



Contract No.: DC/2003/01
Ngong Ping Sewage Treatment Plant

Water Reuse Facilities
Operation Manual
(Final)

Date : September 2006
Prepared by Kenworth Engineering Limited

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 Ngong Ping Sewage Treatment Works

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1. INTRODUCTION

Before operation of Ngong Ping Sewage Treatment Works (NPSTW), it is recommended to read carefully the Operation Manual and Maintenance Manual.

The information in the **OPERATION MANUAL** of NPSTW can be divided into plant overview and equipment operation information and safety requirements. The operation manual shall be read in conjunction with the 'Detailed Design of Chlorine Dosing System in the Form of Sodium Hypochlorite'. The operational requirement / procedures of individual equipment are included in the equipment operation information section. Last but not the least, the general safety requirement will be discussed.

2. SYSTEM OVERVIEW

2.1. General

Ngong Ping Sewage Treatment Works (NPSTW) was built to provide sewage treatment to sewage generated from the Ngong Ping Area including Po Lin Monastery and the newly built Cable Car Terminal and discharged to Tung Wan and for effluent reuse.

The sewerage system of NPSTW includes preliminary treatment, biological treatment in the form of Sequencing Batch Reactor (SBR), tertiary filtration treatment by dual media filters and ultraviolet disinfection. Water Reuse Facilities were also built in Ngong Ping Sewage Treatment Works (NPSTW).

To fulfill the Specific Conditions of the environmental permit (Application No. VEP-184/2005), the effluent for toilet flushing, controlled irrigation and supply to artificial fishpond shall come from the tertiary treated effluent from the Ngong Ping Sewerage Treatment Works, The tertiary treated effluent shall be chlorinated before being conveyed to the point of usage:

1. at the toilets, including two existing public toilets, a future public toilet to be constructed within the new Public Transport Interchange at Ngong Ping, toilets within the Ngong Ping Sewage Treatment Works, Ngong Ping Cable Car Terminal and Theme Village, for flushing;

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2. at the controlled irrigation system within Ngong Ping Sewage Treatment Works;
3. at artificial fishpond within the Ngong Ping Sewage Treatment Works.

The chlorinated effluent for reuse will be termed "reclaimed water".

The following points are addressed and details can be found in this Operational Manual.

- Measures to ensure that no pollution occurs to the water gathering grounds;
 - Export pipelines are provided to divert Ngong Ping STW's effluent to Tung Wan directly with flow monitoring devices for leakage detection in order to ensure that no pollution occurs to the water gathering grounds.
 - Rate and duration of the irrigation shall be adjusted so that no ponding and surface runoff of reclaimed water shall be occurred.
- Handling procedures and requirements for management of waste and chemicals;
 - Operator should study carefully and understand the Material Safety Data Sheet (MSDS) of chemicals to be used. Chemicals should be properly labeled. They must wear the appropriate protective hand gloves, when handling the chemicals. Please refer to attached Material Safety Data Sheet of NaOCl (at 10%). Bund walls are built to prevent spillage of chemical, i.e. NaOCl solution.
- Monitoring requirements, parameters, locations, arrangements and installations;

The reclaimed water (after chlorination process) should be collected at the Effluent Reuse Storage Tank and analyzed in accordance with the following schedule:

- pH – weekly
- Turbidity – continuous (use of turbidity meter in testing filtrate)
- E. Coli – three times a week
- Chlorine residual – continuous
- Total phosphate – weekly

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In addition, as various water quality parameters of the treated effluent of the tertiary sewage treatment (before chlorination process will also be monitored in accordance with the conditions stipulated in the Discharge Licence issued by EPD, the monitoring results of the following parameters of the treated effluent, which will not be affected by the chlorination process, will also be used for monitoring the quality of reclaimed water.

- BOD₅ – weekly
- Ammonia nitrogen - weekly

Concentration of residual chlorine in Treated Effluent Storage Tank should be monitored and should be equal to or more than 0.5 mg/L. Concentration of residual chlorine can be observed from Chlorine Analyzer in Water Reuse Facilities.

The online residual chlorine analyzer provides real time data of residual chlorine. In any cases that concentration of the residual chlorine is lower than the minimum allowable level, the effluent pumps at Effluent Reuse Storage Tank should be stopped immediately and the supply of reclaimed water would then be halted. Instead of supplying to the users, the reclaimed water will be returned to the Emergency Storage Tank for temporary storage and go for chlorination for further NaOCl dosing. The operator shall check the Effluent Reuse System for normal operation (i.e. to check if any equipment failed and/or NaOCl solution refilling is required). Supply of reclaimed water will resume after the concentration of residual chlorine returns to required level.

Chlorine analyzer should be regularly calibrated to ensure its accuracy. The calibration schedule should be in accordance with the manufacturer's recommendations.

The design standard of the reclaimed water is as follows:

Colour <= 20 Hazen Unit

Ammonia N <= 1 mg/L

Odour <= 100 threshold odour number

Dissolved Oxygen >= 2mg/L

BOD₅ <= 10mg/L

Total SS <= 10mg/L

Turbidity <=10 NTU

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E. coli \leq cfu/100mL
Synthetic detergents \leq 5mg/L

NPSTW shall be operated in fully automatic mode. Nonetheless, operators from DSD shall station in NPSTW during daytime to handle any possible defect and failure of the plant operation, which may affect the water quality of the effluent and the reclaimed water. Real time operation data and alarm signals in cases of plant failure shall be transferred to main control station at Siu Ho Wan Sewage Treatment Works for round-the-clock monitoring and control.

- Contingency measures in case that the effluent from the effluent reuse facilities does not meet the required water quality standards;

In case that effluent from the effluent reuse facilities does not meet the required water quality standards, stored effluent in the Effluent Reuse Storage Tank will be returned to the STW inlet pumping station for further treatment. Then, the operator shall check the Effluent Reuse System for normal operation (i.e. to check if any equipment failed and/or NaOCl solution refilling is required). When the system is resumed, operates the Effluent Reuse System to refill the Effluent Reuse Storage Tank for supply of treated effluent for reuse. Water supply shall be backed up by potable water.

With the online residual chlorine analyzer, real time data of residual chlorine will be obtained. If concentration of the residual chlorine is found lower than the minimum allowable level, the effluent pumps at Effluent Reuse Storage Tank should be stopped immediately and the supply of reclaimed water would then be halted. Instead of supplying to the users, the reclaimed water will be returned to the Emergency Storage Tank for temporary storage and g for chlorination for further NaOCl dosing. The operator shall check the Effluent Reuse System for normal operation (i.e. to check if any equipment failed and/or NaOCl solution refilling is required). Supply of reclaimed water will resume after the concentration of residual chlorine return to required level.

- Control measures to ensure the use of treated effluent for toilet flushing, controlled irrigation and supply to artificial fish pond only;

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Pipelines for supply of treated effluent are generally concealed (underground) and to prevent direct contact with unintended users. This underground arrangement ensures the use of treated effluent for toilet flushing, controlled irrigation and supply to artificial fishpond only.

For "exposed" effluent supply tap(s), warning message as shown in Appendix A are displayed to alert people that water is not for potable consumption, and only for restricted use.

The valves, joints and pipes for transporting the tertiary treated effluent is clearly distinguished from those for potable water or sewage by means of difference in size and colour-coded in purple to avoid potential health and hygiene problems associated with incorrect connection of pipes. In addition, dye-dosing system was also implemented for testing the correctness of the newly connected piping system.

Also, Operator, staff of working in Ngong Ping Sewage Treatment Works and other departments and MTRCL, who are using the reclaimed water, shall be made known that treated effluent usages are restricted for toilet flushing, controlled irrigation and supply to artificial fish pond. Use of the treated effluent for other purpose is strictly prohibited. To this end, a briefing session covering details on the design, operation, health and safety aspects of reclaimed water was conducted by DSD on 19 January 2006 where representatives of WSD, FEHD, ArchSD, DSD, EPD and MTRCL had attended.

- Measures to inform users of toilet facilities that treated effluent is being reused for toilet flushing;

Message shall be displaying at the entrance of toilet facilities that treated effluent is being reused for toilet flushing.

- Administrative measures to minimize the risk of human contact with treated effluent used for controlled irrigation and the supply to artificial fish pond in the Ngong Ping STP and to alert the public that treated effluent is being reused

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Pipelines for supply of treated effluent are coloured-coded in purple (24C33 of BS4800). The pipelines are concealed to prevent direct contact with unintended users. For "exposed" effluent supply tap(s), warning message will be displayed to alert people that water is not for potable consumption, and the water is "reclaimed water" for the designated usage.

Warning message shall be displayed at the point of use to alert people that water is not for potable consumption.

- Other operational requirements including but not limited to normal and emergency procedures, maintenance and monitoring schedules for the effluent reuse system.

The system operations shall also make reference to the Environmental Management Plan of the Ngong Ping STW.

All effluent reuse facilities shall be located within the Ngong Ping STW. Tanks and pumps of the effluent reuse facilities of the Project shall be enclosed within buildings or located underground to minimize the potential noise and odour impacts.

Effluent reuse for controlled irrigation and supply to artificial fishpond shall only be carried out within the Ngong Ping STW. Drip irrigation system shall be used in controlled irrigation to minimize the risk of human contact with treated effluent. The artificial fishpond shall be water proofed. Only ornamental fishes shall be kept in the fishpond and no fish in the fishpond shall be used for human consumption. All discharge from the artificial fishpond shall be conveyed back to the Ngong Ping STW for treatment.

- Monitoring of Groundwater Quality

Monitoring of groundwater quality shall be implemented in accordance with S.4.5.16-4.5.18 of the approved EM&A Manual for Contract No. DC/2003/01 – "Ngong Ping Sewage Treatment Plant, Truck Sewers and Effluent Export Pipeline" submitted under EP No. EP=157/2003 as follows:

To have an early detection of groundwater contamination during operation

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of the sewage treatment plant, it is proposed to monitor the groundwater quality on monthly basis. Water samples will be taken from the installed boreholes inside Ngong Ping Sewage Treatment Plant and the Effluent Export Pipeline. The frequency of monitoring will be reviewed after a period of time and may be increased or decreased if necessary.

