

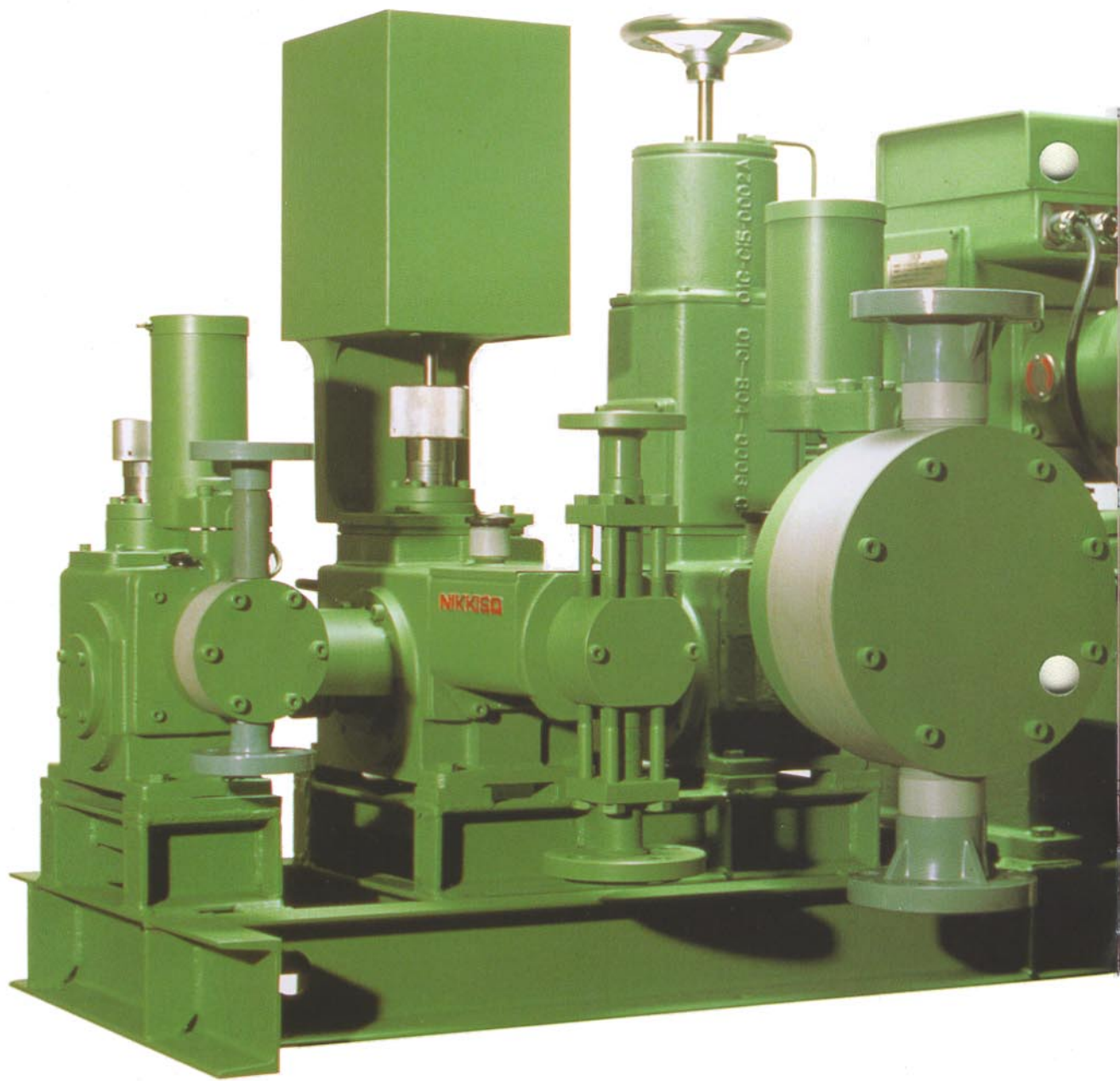
NIKKISO METERING PUMPS SERIES M150



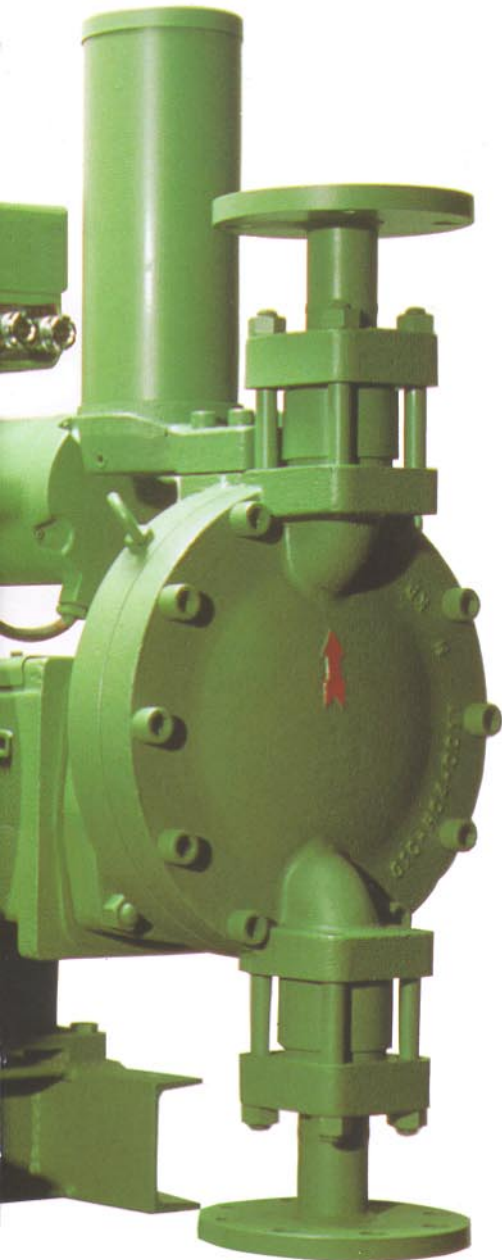
HIGASHIMURAYAMA PLANT



HIGASHIMURAYAMA PLANT



Heavy-Duty, Positive Displacement Pumps — Controlled Volume



- **Long Service Life**

Nikkiso metering pumps are designed and constructed for an uninterrupted continuous service life of several-decades under normal specified operating conditions.

- **High Accuracy, High Repeatability & High Linearity**

The pump flow rate of Nikkiso metering pumps is linearly adjustable between 0% and 100% while the pump is running or stopped.

Nikkiso metering Pumps fully satisfy following API 675 performance requirements:

- Steady state flow accuracy within $\pm 1\%$ over a turndown ratio of 10:1
- Flow repeatability within $\pm 3\%$ over a turndown ratio of 10:1
- Deviation from linearity of less than $\pm 3\%$ over a turndown ratio of 10:1

- **High Pressure Discharge**

Nikkiso metering pumps come in standard models which discharge even at a high pressure of 50MPa (7110PSIG) a wide range of capacities.

- **Low Maintenance & Installation Costs**

Nikkiso metering pumps are designed with conservative stroking speeds.

