mA	150 mA	300 mA
CD-20 SFA	115 / 230 VAC	70 mA	170 mA	300 mA
CD-30 A	115 VAC	30 mA	130 mA	300 mA
CD-20 A	12 / 24 VDC	30 mA	0.5 Amp	1 Amp
CD-20 B	12 / 24 VDC	30 mA	0.5 Amp	1 Amp
CD-20 SFA	12 / 24 VDC	30 mA	0.5 Amp	1 Amp

Installation Accessories

When a pipeline is properly fitted with a 2-in. ball valve and a U-22 union adapter, the C Series Sample Probe can be safely installed in a pipeline or removed from a pipeline, even under pressure, with an A-3 sample probe retriever. A pressure equalizing valve (PEV) and/or LA-22 line adapter may also be required in a C-Series probe installation.

A-3 Sample Probe Retriever

The A-3 Sample Probe Retriever allows an operator to install or retrieve a C Series Sample Probe from a pressurized pipeline or vessel (up to 1000 psig) without interrupting service and with minimal loss of product. Sample probes can therefore be removed from lines for repair, inspection, or preparation of scraper runs without depressurizing or interrupting service. Additionally, a C Series Sample Probe can be safely and easily removed from a pipeline for use at different locations. Only one retriever tool is needed to service multiple sample probe locations.



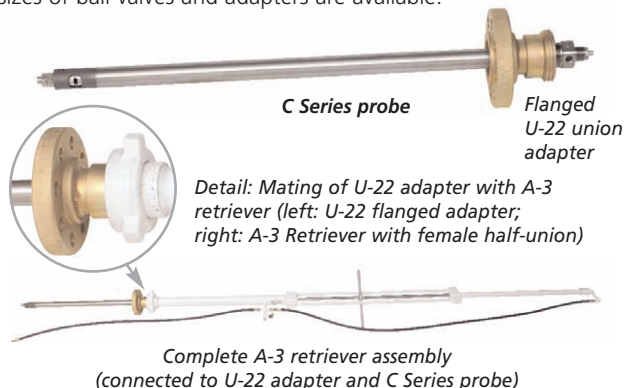
The A-3 retriever equalizes pressure between the pipeline and sample probe, allowing the probe to be installed or retrieved with minimal manual force, even at high line pressure. A specially designed ratchet wrench minimizes the effort required to loosen and tighten connections during probe installation and retrieval operations.

The retriever is made of high-quality carbon steel structural components, and is fitted with rust-proof plated steel rods, bronze rod bushings, Viton® O-ring seals, and Teflon® backup rings. Flexible hoses on the retriever have high-pressure, reinforced construction for durability.

The A-3 Retriever is available in two sizes to accommodate all sizes of C Series Sample Probes—one for probe extension lengths up to 16 in., and one for extension lengths of 18 to 30 in. A female hammer-union half is attached to one end of the retriever for mating with a U-22 adapter during probe installation and retrieval.

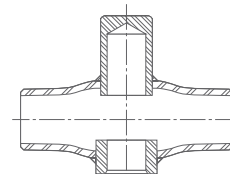
A-3 Retriever Adapter

A 2-in. ball valve and a U-22 union adapter are required for attaching the A-3 Sample Probe Retriever to the product line. Typically, a 2-in. pipe connection is welded to the product line, and a 2-in. ball valve is threaded or flanged into this connection. The U-22 adapter (threaded or flanged) then mounts directly to the ball valve via a 2-in. NPT or flange connection. A 2-in. connection is standard; however, other sizes of ball valves and adapters are available.



LA-22 Line Adapter

The LA-22 Line Adapter may be required to properly position a C Series probe in a small pipeline (2- to 4-in. diameter). The spool-type adapter is welded on the outside of the pipeline to allow the probe to be correctly positioned within the line so that the sample window is in the center one-third of the pipeline.



Pressure Equalizing Valve

The PEV-3C Pressure Equalizer Valve is designed to reduce pressure across the sample probe seal tip, maximizing the life of the probe and minimizing the need for seal tip replacement. PEVs are recommended for any installation where line pressure exceeds 195 psi.



Tubing connects the PEV to the sample probe outlet, to the pipeline, and to the receptacle. Connection points are clearly marked on the PEV for quick and easy installation.