The following parameters of groundwater quality will be analyzed:

- 5 day Biochemical Oxygen Demand (BOD₅)
- Ammonia Nitrogen (NH₃-N)
- Nitrate + Nitrite Nitrogen
- E. coli
- pH
- Turbidity
- Total Phosphates
- Oil & Grease
- Synthetic Detergent

All results should be made available to WSD and EPD upon completion of analysis.

2.2. Water Reuse Facilities

The disinfected effluent will be diverted to Emergency Storage Tank No. 5 for temporary storage via the Effluent Reuse Transfer Pumps in Effluent Reuse Pumping Chamber as indicated in Drawing No. PP197/EM/RWP/GA/002 (Sheet 1 to 6). On the other hand, two submersible pumps (effluent transfer pumps) are also located inside the effluent reuse pump chamber. Sodium hypochloride will be added to the disinfected effluent before the effluent enters the chlorine contact tank to attain a residual chlorine level of 0.5 mg/L.

Two submersible type treated effluent pumps are installed for the distribution of the reclaimed water to the distribution network leading to the public toilets and toilets inside Cable Car Terminal and Theme Village. At the same time, two pneumatic pressure vessels are in-place to ensure that the treated effluent pump duty cycles do not exceed 20 starts per hour.

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2.3. Water Reuse System

The six emergency storage tanks are equipped with level sensor, submersible pumps, ejectors and penstocks. Two (No.5 & No.6) of the six tanks are used as temporary storage. Other four emergency storage tanks will serve as the temporary storage tanks when the incoming flow to the STP is extreme high. Portion or all the treated effluent will be discharged into Effluent Reuse Pumping Chamber through Sampling Chamber.

Treated effluent will be pumped to the assigned emergency storage tank for temporary storage and then dosed with sodium hypochlorite (NaOCl) with automatic dosing systems (1 duty, 1 standby) and residual chlorine control for disinfection before being pumped to the Chlorine Contact Chambers (1 duty, 1 standby). Finally reclaimed water will be pumped to the water distribution system with pressure control by two pressure vessels and on-line pressure sensor. The working pressure of the water reuse system will be kept in the range between 2.3 to 3.1 bars by the diaphragm type pressure vessels.

Details of the process and control philosophy refer to the attached Schematic Diagram of The Water Reuse System and Control Philosophy Diagrams of Transfer Pumps and NaOCl Dosing System.

The pump start / turn off and penstock open / close are controlled by level sensors and SCADA automatically. The operation status of the system shown on the LCP and SCADA is given as follows:

Submersible pump and Ejector	- Running
	- Stopped
	- Fault
	- Start
Penstock c/w actuator	- Auto / Manual control status
	- Travelling
	- Opened / closed
	- Open
	- Close
	- Fault

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Total residual chlorine $>0.5\text{mg/L}$ (after one day storage) was determined during the system commissioning and testing period. The concentration of NaOCl solution delivered to NPSTP was about 11.5%. Therefore 11.5% NaOCl content was used in the process design of chlorination.

A dye dosing system is also installed at the water reuse system. Dye solution could be added to the reclaimed water when it is necessary, for instance after new watermain connections are made.

The operators shall follow the instructions provided by the chemical suppliers for handling the chemicals such as sodium hypochlorite and dye. The operation staff shall also pay attention to the emergency procedures in case that the water quality of the re-claimed water cannot meet the requirement. Details and procedures of the emergency measures refer to the Appendix A of this manual. The controlled measure and warning labels & signs for the use of re-claimed water for flushing and irrigation refer to the Appendix A of this manual.

Calibration of residual chlorine monitor shall be done against a laboratory measurement on the same sample that the sensor is measuring for the initial plant start-up and continuous running. A sample shall be collected from the in-line feeding the flow cell and quickly analyzed for residual chlorine concentration. There are immediate and post calibration modes of calibration procedures. Calibration details and procedures of the residual chlorine monitor refer to the attached Manufacturer's manual. The proposed calibration schedule is given below:

- (a) At the initial plant start-up, calibration of residual chlorine monitor shall be carried out bi-weekly.
- (b) After the completion of system commissioning and the running of plant being in normal operation, the calibration period should be conducted on a monthly basis. It depends on real site situation and stability of the plant performance.

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EQUIPMENT OPERATION INFORMATION

3.1. Sodium Hypochloride & Color Dye Storage & Dosing Systems (Effluent Reuse Plant)

3.1.1. Equipment Schedule



10% SODIUM HYPOCHLORITE SOLUTION

Material Safety Data Sheet

Emergency 24 Hour Telephone: CHEMTREC 800.424.9300.

Corporate Headquarters:

Hasa Inc.
23119 Drayton Street
Saugus, California 91350
Telephone • 661.259.5848
Fax • 661.259.1538



HASA 10% SODIUM HYPOCHLORITE SOLUTION
Material Safety Data Sheet MSDS No. 105

IDENTIFICATION OF PRODUCT

Product Name:	POOLCHLOR 1 Chlorinating Liquid for Pool and Spa Sanitization
Common Chemical Names:	Hypochlorite solution sodium salt, sodium hypochlorite
Chemical Names of Ingredients [$>1.0\%$ by weight]:	Sodium hypochlorite, Water
Chemical Family:	Inorganic halogen compound
CAS Registry Number:	7681-52-9
Empirical Formula:	NaOCl
Molecular Weight:	74.45

PHYSICAL AND CHEMICAL PROPERTIES

Vapor Pressure:	12.1 mm Hg at 20°C [12.5% solution]	Flash Point:	Not Applicable.
Weight/Gallon:	9.63 lbs (4.37kg)	pH:	11.2 – 11.4
Density [liquid]:	1.155 at 20°C [68°F]	Odor:	Slight Chlorine
Bulk Density:	Not Applicable.	Boiling Point:	Decomposes
Melting Point:	Not Applicable.	Freezing Point:	-20° Fahrenheit
Physical State:	Liquid Solution	Color:	Straw Yellow
Solubility in Water:	Complete	Stability:	Stable

PHYSICAL HAZARDS

Potential for Fire:	None. Nonflammable and combustible liquid.
Potential for Explosion:	None. Nonflammable and combustible liquid.
Reactivity:	Violent reactions with amines, ammonium aldehyde, ammonium carbonate, aziridine, methanol, phenylacetonitrile, ammonium nitrate, ammonium oxylate, ammonium phosphate, cellulose, ethylene imine. Do not mix acids, aqua ammonia, or other organic or inorganic chemicals with this product.

HEALTH HAZARDS

Signs and Symptoms of Exposure:	Eyes and skin irritation. Chemical burns to broken skin.
Medical Conditions Aggravated by Exposure:	No data available.
Oral [ingestion] LD ₅₀ :	No data available.
Dermal [skin absorption] LD ₅₀ :	No data available.
Inhalation [breathing] LC ₅₀ :	No data available.
Eye Irritation:	Irritating. May cause eye damage.
Skin Irritation:	Mild irritation. Not considered to be a skin sensitizer.
OSHA PEL:	None established.
ACGIH TLV/TWA:	None established.

POTENTIAL ROUTE [S] OF ENTRY

Inhalation [Breathing]:	Unlikely to occur. Vapor may cause irritation to upper respiratory tract.
Dermal [Skin]:	Contact with broken skin may cause burning, blistering, and tissue destruction if not washed off immediately.
Eyes:	Corrosive to eyes.
Ingestion:	Not anticipated. May cause severe chemical burns to esophagus and to stomach lining.

CARCINOGENIC [CANCER POTENTIAL] INFORMATION

National Toxicological Program [NTP] <i>Sixth Annual Report on Carcinogens</i> :	Not listed.
International Agency for Research on Cancer [IARC] <i>Monographs, V. 1-53, Supps. 1-8</i> :	Not listed.
Listed by Federal OSHA as Carcinogens:	Not listed.

Safe Drinking Water and Toxic Enforcement Act of 1986 [Proposition 65, California only]:

Small quantities – less than 100 ppm (parts per million) – of impurities, including bromates, may be found in all chlorinating products, including this product. Bromates are derived from bromides, which are present in sodium chloride (table salt) from which chlorine is manufactured. Additional small quantities of bromates may be generated during the disinfection process. Bromates are known by the State of California to cause cancer when administered by the oral (drinking or ingesting) route. Read and follow label directions and use care when handling or using this product. The US Environmental Protection Agency has established a maximum contaminant level (MCL) for bromates in drinking water at 10 ppb (parts per billion). Application of this product in accordance with label directions at use dilution will not exceed this level.

This warning is provided pursuant to Proposition 65, the Safe Drinking Water and Toxic Enforcement act of 1986, Chapter 6.6 of the California Health and Safety Code, which requires the Governor of California to publish a list of chemicals "known to the state to cause cancer or reproductive toxicity." This list is compiled in accordance with the procedures established under the proposition, and can be obtained on the internet from California's Office of Environmental Health Hazard Assessment at <http://www.oehha.ca.gov>. There are over 700 chemical substances on this list.

GENERAL PRECAUTIONS FOR SAFE USE AND HANDLING

Open containers carefully. Sodium hypochlorite solutions are packaged with vented closures. Do not use containers which are leaking or show evidence of having leaked. Mix only with water. Do not mix with other chemicals. Use clean, dry utensils when mixing. Do not discharge this product or mixtures of this product into lakes, streams, ponds, bays, estuaries, or the ocean. Sodium hypochlorite is toxic to aquatic organisms at very low levels.

PERSONAL PROTECTION AND HYGIENE

Wear goggles or face shield and rubber gloves when handling. Remove and wash contaminated clothing before reuse. Wash hands after handling.