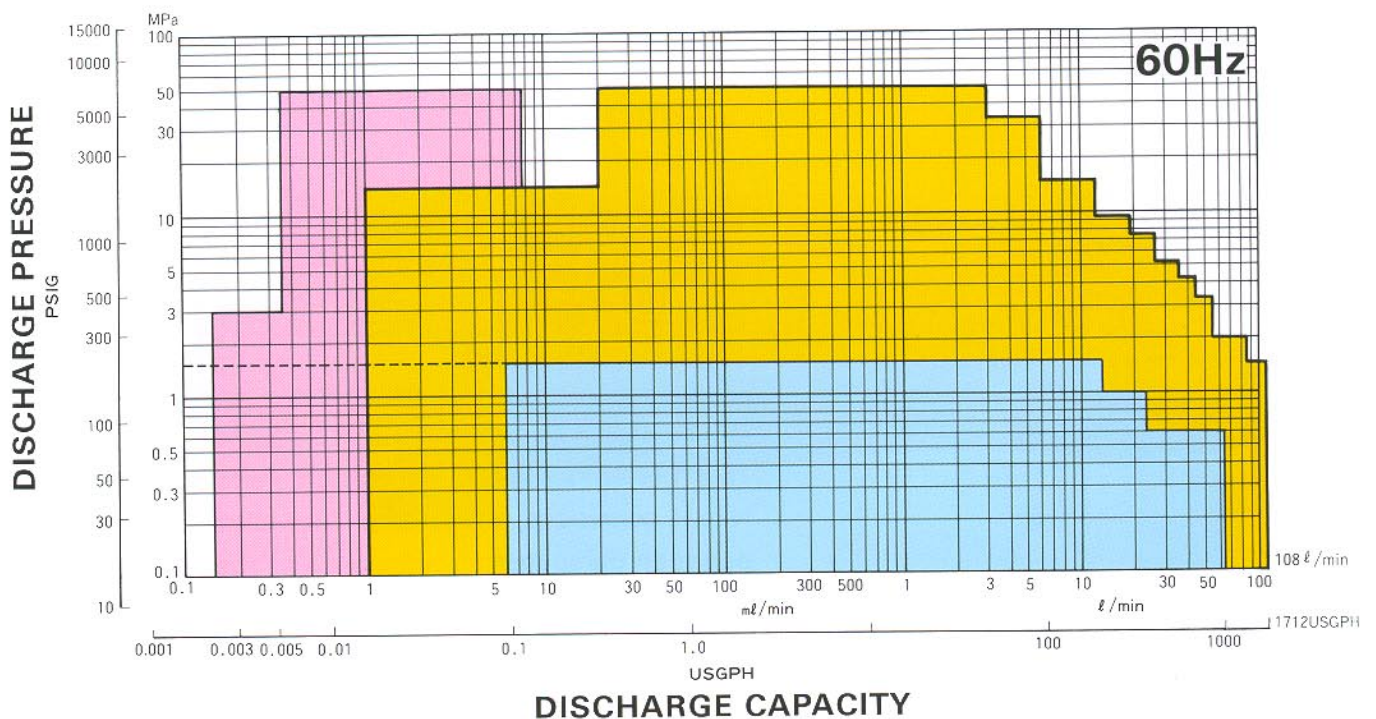
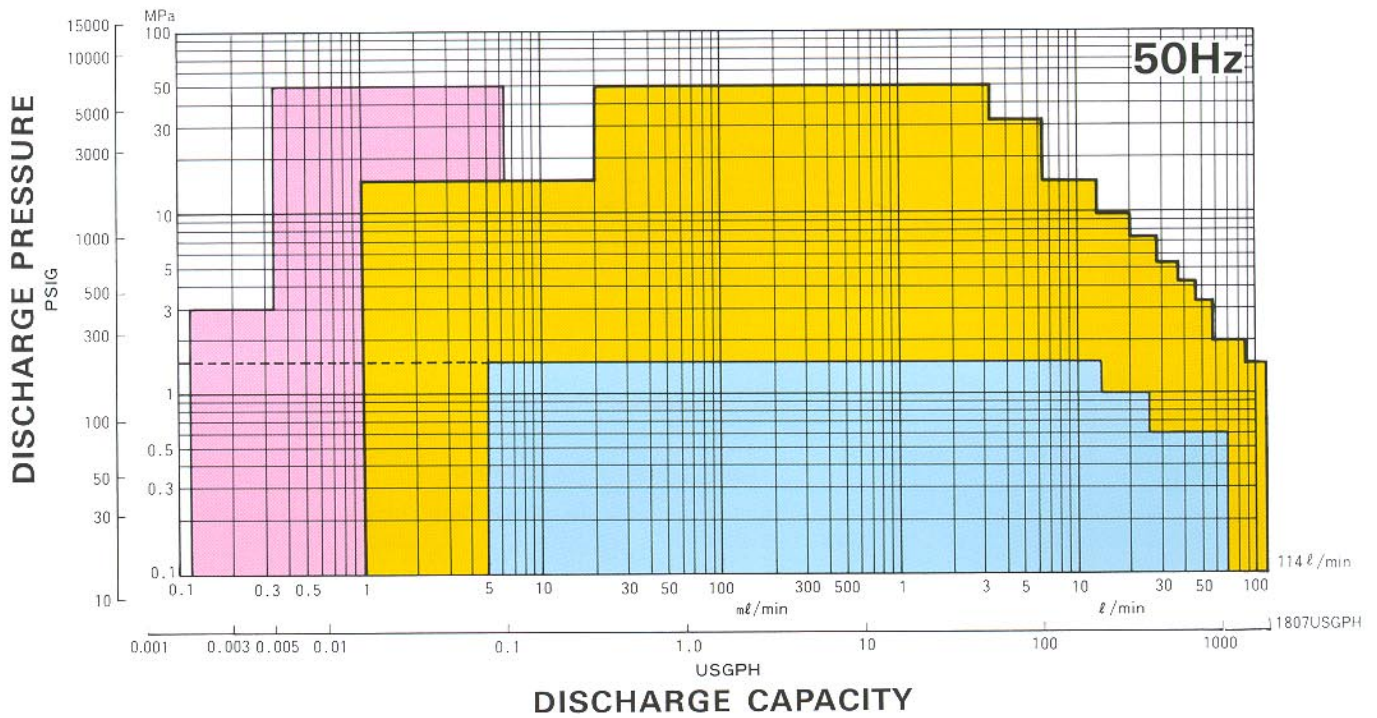
This prolongs the life of moving parts and improves NPSH conditions, minimizing the necessity of using a pulsation dampener.







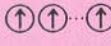






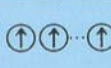






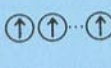













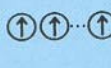






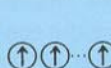






























































Capacity-Pressure Ranges

The charts below show the capacity-pressure ranges of Nikkiso simplex metering pumps. With multiplex pumps, capacity increases with each additional cylinder.

For detailed information on capacity, pressure, pump model, etc., refer to the technical data for Nikkiso metering pumps.

For pumps with capacity-pressure ranges in excess of those indicated in the charts below, refer to the Nikkiso "Hi-Power" Pump catalog.



Series Micro	NIC, NID									Description of Symbols	
	SK										
Series M150 Type "L"	S1L										
	S2L										
	S3L										
	S4L										
	S5L										
Series M150	S1A										
	S2A										
	S3A										
	S4A										
	S5A S6A										
Series Pulseless	C21 C22 C23 C24										
Additional models designed and manufactured on request.	Gas-Driven										
	Air-Driven										
	Others OEM Products										

Special Features

"N-Crank" Stroke Length Adjustment—Patented

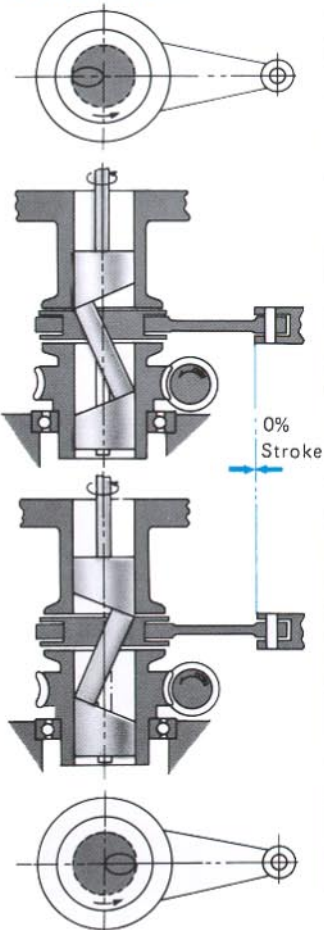
Stroke length adjustment between 0 and 100% while the pump is running or stopped, is made possible by the vertical movement of the "N-Crank", which linearly varies the total value of the eccentricity of the N-Crank and cam.

- a) At 0% stroke, the "N-Crank" is at the bottom.
- b) At 100% stroke, the "N-Crank" is at the top.