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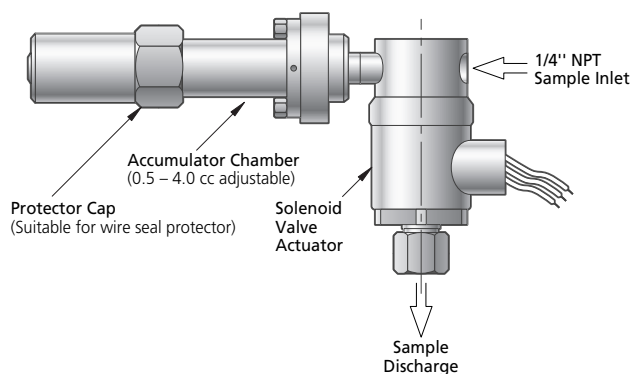
True Cut™ CS Sampler

The True Cut™ CS Sampler captures proportion-to-flow samples of flowing liquids in a simple, cost-effective operation. The sampler body contains an accumulator chamber for collecting the sample, a 1/4-in. sample inlet port, and a solenoid valve actuator. When a flowmeter or measurement control system sends an electrical pulse to the solenoid valve, the CS accumulation chamber connects to the flow stream, and the instrument obtains a sample. When the sampler is de-energized, typically after 1.5 to 2 seconds, the sample is discharged into the sample receptacle.

The CS Sampler is available in two pressure ranges to meet a wide range of applications. The instrument is easy to install and easy to maintain. Various timers for controlling CS samplers are also available from Cameron's Measurement Systems division.

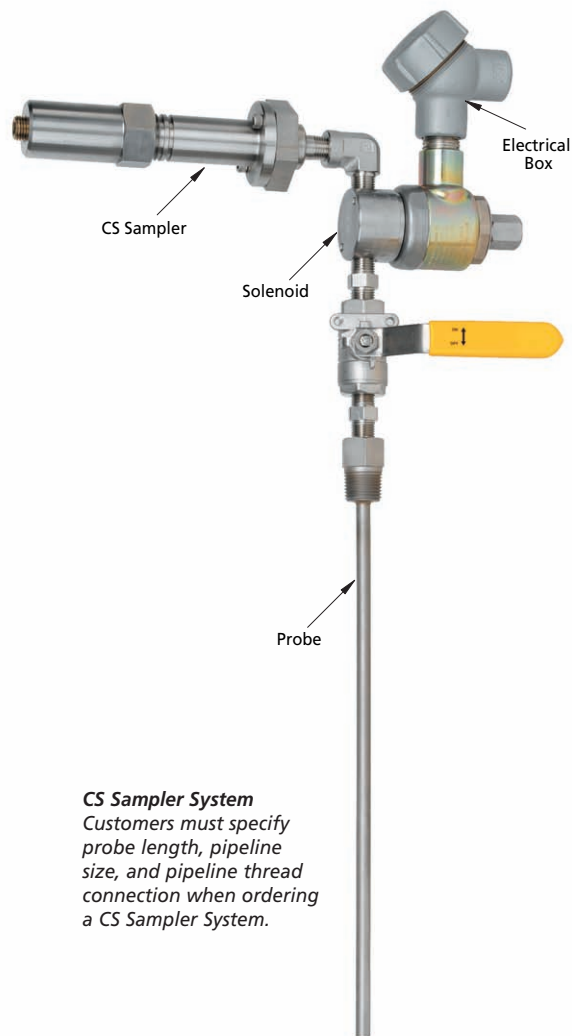
Applications

- Tanker loading/unloading system
- Truck terminals
- Refineries/pipelines
- LACT units
- Loss control
- Custody transfer points
- Petrochemical plants
- Process vessels
- Barge facilities



Specifications

Fluids Suitable for Sampling	Crude oil, refined hydrocarbons and non-corrosive chemicals
Viscosity	12 to 54 API gravity (thicker product may require heating; see Cameron for detailed instruction).
Maximum Operating Pressure	
Model CS-1	150 psig for three-way solenoid 500 psig for dual solenoid
Model CS-2	150 psig for three-way solenoid 500 psig for dual solenoid 1000 psig for pneumatically actuated or electrically actuated ball valve
Pipeline Size (in. ID)	Typically, 2 to 12-in. (pipeline size determines probe length required)
Actuator Method	
Model CS-1	Three-way solenoid (24 VDC, 9.25 watt or 120 VAC, 7.5 watt) Dual solenoid, 24 VDC, 9.5 watt
Model CS-2	Three-way solenoid (24 VDC, 9.25 watt or 120 VAC, 7.5 watt) Dual solenoid, 24 VDC, 9.5 watt Pneumatically actuated or electrically actuated ball valve (for product types and pressures not suitable for solenoids)
Sample Grab Size	Adjustable, 0.5 cc to 4.0 cc
Sample Outlet Connection	1-1/4-in., standard (other sizes available)
Standard Materials	Meter body 316 Stainless steel Seals Buna, Viton, Teflon



CS Sampler System
Customers must specify probe length, pipeline size, and pipeline thread connection when ordering a CS Sampler System.