CLEAN-UP OF SPILLS

Store this product in a cool, dry area, away from sunlight and heat to avoid deterioration. In case of spill, flood area where spill has occurred with large quantities of water. With permission from local authorities, diluted product may be flushed to a sanitary sewer. Product may also be absorbed with sand or diatomaceous earth. Absorbed products must be disposed of in accordance with applicable Federal, State, and/or local regulations. Contact HASA, Inc. for guidance.

FIRST AID

Eye Contact:	Flush with water. Remove contact lenses [if applicable]. Hold eyelids open. Continue flushing with water for 15 minutes. Get prompt medical attention.
Skin Contact:	Wash affected area with water for 15 minutes. Get medical attention.
Ingestion [swallowing]:	Drink large quantities of milk or gelatin solutions. If these are not available drink large quantities of water. DO NOT induce vomiting. DO NOT give vinegar or other acids. Get prompt medical attention.

FEDERAL/STATE LISTS/REGISTRATION/S/REPORTING REQUIREMENTS

CERCLA Hazardous Substance [Section 1010 [4], P.L. 96-510]:	RQ=100 lbs [80 gallons for 12.5% solution]
Extremely Hazardous Substance [40 CFR 355, Appendix A]:	Not listed.
Pesticide Product 7 U.S.C. 136 et seq.:	Registered as a pesticide product by Federal EPA.
Toxic Substance under TSCA:	Not reported.
Pesticide Product [various State Laws]:	Registered as pesticide product in states where marked.

MATERIAL CLASSIFICATION

OSHA Hazard Communication Standard, Department of Labor, Occupational Safety and Health Division, 29 CFR 1910.1200:	Irritant
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HASA 10% SODIUM HYPOCHLORITE SOLUTION
Material Safety Data Sheet MSDS No. 105

Hazardous Materials Transportation Regulations, Department of Transportation (Federal) 49 CFR 172.101	
Proper Shipping Description [1 gallon or less]:	Consumer Commodity, ORM-D
Proper Shipping Description [greater than 1 gallon]:	Hypochlorite Solutions, 8, UN1791, P.G. III
National Fire Protection Association NFPA 704 [1990]:	2-0-0
BOCA National Fire Prevention Code/National Building Code [1999 editions]:	Irritant
Standard Fire Prevention Code/Standard Building Code [1997 editions]:	Irritant
Uniform Fire Code/Uniform Building Code [1997 editions]:	Irritant
Uniform Fire Code Standards 79-3, Uniform Fire Code, V. II [1997 edition]:	2-0-0

RETURNABLE CONTAINERS

Returnable (deposit) containers must be resealed and the contents drained therefrom prior to return to the distributor or manufacturer for credit. Do not offer leaking or damaged containers for transportation. Call HASA, Inc. or your distributor for instructions.

Please Note: The information contained herein, while not guaranteed, was prepared by competent technical personnel and is true and accurate to the best of our knowledge and belief. NO WARRANTY OR GUARANTEE, expressed or implied, is made regarding the product performance, product stability, or as to any other condition of use, handling, transportation, and storage. Customer use, handling, transportation, and storage may involve additional safety and/or performance considerations. Our technical personnel will be happy to respond to questions regarding safe handling, storage, transportation and use procedures. The safe handling, storage, transportation and use procedures remain the sole responsibility of the customer. No suggestions for handling, storage, transportation or use are intended as or to be construed as recommendations which may infringe on any existing patents or violate any Federal, State, and/or local law and/or regulation, ordinance, standard, etc. This Material Safety Data Sheet has been prepared by HASA, Inc. staff from test reports and other information available in the public domain.

HASA 10% SODIUM HYPOCHLORITE SOLUTION
 Material Safety Data Sheet MSDS No. 105

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3. EQUIPMENT OPERATION INFORMATION

3.1. Sodium Hypochloride & Color Dye Storage & Dosing Systems (Effluent Reuse Plant)

3.1.1 Equipment Schedule

	Specs Required	Tyco	Remarks
NaOCl Dosing Pump	Capacity: 0.17L/min	JESCO MEMDOS E15	included standard motor pressure gauge at inlet & discharge
	8.4m Head	15LPH @ 10bar	
	Pump Head: PVC	380V/3~/50Hz	
	Diaphragm: PTFE	0.05kW	
	Pressure relief valves included	Mechanical Diaphragm Pump	
Inlet filters included			
No flow sensors			
TEFC motors installed (IP55)		Pressure relief values: 12532000	
		Pulsation damper: PDS80	
		Flowmeter: FLOMAG ICM, DN10	
		Injection valve: d16 (16mm OD) tubing connection PVC	
Residual Chlorine Controller		B&C	
		CL 7685.010 Submersible type, 4 - 20 mA	
Dye Dosing Pump	Capacity: 1.08L/min	JESCO MEMDOS E75	included standard motor pressure gauge at inlet & discharge
	8.4m Head	75LPH @ 10bar	
	Pump Head: PVC	380V/3~/50Hz	
	Diaphragm: PTFE	0.25kW	
	Pressure relief valves included	Mechanical Diaphragm Pump	
Inlet filters included			
No flow sensors			
TEFC motors installed (IP55)		Pressure relief values: 12532000	
		Pulsation damper: PDS80	
		Flowmeter: FLOMAG ICM, DN10	



MB 1 04 02 / 1

General

The MEMDOS E / DX combines the properties of the MEMDOS series working reliably for many years with the latest requirements in metering technology. Due to an improved flexibility and the further development of individual components, it can be integrated even more efficiently in metering processes. Heads and diaphragms are the same as for the existing pumps so that the continuity of spare parts keeping and service is ensured.

Two models of the MEMDOS are available, each with or without microprocessor control. The smaller version can be used for capacities from 0...4 to 0...150 l/h and the larger version for capacities from 0...150 to 0...380 l/h. Pressures are admissible between 4 and 10 bar, depending on the size.

If no control is required for constant metering, the motor is connected directly to the terminal box. In this case, MEMDOS E pumps are used.

Three-phase and a.c. motors are available. To change the metering capacity, either the stroke length can be adjusted mechanically or the speed of the three-phase motor can be controlled by means of a separate frequency converter.

The microprocessor-based MEMDOS DX is used if the pump is to be integrated in controls or automatic control systems. The intelligence of the MEMDOS DX is derived from the well-proved series of MAGDOS DE/DX solenoid metering pumps.

It allows the adaption to a large number of different control signals and system monitoring equipment. It controls the chemical supply in two ways, for example: tank level control with alarm signal and low level indication. The signals required for external activation of the pump can be simple voltage-free closing contacts from water meters or controllers or analog 0(4)...20 mA signals.

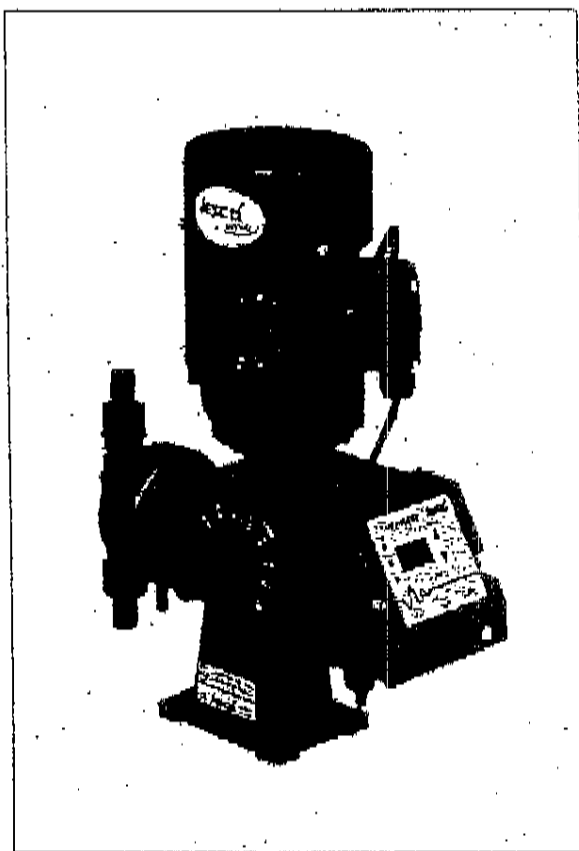
Depending on the version, the MEMDOS DX can be adjusted continuously between 0 and 142 strokes/min. for internal control. A single stroke follows each contact. In addition, the stroke frequency can be changed by pulse division or multiplication.

Metering head

MEMDOS pumps can be equipped with a PVC, PP or stainless steel head. Other materials are available upon request.

The diaphragms are made of chemically and mechanically resistant materials. EPDM with a protective PTFE coat (Teflon) and a textile reinforcement are vulcanized onto a large-surface insertion part.

Suction and discharge valve are fitted with two valve balls each for double sealing.



For media with a viscosity of more than approx. 400 mPa*s spring-loaded single-ball valves should be used (opening pressure approx. 0.1 bar).

Separating chamber

The diaphragm flanges have been designed so that, in the case of a diaphragm rupture due to wear, no chemical enter the gear but is routed downwards through a drain pipe. A leakage probe according to data sheet MB 1 31 01 can be fitted in order to detect the failure and cause the pump to stop.

Drive

To operate the pump three-phase or a.c. motors can be used for MEMDOS E pumps. The intelligent MEMDOS DX pumps with control unit are always equipped with a single-phase a.c. motor.

The gearbox is made of light but inherently stable and high-alloyed cast aluminum. It contains a single-stage worm wheel set running in an oil bath just as the roller bearings. Metering happens while the push rod is displaced by means of an eccentric. The suction stroke is caused by the resetting of the spring.

To set the metering capacity by manual stroke adjustment, the spring-loaded diaphragm rod is locked at the corresponding position. Thus an adjustment range of 1:10 is possible.

Improved changes are always reserved without notice.