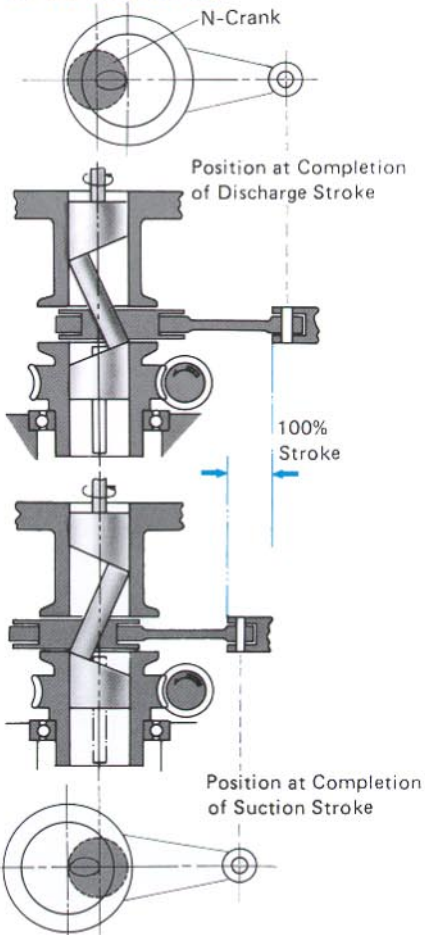
The cam has an eccentric value of 1/4 the maximum stroke length between the center and center of the "N-Crank". The eccentric value of the center of the "N-Crank" is 0. The bevelled upper and lower ends have the same eccentric length, with the cam and "N-Crank" combined as shown in the figure below. When the "N-Crank" is at the bottom, the eccentric value of the "N-Crank" and the eccentric value of the cam cancel one another and the total eccentric value becomes 0. The center of the cam and the center of rotation of the "N-Crank" coincide, resulting in a stroke of 0%. When the "N-Crank" is at the top, the sum of the eccentric value of the cam and that of the "N-Crank" become the eccentric radius and the stroke length becomes 100%.



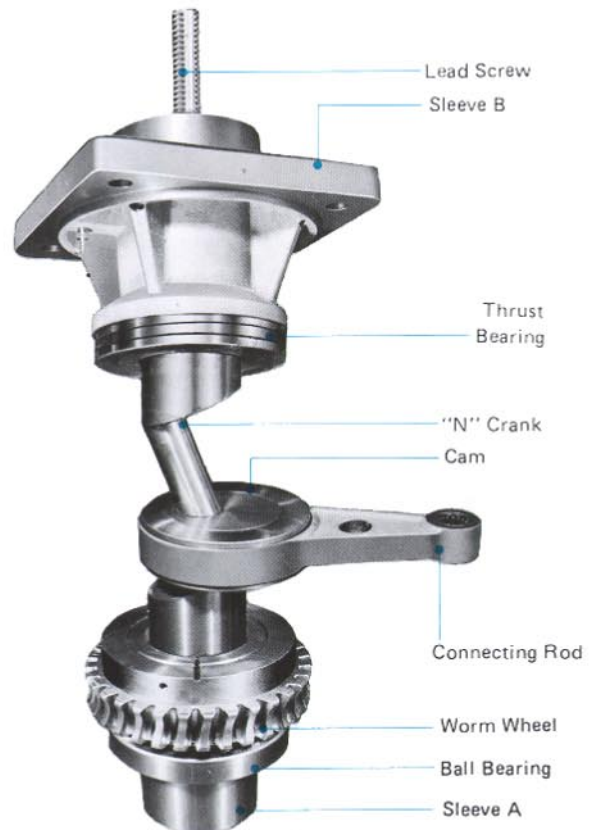
a) At 0% Stroke



b) At 100% Stroke



Structure of N-Crank



Why Nikkiso metering pumps are so tough and accurate

Type "L"

Suitable for Almost All Liquids.
Hydraulically driven diaphragm construction prevents liquids from leaking, and assures accurate designs and long life.
Even diaphragm hydraulic oil does not leak out.

Totally Enclosed, Weatherproof Housing

The crank and stroke length adjustment mechanism are housed in a totally enclosed case with dust seals, enabling installation of the pump almost anywhere.

Easy piping, horizontal type tandem multiple connection

Compact multiple connections are available for immediate piping use in various applications.

Roller Bearings Employed Throughout

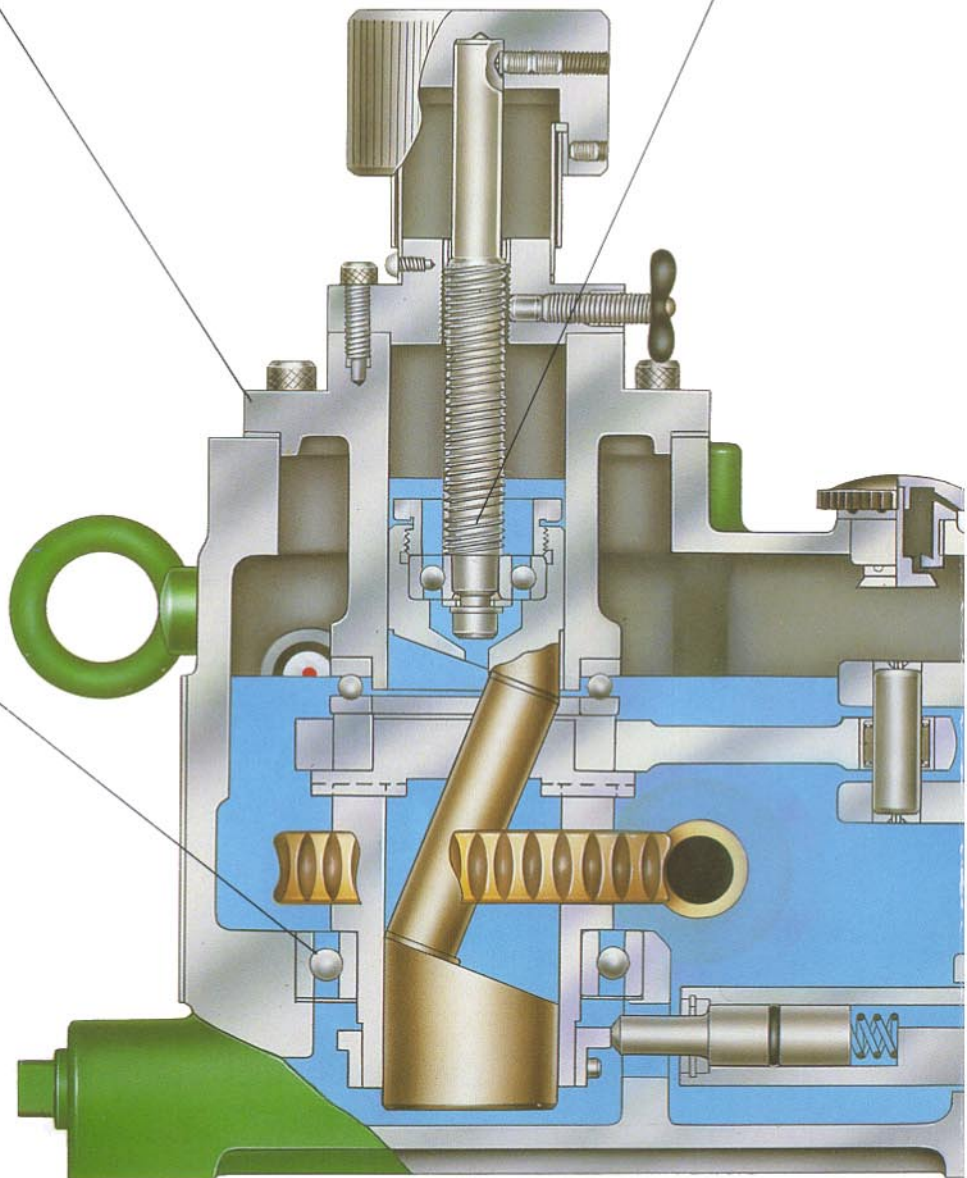
Metal bushings are eliminated through the use of taper bearings, ball bearings, or needle bearings at the main shaft and worm shaft. Operational life of these parts is increased and operating costs are reduced.

Versatile Servomotor

The pneumatic or electric servomotor, including the coupling section, is totally enclosed and equipped with an auto-manual clutch. It is available in a multiplex pump either with all cylinders controlled by one servomotor or with each cylinder controlled by individual servomotors. This enables versatility and flexibility in pump planning and usage.

Original Nikkiso Stroke Length Adjustment Mechanism

"N-crank" stroke length adjustment mechanism can withstand great piston forces without kinetic reaction at the adjustment end.

