

WATER SUPPLIES DEPARTMENT
STANDARD SPECIFICATION EM-01-05
CHEMICAL METERING PUMPS

1. **METERING PUMP**

Metering pump for use in water treatment plant shall be variable stroke, positive displacement, reciprocating and hydraulic actuated double diaphragm pump with components such as gears, shafts and reciprocating members contained in a rigid pump body to ensure correct alignment and rigidity. The pump shall be designed for leak-proof operation and trouble free performance. The length of stroke shall be manually adjustable from 0% to 100% by means of a rotary hand wheel with a graduated scale or a micrometer dial while the pump is running or idle. A locking device shall be incorporated to prevent accidental adjustment of pump stroke.

The metered solution shall be pumped by the action of a flexible process diaphragm. The process diaphragm shall be vertically set in the pump head. The process diaphragm shall be compressed and relaxed during the forthstroke and backstroke of the piston respectively. The stroking action of the piston shall be transmitted to the process diaphragm by a non-contaminating intermediate fluid. External accessible valves for fluid refill, excessive pressure relief and air purge shall be provided with for the hydraulic system.

The metering pump head shall be made of cast iron or stainless steel grade 316 with diaphragms of polytetrafluoroethylene (PTFE) or similar materials which shall be resistant to the corrosive action of the chemicals to be handled. The use of plastic material for pump head and casing shall not be acceptable unless approved otherwise. Rotating parts of the pump shall be dynamically balanced and shall be supported on suitable lubricated bearings to prevent undue vibration. Fixing bolts, nuts and washers shall be of stainless steel grade 316.

The metering pump shall be provided with check valve cartridges which shall be removable to allow inspection and cleaning of the valves and seats. Spring-loaded check valves shall be employed for high viscous solutions as recommended by the manufacturer. Check valve materials shall be resistant to the corrosive action of the chemicals to be handled.

Each metering pump shall be driven by an electric motor, which is controlled by a variable speed drive, through an integral worm reduction gear arrangement. The metering pump shall not exert thrust on the driving motor. The power driving and reciprocating mechanism shall be immersed in a sealed lubricating oil bath for wear-free operation. Ganging of metering pumps to a common driving motor shall not be allowed unless otherwise specified.

The turndown ratio of the pump shall be at least 10:1 over which the guaranteed metering accuracy shall be within $\pm 1\%$.

The metering pump shall be equipped with a pressure type or conductance type diaphragm leak detection system which shall activate a volt-free relay output contact rated at 3A 220V a.c. for remote diaphragm leak alarm indication and pump trip initiation. The leak detecting system shall operate on 220V 50 Hz a.c. and complete with a local controller enclosure with degree of protection of IP55 to IEC 60529 for cable termination.

2. DRIVING MOTOR

The driving motor for the metering pump shall be a squirrel-cage induction motor complying with WSD Standard Specification E-51-04. Unless otherwise specified in the Particular Specification, a variable speed drive in accordance with WSD Standard Specification E-86-02 shall be provided for controlling the motor speed.

The pump motor shall be fan cooled to IEC 60034-6, IC411 with Class F insulation for Class B operation. It shall be suitably oversized for operating within the speed range from 20% to 100% without any thermal damage to the motor winding. The motor shall be flange-mounted type suitable for mounting onto the pump body for driving the pump. Should foot-mounted motor be offered, it should be directly coupled to and mounted on a common rigid platform with the metering pump unit. Where necessary, recesses shall be provided in the base plates to accommodate cables.

3. VALVES AND ACCESSORIES

Each metering pump supplied shall be complete with the following valves and accessories for installing on the pipework :-

- (a) 1 no. of pressure relief valve
- (b) 1 no. of diaphragm pulsation dampener (single end type) on the pump delivery side
- (c) 1 no. of back pressure loading valve

Calibration column, if so specified in the Particular Specification, shall be provided for installation at the suction side of the pump to enable in-situ calibration of the pump over its entire operation range.

Pressure relief valve shall be provided with pipework for discharging to safe and suitable location to be specified.

Valves and accessories supplied shall be manufactured from materials compatible with the chemical solution being handled.

4. PUMP TEST

Metering pumps shall be tested at the manufacturer's works at rated speed and pressure to verify their performance and metering accuracy as follows:-

- (a) Pressure test to 150% of the rate pressure for not less than 30 minutes.
- (b) The steady state flow accuracy shall be within $\pm 1\%$ of rated flow over the specified turndown ratio.
- (c) The flow repeatability shall be within $\pm 3\%$ of rated flow over the specified turndown ratio.
- (d) Deviation from linearity shall not exceed $\pm 3\%$ of rated flow over the specified turndown ratio.

- End of this Specification -