JESCO DOSIERTECHNIK GmbH & Co. KG

Diaphragm Metering Pump MEMDOS E / DX



MB 1 04 02 / 2

Control unit

In general the following functions are possible with the control unit:

- Indication of operating states and menu guidance on 3-digit LC display.
- Operating panel with four pressure-sensitive keys and three LEDs.
- Internal control of stroke frequency, continuously adjustable between 0...144 strokes/min., depending on the gear reduction.
- External control by
 - a) voltage-free contacts (mechanical or semiconductors).
 - b) analog 0...20 and 4...20 mA signal.
- External pump stop by voltage-free opening contact
- Warning alarm relay with voltage-free changeover contact (signaling of (almost) low level, life zero error with 4...20 mA, remote switchoff).
- Pulse multiplication for contact control with factor 2 / 4 / 8 / 16 / 32 / 64.
- Pulse division for contact control with divisor 2 / 4 / 8 / 16 / 32 / 64.
- Chemical tank level control with alarm signal and main alarm (pump stops).

Technical data

Types	MEMDOS E / DX 4...156											MEMDOS E / DX 160...380					
	4	8	15	25 ¹⁾	26 ¹⁾	50	75 ²⁾	76 ¹⁾	110	150 ²⁾	156 ¹⁾	160	200	260 ²⁾	300	380 ²⁾	
Capacity at max. pressure	l/h	4	7.5	15	23	24	48	72	73	107	160	162	156	208	263	292	393
Stroke volume	ml/str	2.6			8.5			19			36.5			51.2		54.5	
Max. pressure	bar	10					5			4		10			8		6
Stroke freq.	1/min	26	48	95	142	144	95	142	144	95	142	144	71	95	120	95	120
Diaphragm-ø	mm	52			64			90			120			150			
Hublänge	mm	6			9			10									
Suction lift	mbar	900			800			700			600			450			
Max. ambient temperature ³⁾	°C	40															
Leistung E (3~)	W	50					250					370					
Leistung DX (1~)	W	50					120					250					
Weight plastic	kg	7.4			7.6			10.2			18.0			19.0			
Memdos E		7.4			7.6			10.2			18.0			19.0			
Memdos DX		8.0			9.2			18.2			26.0			31.0			
Weight SS	kg	8.2			8.4			11.0			22.0			23.0			
Memdos E		8.2			8.4			11.0			22.0			23.0			
Memdos DX		8.8			10.0			19.0			30.0			35.0			

¹⁾ Special sizes for 60 Hz operation. Flow rate and stroke frequency data refer to 60Hz operation.

²⁾ Not suitable for 60Hz operation.

³⁾ Max. ambient temperature for PVC metering head 40°C and for PP or stainless steel metering heads 60°C (for a short time 80°C).

Additional fittings

The precision and operational life of metering pumps can be increased considerably if the appropriate fittings are used.

These are among others:

- Double diaphragms which indicate a diaphragm failure and allow metering to be continued for a some time.
- Pulsation dampeners for suction and discharge side.
- ATE servomotors for automatic metering capacity adjustment.

- Approximation initiators for indicating individual strokes.
- Leakage probe for detecting leaking in the case of a diaphragm failure.
- Application-oriented suction lines, also with level control for the medium to be metered.
- Relief valves as safety valves to protect pump and system.

Improved changes are always reserved without notice.

JESCO DOSIERTECHNIK GmbH & Co. KG

Diaphragm Metering Pump MEMDOS E / DX

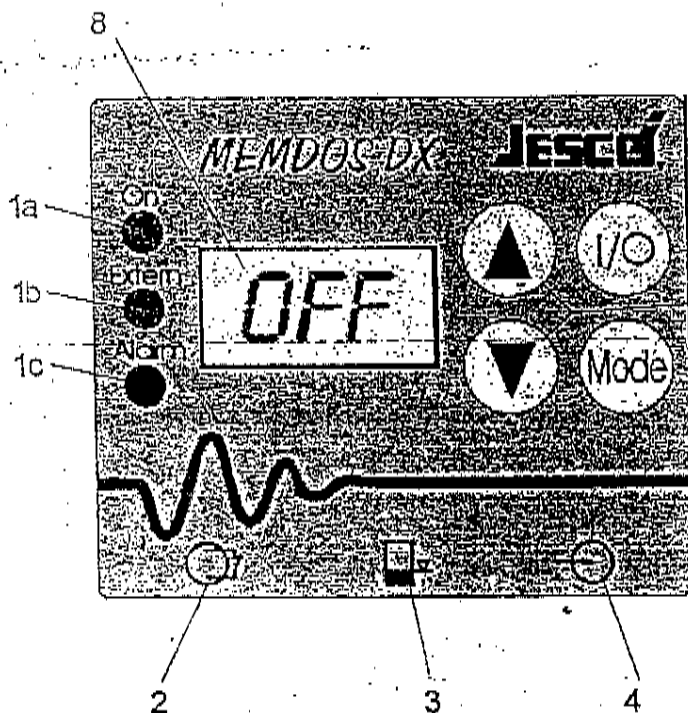


MB 1 04 02 / 3

Technical data of the control unit

Mains voltage	115 or 230V AC, 50/60 Hz
Electrical connection	Safety plug with 2,5 m cable
Power consumption (without motor)	10 W
Insulation class	F
Protective class	IP 65
Pulse for contact activation	min. 30 ms
Voltage at pulse input	5V DC (must be voltage-free for contact making)
Multiplication / division of contacts	1 / 2 / 4 / 8 / 16 / 32 / 64
Load for 0(4)...20 mA input	150 Ohm
Voltage at level connection	5V DC (level probe w. break contact for alarm empty)
Alarm relay: voltage-free changeover contact	250V AC, 2,5 A or 30V DC, 2,5A
Remote pump switchoff	by voltage-free break contact (on site)
Max. admissible ambient temperature	40°C
Digital display	3-digit display for stroke frequency and level state
LEDs for functional display, 3 off	green = in operation, red = trouble, green = external control
Pressure-sensitive keypad	4 keys for programming and operation
Weight	0.8 kg

Operating panel



- 1a Check display "in operation"
- 1b Check display "external control"
- 1c Check display "alarm"
- 2 Remote switchoff
- 3 Level connection
- 4 External control
- 5 Selection of operating mode
- 6 Setting of values
- 7 ON /OFF switch
- 8 Display

Diaphragm Metering Pump MEMDOS E / DX

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4. SAFETY REQUIREMENTS & FIRST AID TREATMENT

4.1 Personal Safety

In general, locations of eye-washer, shower, life buoy, fire-extinguisher, sand bucket, and first aid box, etc. to be highlighted in layout drawing.

4.1.1. Lifting object

- Robust trolley is one of the common tools for transporting heavy loads horizontally.
- Staff shall wear appropriate personal protective equipment to protect themselves from being injured during work, e.g. gloves to protect against cuts, scratches or puncture, safety shoes or boots with steel toe-cap and mid-sole to protect against falling objects and stepping on sharp objects, etc.
- Size up the load and check overall conditions, for instance its shape, dimensions and weight, also check for grease, oil and sharp edges.
- Do not attempt to lift alone if it appears too heavy or awkward. Consider to get assistance from colleagues or use mechanical aid.
- Staff shall plan and check the routing of transportation prior to work. The routing shall be free from obstruction and tripping hazards. Staff shall also plan for the location where and how the object will be let down.
- For lifting and transporting a load, the following procedures are recommended:
 - Make certain of good balance. Feet shoulder-width apart; one foot beside and the other foot behind the load to be lifted;
 - Bend the knees; do not stoop. Keep the back straight. Tuck in the chin and straighten the back;
 - Grip the load with palms of the hands and the fingers. With grip taken, tuck in the chin to make certain the back is straight;
 - Make a trial lift of the load for a few inches;
 - Use the body weight to start the load moving and then lift by pushing up with the legs, making full use of the strongest set of muscles;
 - Keep the arms and elbows close to the body when lifting;
 - Do not twist the body. To change direction shift the foot position and turn the whole body;
 - If the load is to be lowered, bend the knee; do not stoop. To deposit load on a bench, shelf or table, place it on the edge and push it into position.

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4.1.2 Working at height

Working Platform and Ladders

- All open sides of a workplace from which a person is liable to fall by more than 2m shall be protected by guardrails and toeboards. The height of the guardrail shall be between 900mm and 1150mm and the height of the toeboards shall be at least 200mm.
- Working platforms with guardrails and toeboards shall be erected for workplaces at height. If provision of working platform is impractical, all workers employed at the elevated workplaces shall be protected from falling by means of appropriate safety nets, and safety belts and harnesses with lifelines or lanyards properly attached to secured points.
- All workers shall be suitably trained in the use of safety belts and harnesses.
- All equipment shall be regularly inspected for damage and that there is a system of reporting defects to the supervisors.
- All elevated workplaces and working platforms shall be provided with safe and suitable means of access and egress such as stairs, ramps and ladders.
- Breaks in handrailing or fencing for passage of personnel, e.g. landing point of cat-ladders, etc., shall be protected by removable safety chains of suitable length at the top rail level and mid-level.
- Never lean against safety chains.
- Ensure that all safety chains are securely fastened at all times except during passage and remain taut with no more than 700mm of droop. Safety chains are not suitable for wide openings which shall be protected by removable or openable rigid fencing or gate instead.
- All portable ladders used shall meet the following requirements :
 - Securely fixed near the top, or if impracticable, near the bottom;
 - Rest on a firm level footing;
 - Extend at least 1m above landing place, unless other suitable hand hold is provided;
 - Vertical run not to exceed 9m, unless an intermediate landing is provided;
 - Set ladders at a slope of 4 to 1 approximately;
 - The rungs shall be free from moisture, dirt and grease;
 - Always face a ladder when going up or down and use both hands to grasp the rungs for support. Use a tool holster to carry hand to spare hands for

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holding the ladder;

- All portable ladders shall be inspected and maintained at regular intervals with records;
- Never paint wooden ladder as it may conceal defects.
- Never throw materials from height. Use enclosed chutes.
- Works at height shall not be carried out in adverse weather conditions, e.g. high winds or when surfaces may be slippery due to rain.
- Safety nets and properly constructed catch fans shall be erected to prevent any person from being injured by falling objects.