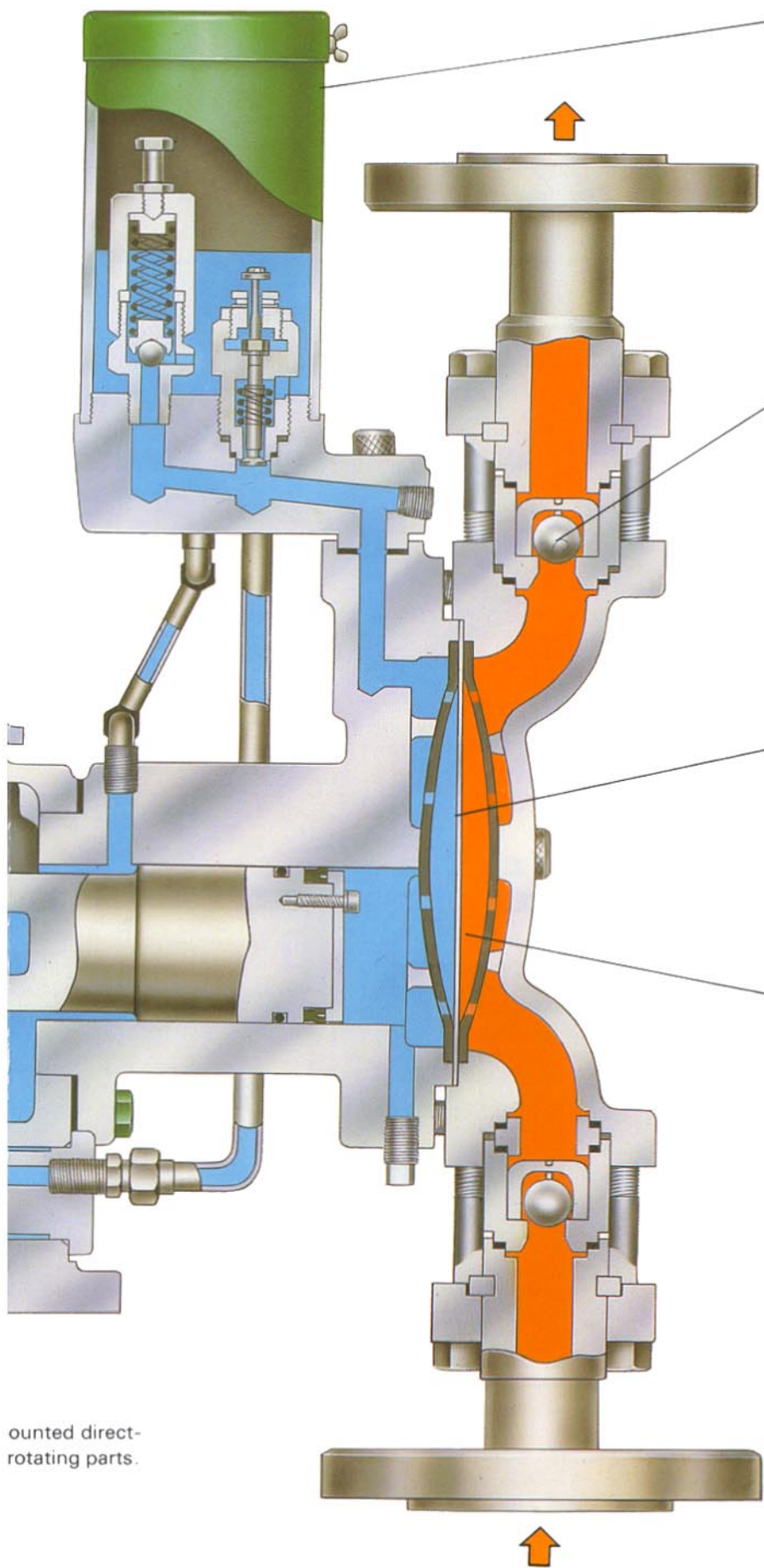


Fully Automatic Lubrication

The crank is immersed in an oil bath. The mechanism above the oil level is lubricated automatically by an integral oil pump. No daily maintenance is required. Manpower for maintenance is greatly reduced.

Drive Motor Safety

The flange type motor is mounted fully without any exposure of



Unique Hydraulic System

An oil compensating valve maintains an adequate supply of hydraulic oil within the displacement chamber, and vents air and gas in the displacement chamber automatically. An oil relief valve protects the diaphragm from rupturing due to abnormally high pressure.

Precise Ball Check Valves

The roundness tolerance of the ball check valves is within 0.1 micrometer. Material homogeneity and wear resistance assure high accuracy over an extended period. The spinning action clears any particles lodged in the ball seat and insures the ball never seats in the same position, thus reducing seat wear.

Long-life Diaphragm

The diaphragm is made of specially molded and heat-treated PTFE. The unique hydraulic system, limited curvature of the back-up plates and low stroking speeds provide longer diaphragm life.

Conservatively Designed Displacement Chamber

The back-up plates in the displacement chamber prevent excessive diaphragm flexure, and their curvature is conservatively designed at the minimum level possible.

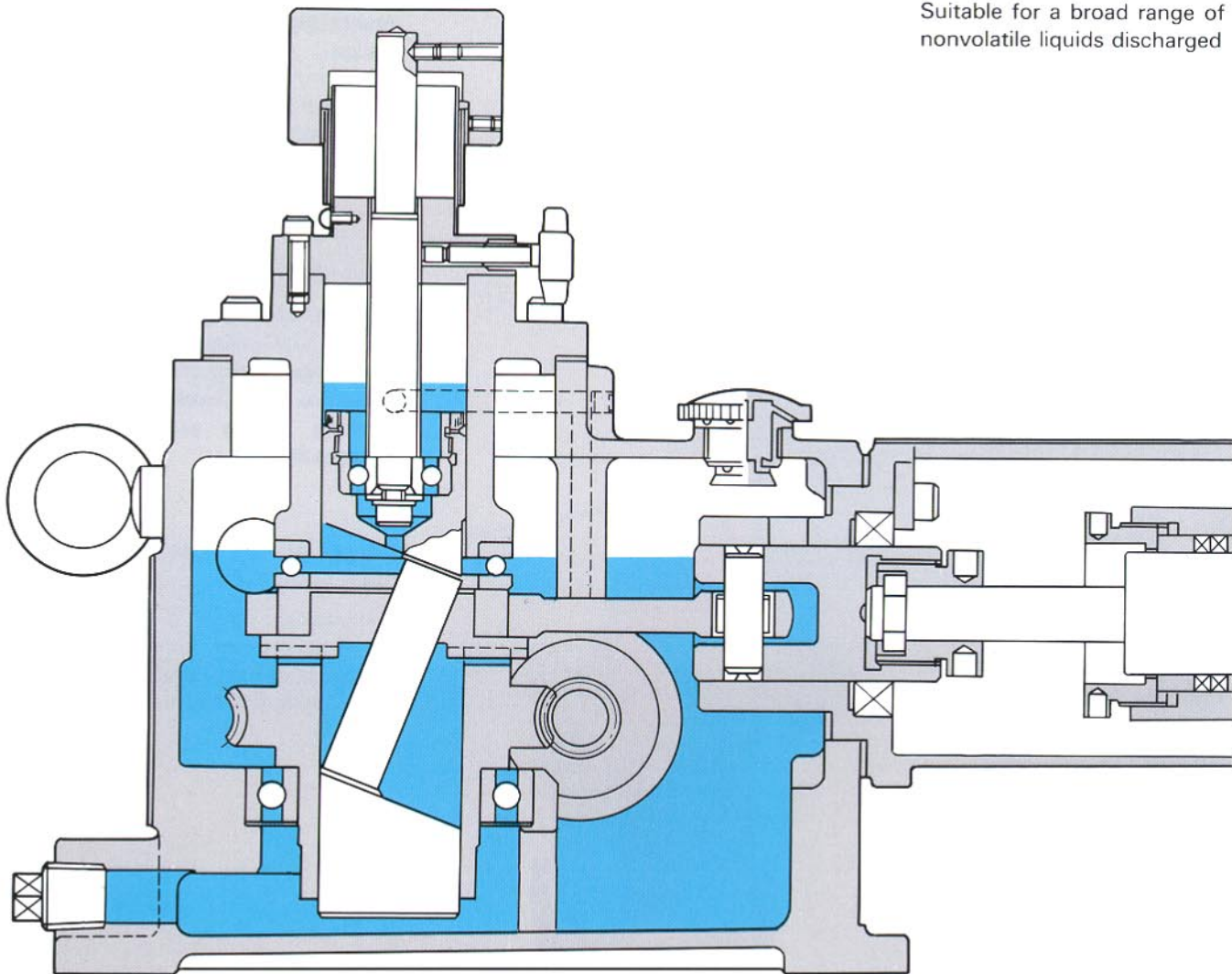
ounted direct-rotating parts.