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CLIF MOCK™

LGS-1500 Liquid/Gas Sampler

The LGS-1500 Sampling System is an electronic sample controller with an integral liquid/gas sample pump. For liquid service, the sampler is pneumatically operated by a customer-supplied air source. For gas service, an internal pressure regulator rated for the full range of pipeline pressure protects the sampler from pressure spiking. The sampler transfers samples into a vented sample receptacle or a pressure-balanced piston cylinder.

A purge valve manifold allows easy connection to process piping, including fast-loop connections, and a needle valve isolates the sampler from process piping. The controller automates the sampling process and is easily configured to operate as a timer or a pulse counter to allow proportional-to-time or proportional-to-volume sampling.

Features

- 316 stainless steel pump
- 7-digit LCD
- Automatic decimal point placement
- Selectable units of measurement on LCD
- Double-precision floating point arithmetic operations
- Lithium battery provides 18 months of autonomous power (based on 10-minute cycles)
- Supports flow-proportional or time-proportional sampling
- Air regulator available in standard and premium (high pressure) models
- Solenoid valve available in standard and premium (wet gas) models
- Intrinsically safe

Pump Specifications

Available for stand-alone installation or as part of a sampling system

Viscosity range:

- 650 centistokes (maximum)

Temperature range:

- -15°F to +375°F (-26°C to 191°C)

Working pressure of sampling media:

- 30 to 1500 psi

Maximum air supply pressure:

- 300 psi with standard regulator
- 3000 psi with premium regulator

Air consumption:

- 0.003 scf @ 60 psig
- 0.009 scf @ 100 psig

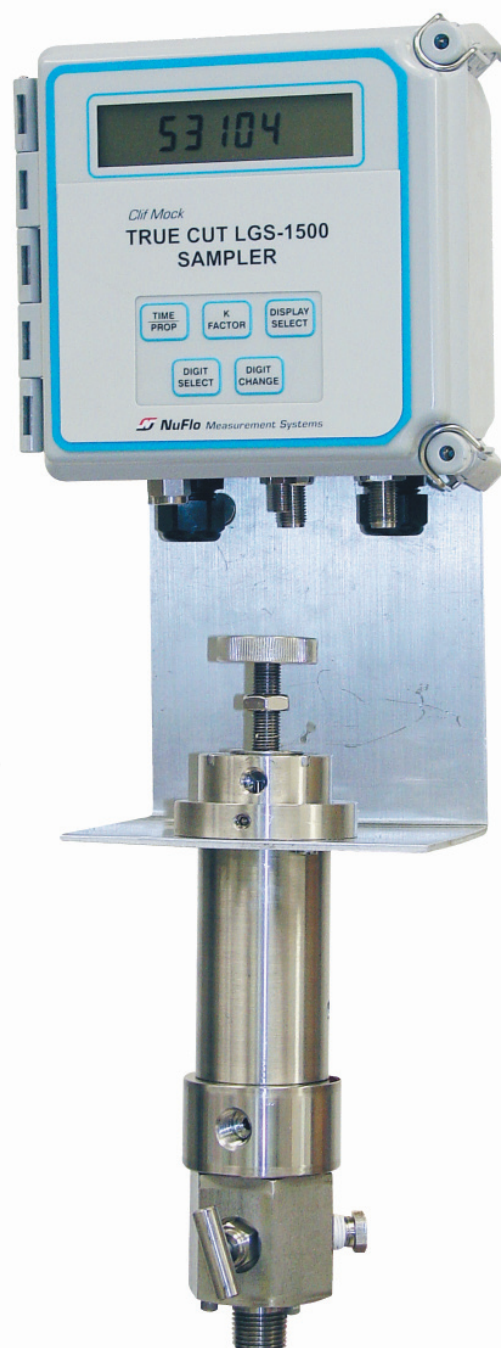
Minimum operational cycle:

- 5 seconds

Sample grab size range:

- Liquid: 0.25 cc to 1.25 cc
- Gas: 0.05 cc to 1.00 cc

* For applications requiring parameters outside those listed above, contact Cameron's Measurement Systems division



LGS-1500 Liquid/Gas Sampler

Display

- 7-digit display
- Large 0.500-in. high characters
- Updates every second
- Selectable units of measurement: BBL, GAL, M3, and CF

Enclosure

- Fiberglass, NEMA 4X
- Self-supporting bracket design for mounting directly to a sample probe
- 2-in. pipe mount, optional

Power Supply

- 7.2V lithium battery pack
- Solar panel (optional, for use with lead acid battery)
- External 12VDC power (optional, for use with lead acid battery and customer-supplied safety barrier)

Flowmeter Inputs

- Turbine Flowmeters
 - Sensitivity: 85 mV peak to peak with 10 mV hysteresis
 - Frequency range: 0 to 5000 Hz
 - Volume measurement accuracy: ± 1 least significant digit
- Positive Displacement Meter
 - Dry contact closure
 - Minimum pulse-width duration: 0.1 ms
 - Frequency range: 0 to 5000 Hz

Approvals

- CSA (US and Canada), Class I, Division 1, Groups A, B, C and D



Sample pump with integral purge valve manifold

Receptacles

Cameron's Measurement Systems division offers a variety of receptacles for use with liquid and gas sampling systems. Contact your local sales representative for assistance.