Mobile Scaffolds

- A scaffold shall be completed with full width working platform, accessing ladders, handrailing and toeboards. After it has been erected, it shall be inspected by competent person and recorded at regular intervals.
- Every wheels of a mobile scaffold shall be fitted with a locking device that cannot be accidentally released. All wheels shall be securely locked before the scaffold is used.
- The wheels shall be securely fixed to the uprights so that they cannot fall out even when they are not in contact with the ground.
- The scaffold shall not be moved when people or materials are on the working platform.
- The scaffold shall only be moved at the base.
- The ratio of height to the least base dimension shall not exceed 3:1 for outdoor work, or 3.5:1 for indoor work, unless tied to suitable fixed point.
- Minimum width of the scaffold at base shall be 1.2m.
- The working areas shall be fenced off and a suitable warning notice shall be erected to warn people and traffic.

Personal Protective Equipment (PPE)

- The personal protective equipment for working at height include safety belts, full body safety harnesses, fall arrestors, lifelines, lanyards and shock absorbers.
- Staff working at height shall be provided with safety belt or other PPE as appropriate. The staff shall wear and use the PPE properly at all times during work.
- Before works commence, suitable type of safety belt and anchorage system

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shall be selected. The "Guidance Notes on Classification and Use of Safety Belts and their Anchorage Systems" publishing by Labour Department has suggested the following common methods of anchorage of safety belt:

- Fixed anchorage
- Vertical independent lifeline
- Horizontal lifeline

4.1.3 Lock out procedure & permit to work

- Security control shall be maintained at all plants, whether they are manned or unmanned. The entrance of a plant shall always be locked when the plant is unattended.
- Any damage at the boundary wall or wire mesh fencing shall be repaired immediately.
- If there is any renovation work being carried out in the plant, the daily in-and-out of the contractor's staff and workers shall be controlled and recorded. Nobody can work in the plant without a permit to work.
- The officer-in-charge shall keep records of visitors to the sewage treatment facilities and pumping stations.
- The officer-in-charge shall be aware of the total number of persons within the plant all the times including DSD's staff, contractor's staff and visitors.

4.1.4 Working on electrical equipment or power supply

General Electrical Precaution

- Before undertaking work on the electrical controls or drives, disconnect power and place a notice to advise others of the type of the work in process.
- Ensure all necessary grounds are in place and solid.
- Do not disconnect or disable ground connection.
- Follow all electrical regulations where required by electrical engineering trades.

Safety precautions for work on low voltage installation

(1) Work on low voltage installation

- Where practicable work on low voltage equipment should be carried out after the equipment has been isolated.

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- Where serious inconvenience would arise from isolating circuits, adequate precautions should be taken to avoid danger for work involving the handling of energized parts or working within touchable distance, direct or indirect of energized parts at low voltage. The following precautions are to be taken:
 - (i) Work on energize low voltage conductors or equipment should be undertaken by the registered electrical workers or in their presence; and
 - (ii) Screen or other means to avoid danger from inadvertent contact with energize conductors should provide.
- Danger cannot be avoided for work on energized equipment, the electrical equipment should be isolated and verified deed with a voltage indicator; a permit-to-work should be issued.
- Where is to be done on dead low voltage electrical equipment, controlled by a circuit breaker or switch, the circuit breaker or switch should be locked off where practicable and a warning notice for repair affixed. The keys for lock issued to lock off circuit breaker or switch should be kept under the control of a responsible person.

(2) Precautions for supply connection

Temporary or permanent supply should not be connected to a circuit unless:

- the circuit and its final circuits, if any, are completed and properly terminated, or
- the part(s) of the circuit or its final circuit which have not been completed, are disconnected or isolated with its associated isolating devices locked off.

(3) Precautions for major alteration

Before a major alteration is carried out on a circuit such repositioning a circuit, the circuit should be either:

- Disconnected from the supply source at the distribution board concerned; or
- Isolated with the isolating device locked off or its operation handle removed. The key or the handle, being non-interchangeable with any others with is used for a similar purpose for other parts of the installation, should be kept by the responsible person.

Switchroom/Substation

(1) Facilitates for locking

- Every switch room should have suitable means of entrance / exit, which should be so arrange as to prevent unauthorized entry but give authorized

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person ready access at all time. For the purpose of preventing unauthorized entry, or access to low voltage installations, the display of suitable warning notice is acceptable provide that the equipment is not readily accessible to the general public.

- Where an entrance or exit of a switchroom/substation is provided with locked doors or gate, the arrangement of the lock should be such that it requires a key to open the door or gate from outside.

(2) Prohibition of storage

Switch room/ substation, other than the tools used for the operation and maintenance of the switchgear inside it, must not be used for storage purposes.

4.1.5 Working on mechanical equipment

Mechanical Precaution:

- Prior to undertaking any mechanical maintenance repair, installation, etc, SWITCH OFF, and disconnect power before proceeding.
- Personnel must wear the appropriate protective safety attire and remove loose clothing, jewelry etc.
- Never operate an engine driven unit in an explosive atmosphere, near combustible materials, or where insufficient ventilation exists unless specific provision has been made regarding the power unit so as to prevent possible injury and damage. Be certain any other power unit is safe for the area in which it is to be operated.
- Always be sure that the unit is on a secure footing and keep the immediate power unit area free of all unauthorized personnel. If the power unit is sitting beside a pit, be sure it is well anchored so that it does not fall in.
- Be sure that the power unit, pump, wiring and piping materials and installation are suitable for the liquid being pumped, and comply with all applicable codes and regulations.
- Use replacement parts supplied by the manufacturer only.
- Do not run a pump dry. Always fill the pump body with liquid before starting the pump.
- Do not restrict the flow through a pump such as with a closed discharge valve or 'starved' suction line. Harmful heat build up will result. If it is necessary to restrict the flow for longer than 5 minutes, either the pump must be stopped or a discharge by-passed line installed to keep liquid temperature below maximum recommended operating temperatures.

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4.1.6 Working on chemical plant

Chemicals Handling Precautions

Study carefully and understand the Material Safety Data Sheet (MSDS) of all chemicals to be used in the SHWSTP. Chemicals and hazardous substances shall be properly labelled in accordance with the requirements of the Factories and Industrial Undertakings (Dangerous Substances) Regulations.

Staff who are in the use of liable to come into contact with chemicals or hazardous substances shall be made known of the information and safety precautions for transportation, storage, handling, use and disposal of the substances. They shall also be informed of the restrictions about mixing the chemicals and hazardous substances with other substances. They must wear the appropriate protective safety attire, eye goggle and hand gloves when handling the chemicals.

General information in chemical handling shall be referred to the "Hazards During Chemicals in Use and Safety Guidelines" published by Labour Department,

Specific information for chemical handling shall be referred to the MSDS for individual chemical to be used in this STP

Protection and Spill Containment:

- Ventilate area.
- Use specified protective equipment.
- Contain and absorb on absorbent material.
- Place in waste disposal container.
- Flush area with water.
- Wet area may be slippery.
- Spread sand/grit.

Handling and Storage

Operators must understand the nature of the chemicals and should not mix acid with alkaline materials, and should not add water to exothermic chemicals. Exothermic chemicals should be added in portion to water.

Keep the chemicals in sealed bags or containers and in cool room. Do not freeze. If frozen, thaw and mix completely prior to use.

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4.2 Safe Working in Confined Spaces

To ensure the safety in working in a confined space, the workers shall strictly follow the safety requirements as stated below and the guidelines issued by the government. Also, the "Code of Practice – Safety and Health at Work in Confined Spaces" published by Labour Department is attached in Appendix D for reference.

- No one shall enter a confined space unless:
 - (i) A risk assessment report in respect of the confined space has been prepared by a competent person.
 - (ii) All necessary safety precautions in relation to the hazards identified in the risk assessment report have been taken. "Competent person" means a person who is either a registered safety officer or has successfully completed a safety training course approved by the Labour Department, and has at least one year's relevant post-qualification experience.
 - (iii) He is a certified worker. "Certified worker" means a person who has successfully completed a safety training course approved by the Labour Department.
 - (iv) Every piece of mechanical equipment in the confined space, which is liable to cause danger, has been disconnected from its power source and with its power source locked out.
 - (v) Every pipe or supply line of which the contents are liable to create a hazard has been properly blanked off.
 - (vi) The confined space has been tested to ensure the absence of any hazardous gas and no deficiency or enrichment of oxygen.
 - (vii) The confined space has been adequately purged and sufficiently cooled and ventilated, having regards to the circumstances of the particular confined space, to ensure that it is a safe workplace.
 - (viii) Adequate supply of respirable air and effective forced ventilation have been provided and maintained inside the confined space.
 - (ix) A person is stationed outside the confined space for maintaining communication with the workers inside.
 - (x) Effective steps have been taken to prevent an ingress to the confined space of hazardous gas, vapour, dust or fume, and an in-rush into the confined space of free flowing solid or liquid.
 - (xi) There is no possibility of a cave-in of materials

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- The length of time that a worker can safely stay in the confined space shall be determined before works commence and specified in the permit-to-work. No one shall stay in the confined space longer than the pre-determined time.
- All entrances to the confined spaces shall be securely fenced off and warning signs erected conspicuously indicating that no unauthorized entry is permitted. In the case of ground openings, suitable measures shall be taken to avoid falling of objects into the confined space.
- Appropriate procedures to deal with any serious and imminent danger to workers inside a confined space shall be formulated and implemented. Arrangements for emergency rescue will depend on the nature of the confined space, the risks identified and the likely nature of the emergency rescue. All members of the rescue team shall be properly and adequately trained.
- Effective means of communication between the workers inside confined space and the outside shall be established and maintained.
- The following equipment shall be provided and kept readily available:
 - (i) Sufficient supply of suitable approved breathing apparatus.
 - (ii) Sufficient intrinsically safe lamp or torch.
 - (iii) Safety harnesses and lifelines for rescue operations.
 - (iv) A stretcher and resuscitation equipment.
 - (v) An audio and visual alarm for use of the workers inside the confined space to alert those outside.
 - (vi) First aid facilities.
 - (vii) Safety helmets and bump caps.
- The air within the confined space shall be checked using a multi-gas detector suitable for checking oxygen content and the presence of gases which are hazardous to health, and flammable gases such as methane and propane. The atmosphere shall be continuously monitored throughout the period of stay in the confined space.
- Matches or lighters shall not be allowed to be taken into a confined space.
- No smoking or naked light shall be allowed in a confined space or near openings leading to it.
- Cylinders of oxygen or other dangerous gases shall not be taken into confined spaces.
- Suitable and sufficient fire fighting equipment shall be provided.
- All electrical equipment brought into the confined space where there is a possibility of accumulation of explosive and flammable gas shall be of intrinsically-safe type
- Alarm shall be raised at once in a gassing incident. Immediately send someone

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to summon the rescue team and inform the person-in-charge. No one shall enter such a space without wearing breathing apparatus.