Liquid End Configurations

Various types of liquid end can be furnished with standardized power ends to suit most liquids and process conditions

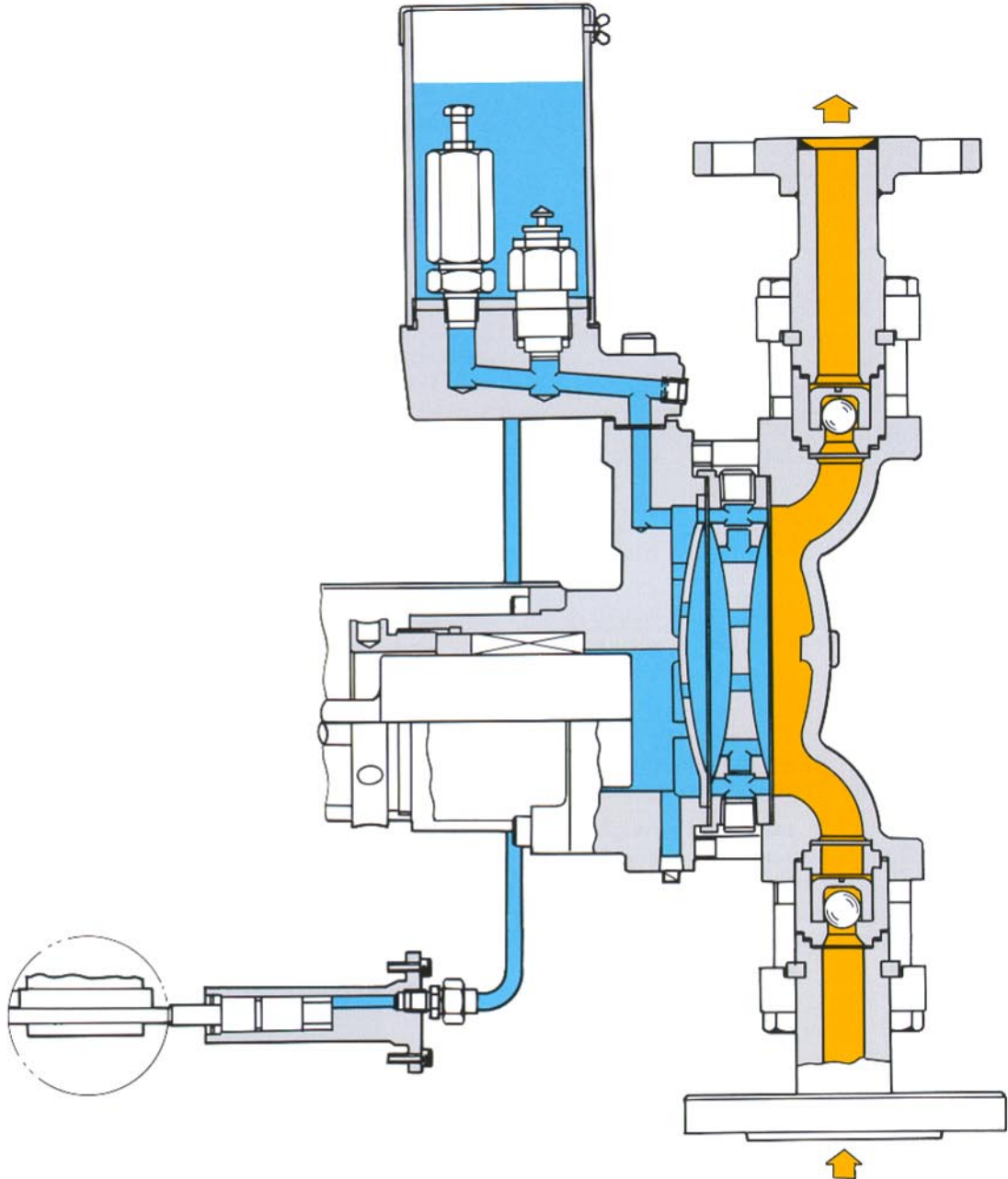
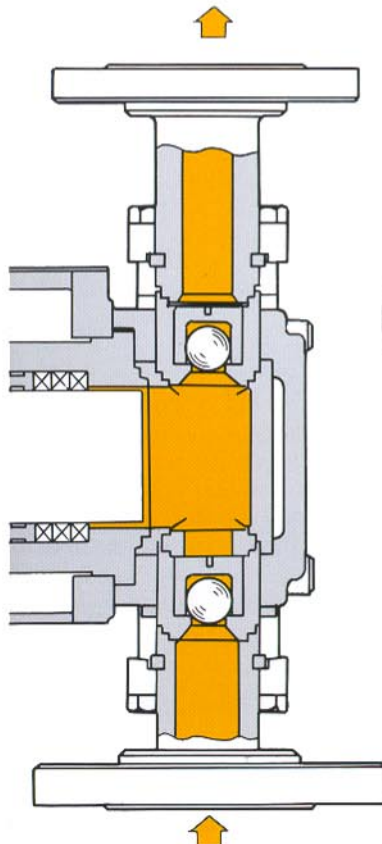
PACKED PLUNGER

Suitable for a broad range of nonvolatile liquids discharged



LIQUID END

nontoxic, noncorrosive and at relatively high pressure

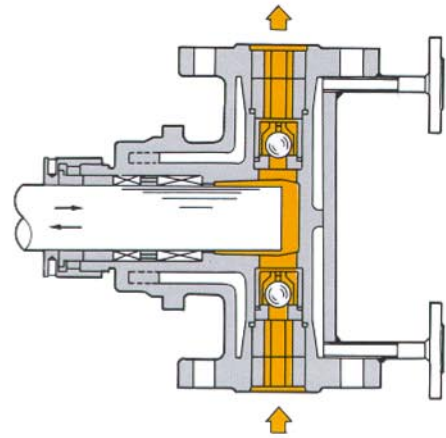
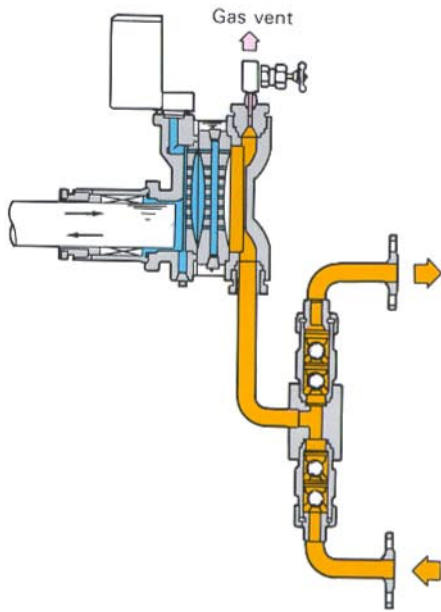


DOUBLE DIAPHRAGM LIQUID END

Suitable for slurry, high viscous liquids, highly inflammable liquids and for processes where possible contamination of hydraulic oil must be prevented.

LIQUID PISTON TYPE

Suitable for slurry with solid particles having a rapid settling velocity. The shorten distance between the suction and discharge valves and the lower valve position prevent solid particle sedimentation in the pump chamber. Gas mixed with the slurry is automatically vented through a vent valve.

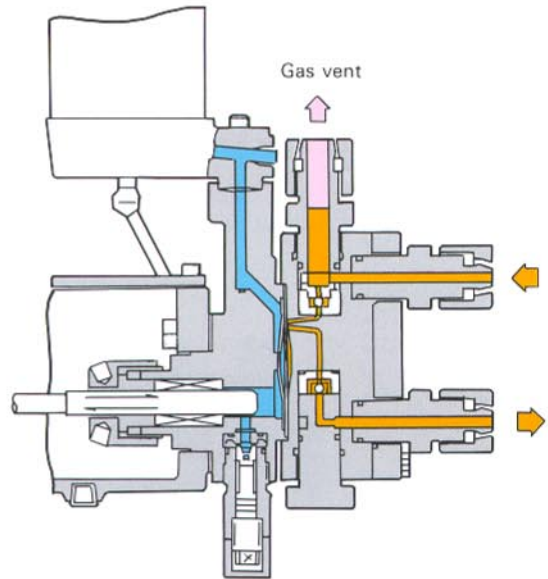
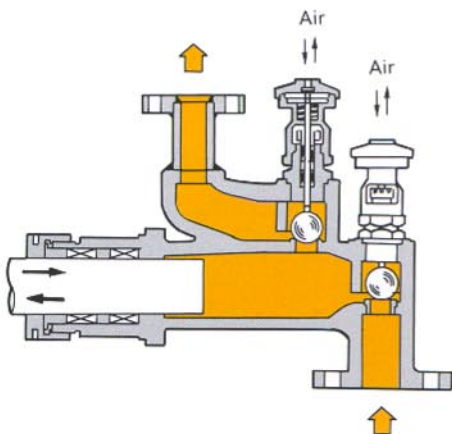


FULL JACKET TYPE

Suitable for high melting point liquids. The pump chamber and stuffing box are fully jacketed to prevent liquids from solidifying.