Liquid Receptacle



Gas Receptacle

Ordering

When ordering, please specify the following:

- Process fluid type (liquid or gas)
 - If gas, what type of gas?
- Line pressure
- Is an air supply available?
- Sample collection period
- Sample receptacle capacity

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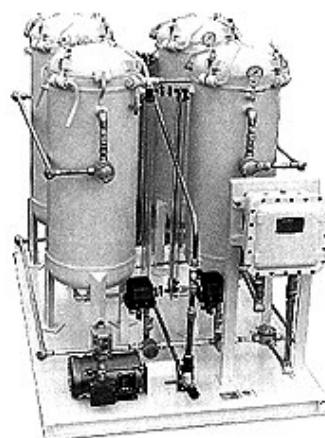
CLIF MOCK™

True Cut™ Automated Sampling Systems

*Crude Oil, Multiple Circulating Systems, Product Sampling,
Multiple Receptacles and Truck Loading/Discharge Systems*

True Cut™ Crude Oil, Multiple Circulating Systems

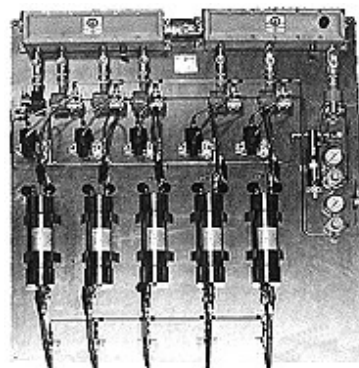
The requirement for multiple crude oil receptacles on pipelines has become common practice in recent years. This has been due to either more frequent or smaller batch sizes as well as the increased accuracy of having dedicated product or customer receptacles. These systems often have electrically or pneumatically operated tank selection valves that can be operated remotely or from a central computer. This eliminates the need to drain and prepare a single receptacle for each batch. The features on the tanks and circulating systems on these units are the same found on popular CMC-500 series systems. These features, along with the selection capabilities on multiple tank skids increase sampling accuracy while decreasing manpower required to operate the systems.



True Cut™ Product Sampling, Multiple Receptacles

Hydrocarbon product blending facilities often require two or more sample cylinders that can be filled either simultaneously or sequentially. Cameron has a variety of controllers available which are adaptable to almost any application or special requirement. As in all Clif Mock™ True Cut™ systems, these units are designed to provide the accuracy required for custody transfer quality sampling, as well as perform with minimum maintenance.

Critical functions, such as fast loop, self purging, proportional to flow pacing and repeatable sample grab size, are addressed with these systems. The controllers for these units can be independent electronics or linked to computer systems for control and monitoring. This allows for functions such as safety shutdowns or sample alarms to be included in the control systems.



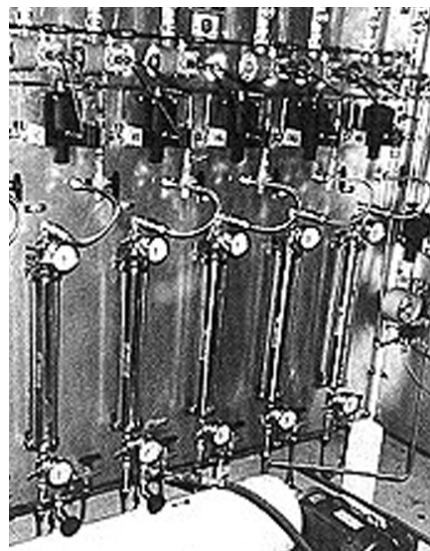
True Cut™ Truck Loading/Discharge Systems

Sampling multiple batches with small deliveries creates a unique set of problems when obtaining accurate, representative samples. Cameron has designed True Cut™ systems with as many as twenty pressure-balanced receptacles. These systems are computer controlled and capable of being programmed to dedicate receptacles to specific batches (trucks) or to total deliveries from a single company. Controls on these systems can be designed to use individual key locks, coded keypads, or magnetic card readers for startup.

Quality and safety systems can be included in these control systems, and provisions made for high pressure and temperature, fire-eye and no flow shutdown, and pump permissive features. In addition, most of these systems are designed to completely purge all tubing, valves, and the sample chamber between samples to assure a fresh sample.

Features & Benefits

- PLC controlled system
- Auto-purge system
- Optional cylinder selection systems
- Optional safety shutdowns
- Electric or pneumatic operation



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