4.2.1 Oxygen deficiency

Places having an enclosed nature, such as underground sewer, manholes, excavations, sumps, inspection pits, some enclosed rooms (particularly plant rooms) and compartments within them, including some cellars and interiors of machines, plant or vehicles, and other places such as open-topped tanks and vats, wells, closed and unventilated or inadequately ventilated rooms, may by reason of its construction, location or contents give rise to the risks of oxygen deficiency.

The threats against the safety and health of workers due to loss of consciousness or asphyxiation arising from gas, fume, vapour or the lack of oxygen.

4.2.2 Chemical of sewer gases

Gas risk areas in sewage treatment facilities and pumping stations are areas where accumulation of flammable and combustible gases is likely to be present, e.g. the inside and the vicinity of gas holders, digestion tanks, pipe gallery and inlet works, etc. Smoking in these areas shall be strictly forbidden.

Prior to any work is carried out in gas areas, the following safety precautions shall be observed and implemented:

- Normally work involves naked flame shall not be allowed.
- Concentration of the combustible gases shall be checked and continuously monitored.
- Adequate ventilation shall be maintained.
- Only spark proof tools shall be used.
- The electrical equipment used in the work shall be of explosion proof type.
- All cabling work and accessories shall be of flameproof construction. These include the connections, termination boxes and cable glands, etc
- All metallic parts shall be continuously and equipotentially bonded.
- The electrical circuit control components shall preferably be located outside the gas risk area.

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4.2.3 Procedure when explosive hazard condition exists

There are 2 hazardous areas are identified, viz. Zone 1 and Zone 2. The electrical installations in these areas are complied with the requirements for their Hazardous Area classification.

**Operational Manual of Treated Effluent Reuse in
Ngong Ping Sewage Treatment Plant and Public Toilets**
(Supplementary Information)

		Remarks
1.	Scope of Reuse of Treated Effluent	
1.1	<p>The reuse scheme will utilize the effluent from Ngong Ping Sewage Treatment Plant (NPSTP). The effluent from NPSTP will be treated further by chlorination, before being conveyed to the point of usage :</p> <ol style="list-style-type: none"> 1. at the toilets, including two existing public toilets, a future public toilet to be constructed within the new Public Transport Interchange at Ngong Ping, toilets within the Ngong Ping Sewage Treatment Plant, Ngong Ping Cable Car Terminal and Theme Village, for flushing. 2. at the controlled irrigation system within Ngong Ping Sewage Treatment Works. 3. at artificial fish pond within the Ngong Ping Sewage Treatment Works. <p>The chlorinated effluent for reuse will be termed "reclaimed water".</p>	
2.	Measures to ensure that no pollution occurs to the water gathering ground.	
2.1	Rate and duration of the irrigation shall be adjusted so that no ponding and surface runoff of reclaimed water shall be occurred.	To address WSD's comment: "It is suggested that measures should be implemented to minimize surface runoff from irrigation to prevent pollution of the water gathering?"


<p>2.2</p>	<p>Monitoring of ground water quality shall be implemented in accordance with s. 4.5.16 – 4.5.18 of the approved EM&A Manual for Contract No. DC/2003/01 – “Ngong Ping Sewage Treatment Plant, Truck Sewers and Effluent Export Pipeline” submitted under EP no. EP-157/2003. The details are recaptured as follows:</p> <p>To have an early detection of groundwater contamination during operation of the sewage treatment plant, it is proposed to monitor the groundwater quality on monthly basis. Water samples will be taken from the installed boreholes inside Ngong Ping Sewage Treatment Plant and the Effluent Export Pipeline (location of boreholes shown on drawings no. OM/01 – OM/04). The frequency of monitoring will be reviewed after a period of time and may be increased or decreased if necessary.</p> <p>The following parameters of groundwater quality will be analysed:</p> <ul style="list-style-type: none"> - Biochemical oxygen demand (BOD₅) - Ammonia nitrogen (NH₃-N) - Nitrate + Nitrite Nitrogen - E.coli - pH - Turbidity - Total phosphates - Oil & grease - Synthetic detergents <p>DSD will take up the groundwater quality monitoring work for both the Ngong Ping Sewage Treatment Plant and the Effluent Export Pipeline. All results should be made available to WSD and EPD upon completion of analysis.”</p>	<p>To address EPD's comment: "as boreholes should have been sunk around the boundary of the sewage compound to monitor the quality of the underground water, the Manual should therefore make reference to this arrangement as part of the monitoring system, particularly for the controlled irrigation within the sewage plant."</p>
<p>3.</p>	<p><i>Handling procedures and requirements for management of waste and chemicals</i></p>	
<p>3.1</p>	<p>Operator should study carefully and understand the Material Safety Data Sheet (MSDS) of chemicals to be used. Chemicals should be properly labelled. They must wear the appropriate protective hand gloves when handling the chemicals. Please refer to the MSDS of NaOCl (at 10%) attached to the previously submitted Manual.</p>	

3.2	The storage tanks of NaOCl shall be housed inside a building, where a bund wall will be built to confine the spillage. No chemical waste will be produced.	To address EPI's comment: "Apart from safety aspect, please also advise how to handle the chemicals to prevent spillage or leakage and how to handle / dispose of the waste (including chemical waste, etc) properly." NOC is required to add the bund wall. (Details to be discussed with ST2.)
4.	Monitoring requirements, parameters, locations, arrangements and installations	
4.1	Grab sample of reclaimed water will be collected at the Effluent Reuse Storage Tank of the Water Reuse Facilities (please refer to the location plan of drawing no. OM/05) for water quality monitoring. The following parameters will be analysed with frequency as shown: - pH : weekly - Biochemical oxygen demand (BOD ₅) : weekly - Turbidity : daily - Coliform : daily - Chlorine residual : twice a day - Ammonia nitrogen (NH ₃ -N) : weekly - Total phosphate : weekly	To address WSD's comment: "Please elaborate the monitoring plan including sampling location and frequency, and the monitoring requirement for test parameters other than the total residual chlorine." To address WSD's comment: "Please consider increasing the frequency of measuring total residual chlorine in Water Reuse Facilities once a day to more frequent interval for quality monitoring."
4.2	On-line residual chlorine analyser is installed at the end of the Chlorine Contact Tank of Water Reuse Facilities for controlling chlorine dosing to ensure the water quality. An on-line turbidimeter is installed at downstream of Tertiary Filter of NPSTP to monitor the effluent quality.	To address WSD's comment: "Please advise apart from the chlorine analyser, are there any other on-line monitoring instruments to be installed for water quality monitoring."

4.3	<p>Water quality standards for effluent from NPSTP are listed below:</p> <p>Colour ≤ 20 Hazen Unit Ammonia N ≤ 1 mg/l Odour ≤ 100 threshold odour number Dissolved Oxygen ≥ 2 mg/l BOD₅ ≤ 10 mg/l Total SS ≤ 10 mg/l Turbidity ≤ 10 NTU E.coli ≤ 100 cfu/100ml Synthetic detergents ≤ 5 mg/l</p> <p>The effluent coming from NPSTP will further undergo chlorination process, after which the effluent for reuse will contain total residual chlorine of greater than or equal to 0.5 mg/l.</p>	<p>To address WSD's comment "It is suggested that a detailed monitoring plan and relevant water quality standards should be included in the operation manual for ease of reference."</p>
4.4	<p>[Calibration and maintenance of chlorine analyser to ensure its accuracy and precision – to be advised later after checking with Contractor]</p>	<p>To address WSD's comment "It is not clear about the arrangement for the calibration and maintenance of the chlorine analyser to ensure its accuracy and precision"</p>
5.	<p><i>Contingency measures in case that the effluent from the effluent reuse facilities does not meet the required water quality standards</i></p>	
5.1	<p>NPSTW shall be operated in fully-automatic mode. Nonetheless, operators from DSD shall station in NPSTP during daytime to handle any possible defect and failure of the plant operation which may affect the water quality of the effluent and the reclaimed water. Real time operation data and alarm signals in cases of plant failure shall be transferred to main control station at Siu Ho Wan Sewage Treatment Works for round-the-clock monitoring and control.</p>	
5.2	<p>The quality of the effluent from NPSTP will be monitored to ensure the effluent supply to the Reuse System is of required quality. The quality of the treated effluent stored at Effluent Reuse Storage Tank shall be further monitored according to the schedule as described in s. 4 above.</p>	