HIGH VISCIOUS LIQUID TYPE

Suitable for high viscous liquids of up to 300,000cP. Valves are seated by air pressure applied in synchronization with the plunger movement, to precisely check high viscous liquids.



GAS-FORMING LIQUID TYPE

Sodium hypochlorite and hydrogen peroxide are very unstable liquids and oxygenous gases with high penetrating characteristics are spontaneously separated from liquids. To prevent unstable operation owing to these gases, the suction port is located at the upper side and the vent connection is furnished at the top of the pump chamber. A special diaphragm material is used to minimize penetration of gases into the hydraulic oil.

Additional Types

Nikkiso metering pumps are available in a wide range of additional types to assure reliable operation for more specialized requirements.

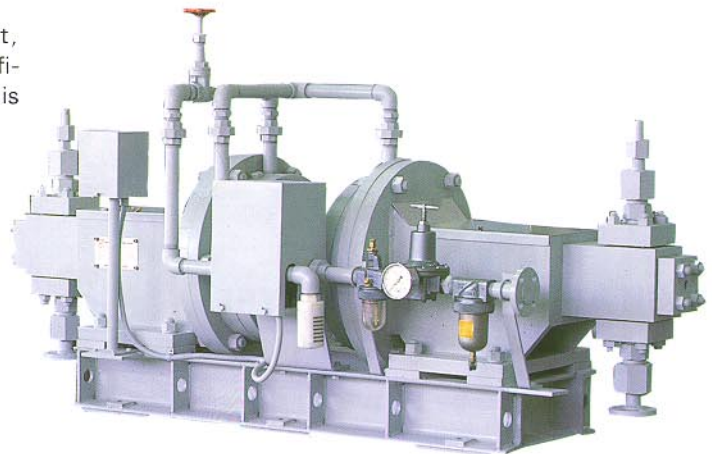
METAL DIAPHRAGM TYPE

Suitable for high pressure and high temperature service beyond the service range of PTFE diaphragms. Minimum curvature design prevents excessive metallic diaphragm flexure, and provides extended diaphragm life.



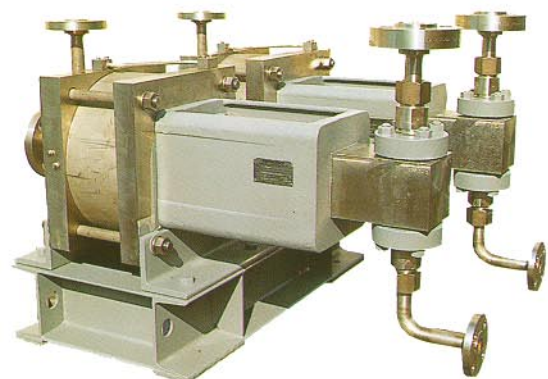
AIR DRIVEN TYPE

Driven by compressed air. Used in plants where strict, explosion preventive measures are required and it is difficult to use electric motors, or for processes where liquid is injected intermittently.



GAS DRIVEN TYPE

Driven by gas. Used on oil-well platforms where no electricity is available in hazardous areas. Gas driver is made of 316s.s. throughout to be suitable for gases contaminated by corrosive H_2S , etc. High design pressure of gas driver eliminates necessity for safety valve with simple piping. Can be installed in extremely hot or cold climates.

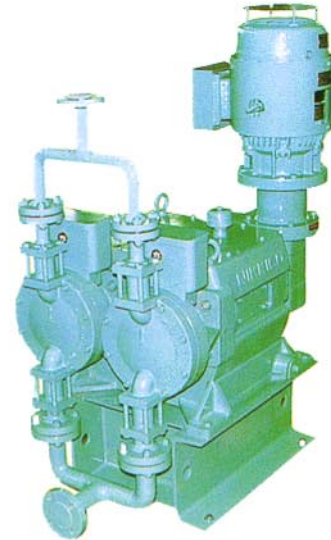


PULSELESS TYPE

Built with a specially designed cam. The pulseless Nikkiso metering pump is a duplex pump with a composite performance curve that is always linear.

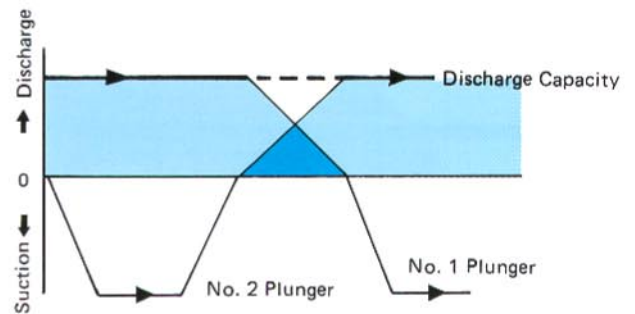
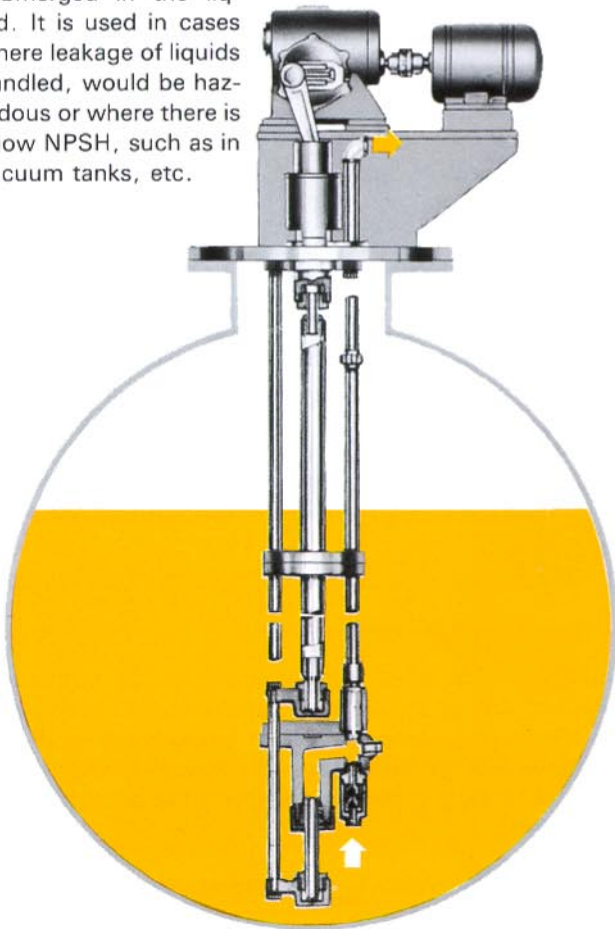
Since the pump stroke length is constant, discharge volume adjustment is made with the speed change gear or the variable speed motor, by changing the pump stroking speed.

Four models, C21, C22, C23 and C24 with a packed plunger or diaphragm liquid end are available in a wide range of capacities.



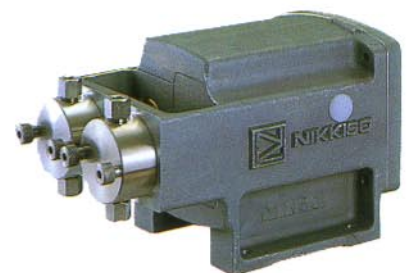
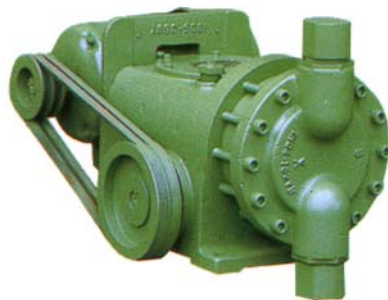
SUBMERSIBLE TYPE

The liquid end of this pump type is entirely submerged in the liquid. It is used in cases where leakage of liquids handled, would be hazardous or where there is a low NPSH, such as in vacuum tanks, etc.



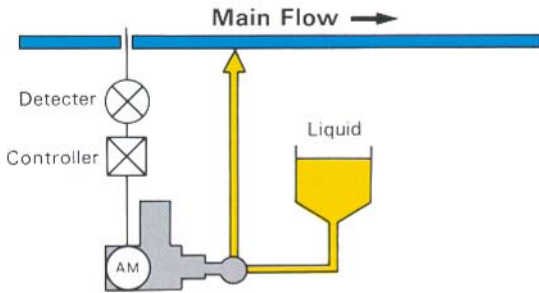
OEM PRODUCTS

Nikkiso can supply special types of metering pumps for standard operating conditions in large quantities at affordable prices.



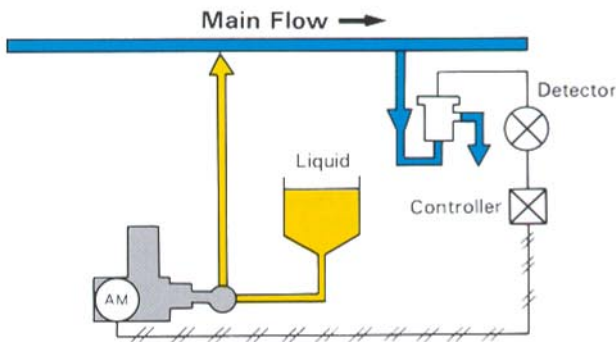
Automatic Control

The pump capacity of Nikkiso metering pumps can be controlled or regulated remotely by adjusting the pump stroke length, pump stroking speed, or by operating the START / STOP button. Four basic systems are available for automatic control of the metering pumps.



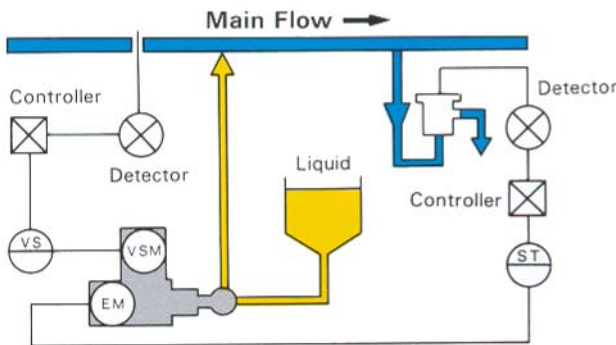
(1) Open Circuit System

This is quite an elementary method for proportional injection in accordance with changes in the main flow, excluding feedback of the injection volume. However, it requires a highly reliable mechanism to ensure perfect linearity in pump discharge.



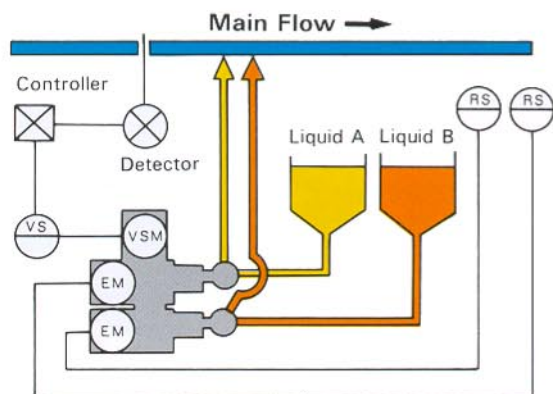
(2) Closed Circuit System

This system is employed in cases where the injected volume corresponds to qualitative changes of pH, etc., instead of volumetric changes in the main flow, and there is no proportional relationship between the two. The transient response characteristics and neutralizing titration characteristics of such a pH control system must be carefully considered, as simply attaching a pH meter for feedback is not feasible.



(3) Bi-Dimensional Circuit System

This is a system in which qualitative and quantitative changes simultaneously occur in the main flow. However, extreme difficulty is incurred if adjustments are conducted as in (2), since conditional requirements are more exacting. It is therefore required that the pump speed be made to correspond to changes in the main flow and compensated according to the volume. At the same time, qualitative adjustment should be conducted for the stroke length control with the feedback loop. Precautions for transient characteristics, etc., are similar to (2).



(4) Open Circuit Multiplex System

A multiplex pump system is employed for the proportional injection of various liquids, and a variable speed motor synchronizes the varying pump speeds for proportional injection in accordance with the rate of the main flow. Proportional injection of chemicals is controlled by varying the stroke lengths of each cylinder.

- | | |
|---------------------------------|--------------------------------------|
| (EM) NIKKISO Electro Servo Unit | (VSM) Variable Speed Motor |
| (AM) NIKKISO Air Servo Unit | (VS) Variable Speed Motor Controller |
| (ST) NIKKISO Spetrol T | (RS) NIKKISO Remote Setter |

NIKKISO Air Servo Unit

Adjusts the pump stroke length remotely by air signal, from 0 to 100%.

Air consumption Model S1~S3: 15N ℓ/min
(1.5 SCFM)
Model S4~S6: 450N ℓ/min
(44 SCFM)

NIKKISO Air Set

Filters, regulates and lubricates the operational air of servo motor.

Servo motor operational
Air pressure Model S1~S3: 0.5MPa
(71PSIG)
Model S4~S6: 0.3~0.7MPa
(43~100PSIG)

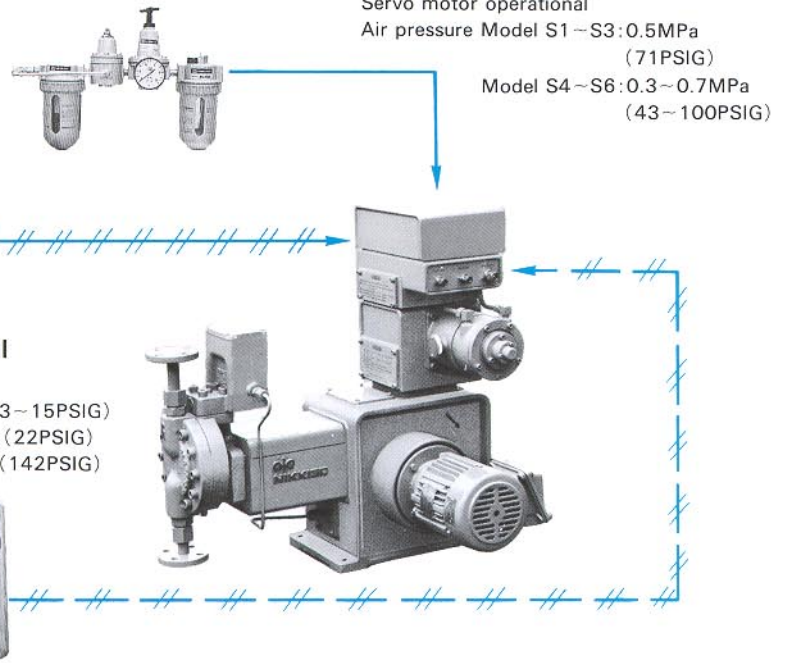
<Automatic Control>

Air pressure signal:
0.02~0.1MPa (3~15PSIG)

NIKKISO Remote Manual Air Setter

Air signal output: 0.02~0.1MPa (3~15PSIG)
Air pressure input: MIN. 0.15MPa (22PSIG)
MAX. 1.0MPa (142PSIG)

<Remote Manual Setting>



NIKKISO Electro Servo Unit

Adjusts the pump stroke length remotely by electric signal, from 0 to 100%.

Servo Motor Output: 15, 40 or 75W
Ex-Proof Type (d₂G₄: JIS) available.

NIKKISO Spetrol-T

Transmit ON-OFF signal to control Servo Motor.
Digital display: 0~100% Auto/manual selection
Alarm signal contact: 125VAC 1A SPST
Auto signal contact: 125VAC 1A SPST
Power requirement: 100/110/115/120VAC