5.3	<p>With the on-line residual chlorine analyser, real time data of residual chlorine will be obtained. If concentration of the residual chlorine is found lower than the minimum allowable level, the effluent pumps at Effluent Reuse Storage Tank should be stopped immediately and the supply of reclaimed water would then be halted. Instead of supplying to the users, the reclaimed water will be returned to the Emergency Storage Tank for temporary storage and go for chlorination for further NaOCl dosing. The operator shall check the Effluent Reuse System for normal operation (i.e. to check if any equipment failed and/or NaOCl solution refilling is required). Supply of reclaimed water will resume after the concentration of residual chlorine returns to required level.</p>	<p>To address WSD's comment: "Please elucidate the operation mode if the quality of treated effluent is stored in the effluent storage tank and sampled for water quality measurement before distribution as non-conforming effluent will be returned to the inlet work of further treatment"</p> <p>To address WSD's comment: "What are the criteria for determining that the effluent does not meet the required water quality standards? For example, if the total chlorine residual of the treated effluent falls below 0.5 mg/l, please advise whether the effluent will be returned for further treatment"</p>
5.4	<p>If the quality of the effluent fails to meet the standard in parameters other than residual chlorine, the effluent pumps at Effluent Reuse Storage Tank should be stopped immediately to halt the supply. Meanwhile, the feeding of effluent from NPSTP to the Water Reuse Facilities will also be halted by stopping the feed pump at the Emergency Storage Tank. The retained effluent at the Effluent Reuse Storage Tank and the Emergency Storage Tank shall be returned to the NPSTP for further treatment. Operators shall check the NPSTP for normal operation and inform WSD and the administration departments / offices of public toilets the suspension of supply of reclaimed water. When the system is resumed, the reclaimed water will be stored inside the Effluent Reuse Storage Tank. Water sampling and testing shall be carried out to ensure that the quality of the reclaimed water meets the required water quality standards before the supply resumes.</p>	<p>[Contact for responsible person of STP, WSD and other administration departments / offices of public toilets should be included.]</p>
6.	<p><i>Control measures to ensure the use of treated effluent for toilet flushing, controlled irrigation and supply to artificial fish pond only</i></p>	<p>[To be agreed/ carried out by DSD (supply side), WSD (distribution) and administration department of Public Toilet (users)]</p>

6.1	All the frontline workers and operators of the system shall be made known that reclaimed water is reused for (a) toilet flushing, (b) controlled irrigation and (c) supply to artificial fish pond only, and the use of reclaimed water for other purposes is strictly prohibited. Training should be provided, particular before the reclaimed water was first put in use.	
6.2	The valves, joints and pipes for transporting the reclaimed water is clearly distinguished from those for potable water or sewage by means of difference in size and colour-coded (colour code 24C33 of BS4800) to avoid potential health and hygiene problems associated with incorrect connection of pipes.	To address EPD's comment "Colour coding of Transporting Pipe, etc." Please advise what is the recommended colour of the pipe, joint, valve, etc.
6.3	The words "RECLIMED WATER" shall be clearly inscribed on equipment tags and the top surface of underground appurtenances and storage tanks.	
6.4	Accurate and updated as-built drawings of the reclaimed water systems showing valve locations, outlets location and appropriate detailed information, shall be properly kept by the administration department.	
6.5	Inspections are required when the public toilet is first connected to the reclaimed water distribution system. If necessary, dyes shall be added to the reclaimed water at the Water Reuse Facilities before the first discharge to intended water supply point to verify the correct connection at the distribution system. The administration department shall conduct regular inspection of the reclaimed water system to verify proper connections, and to ensure proper use of reclaimed water.	
6.6	Volume of reclaimed water for each toilet shall be recorded. The administration department shall analyze the volume of consumption regularly. Irregularities in consuming reclaimed water should be traced to detect any misconnection or misuse.	
6.7	Rejected or discarded reclaimed water shall be discharged directly to the sewage system.	

<p>6.8</p>	<p>An adequate number of warning signs shall be posted at prominent locations at the Water Reuse Facilities, near the fish pond and at the irrigation system where the reclaimed water is accessible to operators or visitors. The warning sign is shown on Figure no. 1</p>  <p>RECLAIMED WATER - DO NOT DRINK 「再造水」- 請勿飲用</p>	
<p>6.9</p>	<p>Same warning signs as Figure no. 1 shall be fixed to the reclaimed water valves, including the distribution pipeline to the public toilets and any outlets, such as reclaimed water tanks and near flushing system inside toilets, to warn the operators and public that the reclaimed water is not intended for drinking.</p>	
<p>7.</p>	<p><i>Measures to inform users of the toilet facilities that treated effluent are being reused for toilet flushing</i></p>	<p>[To be agreed/ carried out by DSD (supply side), WSD (distribution) and administration department of Public Toilet (users)]</p>
<p>7.1</p>	<p>Advisory notice as shown on Figure no. 2 shall be displayed at prominent locations of toilet facilities to inform the users that reclaimed water is being used for toilet flushing.</p>	
<p style="text-align: center;">注意</p> <p style="text-align: center;">本廁所現已使用由昂坪污水處理廠供應的「再造水」作沖廁之用</p> <p style="text-align: center;">Attention</p> <p style="text-align: center;">This toilet is using "Reclaimed Water" supplied from Ngong Ping Sewage Treatment Works for toilet flushing</p>		
<p>8.</p>	<p><i>Administrative measures to minimize the risk of human contact with treated effluent used for controlled irrigation and the supply to artificial fish pond in the Ngong Ping Sewage Treatment Plant and to alert the Public that treated effluent is being reused</i></p>	<p>[To be agreed/ carried out by DSD (supply side), WSD (distribution) and administration department of Public Toilet (users)]</p>

<p>8.1 <u>Controlled Irrigation inside NPSTP</u></p> <ul style="list-style-type: none"> - The rate and/or duration of applying reclaimed water to the planting areas shall be adjusted to avoid ponding of the reclaimed water and surface runoff outside NPSTP. - Timer shall be set, if practically possible such that the irrigation is carried out in early morning and/or evening when there are fewer operators and visitors in NPSTP - Advisory notice shall be displayed at planting area using reclaimed water. 	
<p style="text-align: center;"><u>注意</u> 本園景地帶現已使用「再造水」作有限制灌溉之用</p> <p style="text-align: center;"><u>Attention</u> This area is using "Reclaimed Water" for controlled irrigation This fish pond is using "Reclaimed Water"</p>	
<p>8.2 <u>Fish Pond</u></p> <ul style="list-style-type: none"> - The fish pond filled with reclaimed water shall be fenced off to restrict access. The rate of the inflow to the fish pond shall be adjusted to prevent overflowing of reclaimed water to the surrounding and to prevent windblown spray of reclaimed water. - Advisory notice shall be displayed next to the fish pond. 	
<p style="text-align: center;"><u>注意</u> 本魚池現已使用「再造水」</p> <p style="text-align: center;"><u>Attention</u> This fish pond is using "Reclaimed Water"</p>	

8.3	<u>Warning Signs</u> Warning signs as on Figure no. 1 shall be posted at prominent locations at the Water Reuse Facilities, near the fish pond and at the irrigation system where the reclaimed water is accessible to operators or visitors.	
8.4	<u>Training to operation and maintenance personnel</u> Operation and maintenance of the reclaimed water systems, including valves and outlets, shall be performed by personnel who have completed appropriate training.	
8.5	Guideline for Operation and Maintenance of the reclaimed water system shall be distributed to the frontline workers who have greater chance to come into contact with the reclaimed water. Guidelines shall contain, but not limited to the following information <ul style="list-style-type: none">a) Direct contact with reclaimed water shall be avoided as far as practicable.b) Wash thoroughly after coming into contact with the reclaimed water.c) Do not use the reclaimed water other than the designated purposes.d) Wastage of reclaimed water shall be carried out in a manner to minimize aerosol formation, especially at the locations near outdoor public eating and drinking facilities.e) Rejected or discarded reclaimed water shall be discharged directly to the sewage system.	

REVISIONS :

- 01. DATE MADE
- 02. DRAWN BY
- 03. CHECKED BY
- 04. DESIGNED BY
- 05. APPROVED BY

NOTE

- 1. PRESSURE OVERHAUSE SPECIFIED.
- 2. ALL LEVELS ARE IN MFD

No.	Description	By	Date
1	AS PER O&M LAYOUT OF 2003/04	AV	2004
2	GENERAL REVISION	AV	2004
3		AV	2004