Servo motor power requirements:
100/110VAC, 50/60Hz

<Automatic Control>

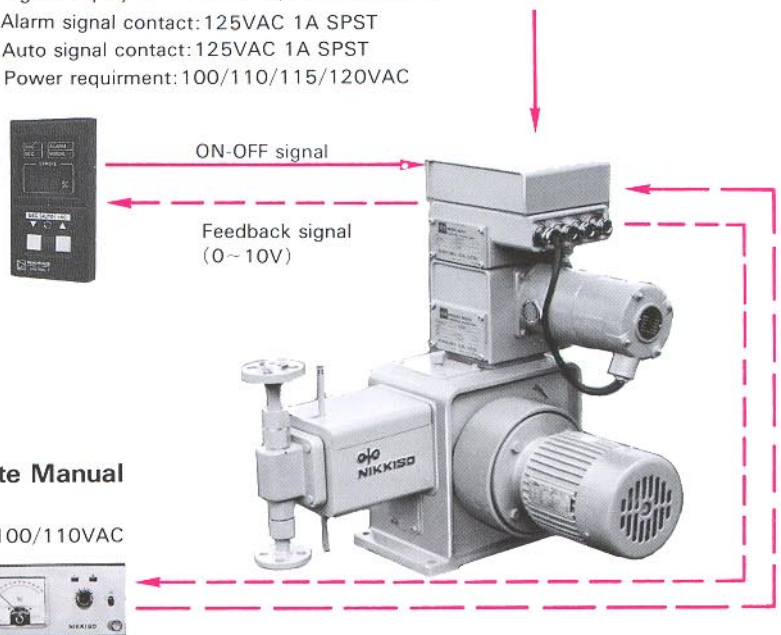
Input signal:
1~5V
4~20mA



NIKKISO Remote Manual Electric Setter

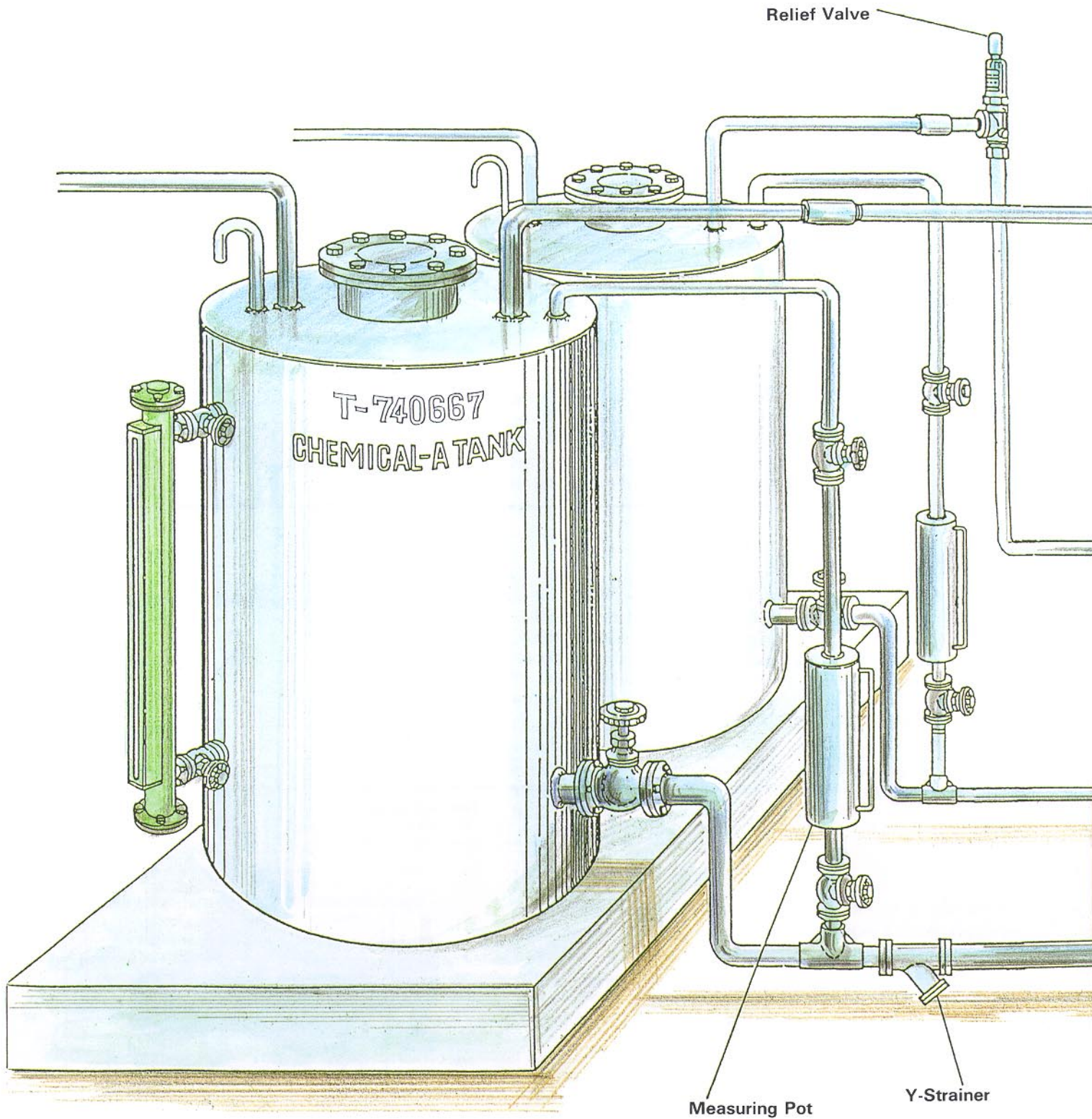
Power requirements: 100/110VAC

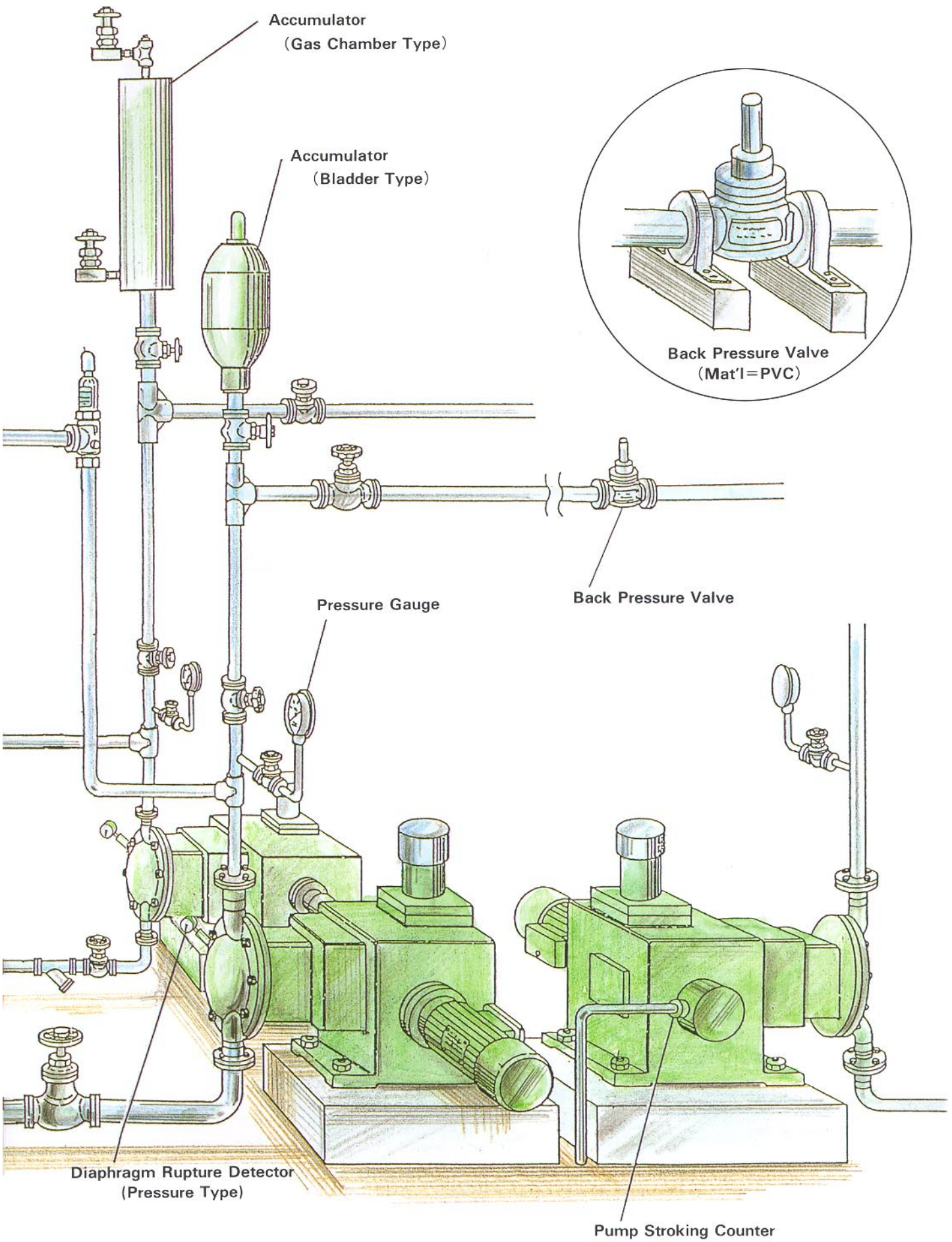
<Remote Manual Setting>



Accessories

A wide variety of accessories are available to ensure that Nikkiso metering pumps can be used effectively and efficiently.





The above sketch shows the accessories.
Please consult Nikkiso for your actual piping plans.



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Representative

● Subject to change without prior notice.