IRVIA
Kenworth-Watfield Joint Venture

Client
Kier-Lescher-Kenworth Joint Venture

Contractor
ARUP
Ove & Arup Partners Hong Kong Limited

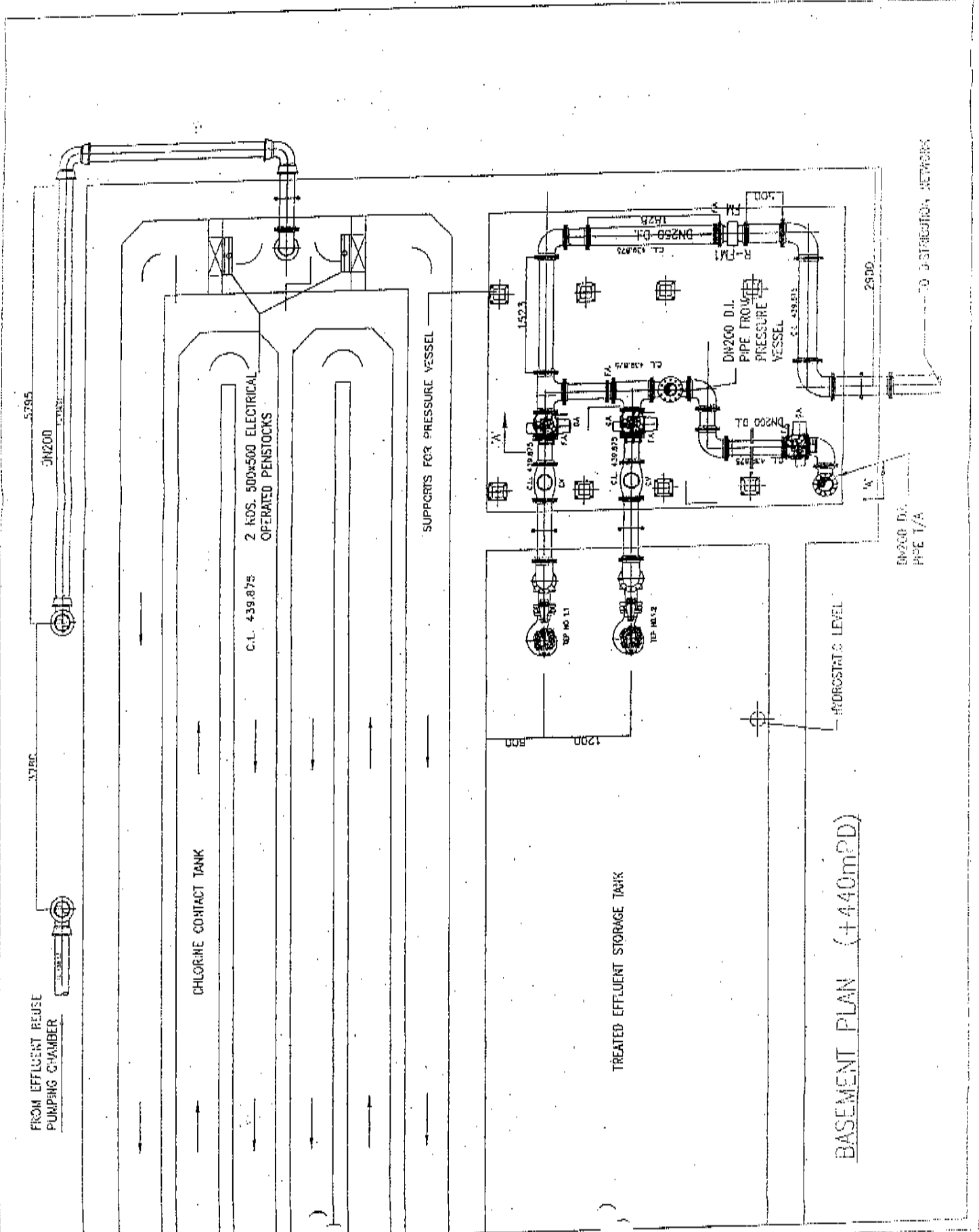
Project No.
CONTRACT NO DC/2003/01

Project Name
KINGING POND SEWAGE TREATMENT PLANT, TRUNK SEWERS AND EFFLUENT EFFLUENT PIPELINE

Sheet No.
EAW PLANT LAYOUT FOR WATER REUSE FACILITIES (Sheet 1 of 6)

NO.	DATE	BY	DESCRIPTION
1	12/10/06	AV	ISSUED FOR CONSTRUCTION

APPROVED FOR CONSTRUCTION
DATE: 12/10/06
BY: AV



BASEMENT PLAN (+440mPD)

LEGEND :

- 1/2" SFT. WIRE
- 3/4" BRASS WIRE
- 1/2" FLANGE W/ 2" HOLES
- 1/2" FLANGE W/ 4" HOLES
- 1/2" FLANGE W/ 6" HOLES
- 1/2" FLANGE W/ 8" HOLES
- 1/2" FLANGE W/ 10" HOLES
- 1/2" FLANGE W/ 12" HOLES
- 1/2" FLANGE W/ 14" HOLES
- 1/2" FLANGE W/ 16" HOLES
- 1/2" FLANGE W/ 18" HOLES
- 1/2" FLANGE W/ 20" HOLES
- 1/2" FLANGE W/ 22" HOLES
- 1/2" FLANGE W/ 24" HOLES
- 1/2" FLANGE W/ 26" HOLES
- 1/2" FLANGE W/ 28" HOLES
- 1/2" FLANGE W/ 30" HOLES
- 1/2" FLANGE W/ 32" HOLES
- 1/2" FLANGE W/ 34" HOLES
- 1/2" FLANGE W/ 36" HOLES
- 1/2" FLANGE W/ 38" HOLES
- 1/2" FLANGE W/ 40" HOLES
- 1/2" FLANGE W/ 42" HOLES
- 1/2" FLANGE W/ 44" HOLES
- 1/2" FLANGE W/ 46" HOLES
- 1/2" FLANGE W/ 48" HOLES
- 1/2" FLANGE W/ 50" HOLES
- 1/2" FLANGE W/ 52" HOLES
- 1/2" FLANGE W/ 54" HOLES
- 1/2" FLANGE W/ 56" HOLES
- 1/2" FLANGE W/ 58" HOLES
- 1/2" FLANGE W/ 60" HOLES
- 1/2" FLANGE W/ 62" HOLES
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- 1/2" FLANGE W/ 66" HOLES
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- 1/2" FLANGE W/ 70" HOLES
- 1/2" FLANGE W/ 72" HOLES
- 1/2" FLANGE W/ 74" HOLES
- 1/2" FLANGE W/ 76" HOLES
- 1/2" FLANGE W/ 78" HOLES
- 1/2" FLANGE W/ 80" HOLES
- 1/2" FLANGE W/ 82" HOLES
- 1/2" FLANGE W/ 84" HOLES
- 1/2" FLANGE W/ 86" HOLES
- 1/2" FLANGE W/ 88" HOLES
- 1/2" FLANGE W/ 90" HOLES
- 1/2" FLANGE W/ 92" HOLES
- 1/2" FLANGE W/ 94" HOLES
- 1/2" FLANGE W/ 96" HOLES
- 1/2" FLANGE W/ 98" HOLES
- 1/2" FLANGE W/ 100" HOLES

1	AT THE LAST CHECK OF PROJECT	DATE	BY
2	GENERAL REVIEWER	DATE	BY
3	DESCRIPTION	DATE	BY

KELCO
Kenworth - Wetfield Joint Venture

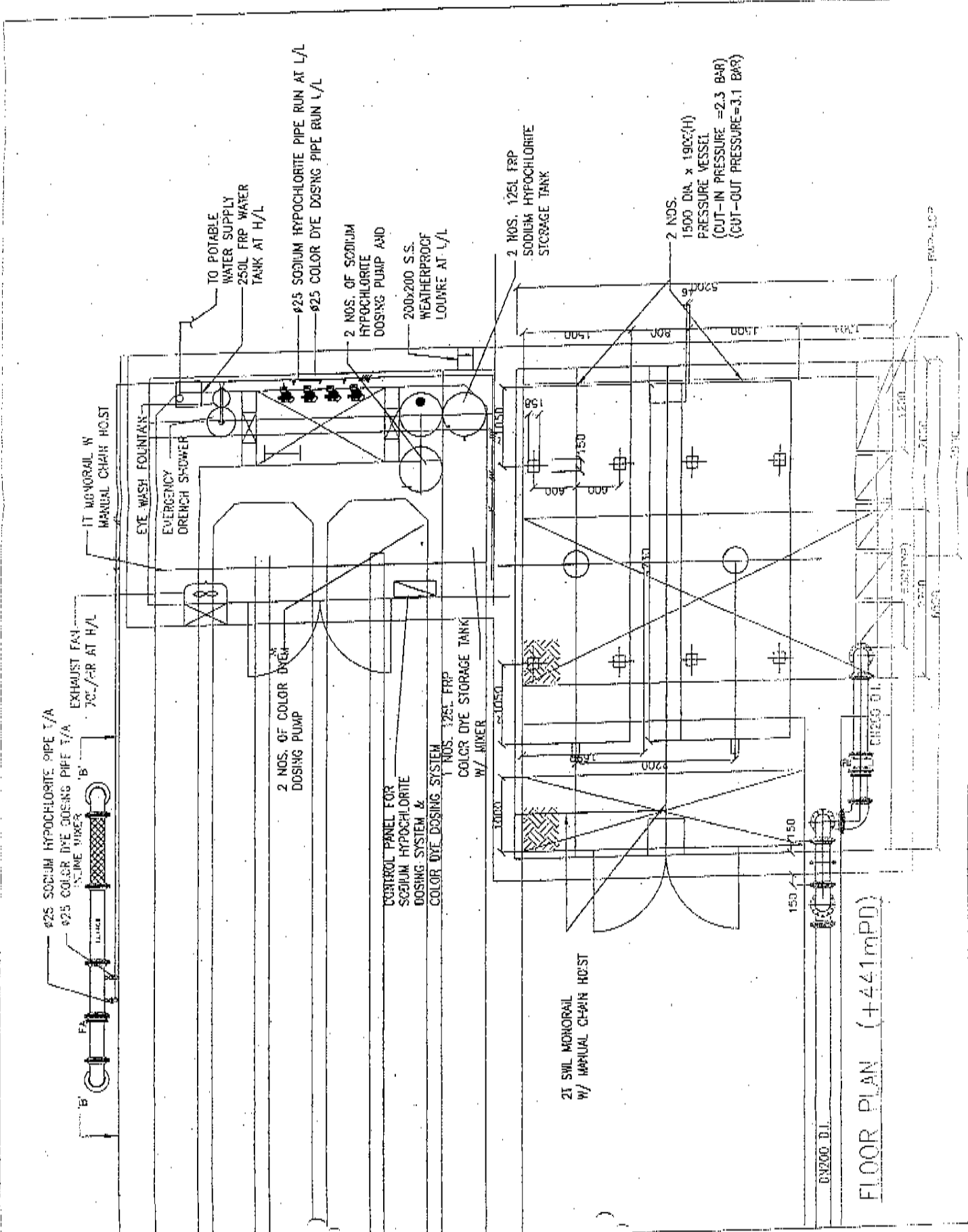
Klar-Loader-Kenworth Joint Venture

ARUP
Ove & Arup Partners along Ko Limited

CONTRACT NO. DC/2003/01
NGONG PUNG SEWAGE TREATMENT PLANT, TRUNK SEWERS AND EFFLUENT EXPORT PIPELINE

DATE: 12-OCT-2006
PROJECT NO: 31843493
SHEET NO: 43 OF 43

DESIGNED BY: [Name]
CHECKED BY: [Name]
APPROVED BY: [Name]



FLOOR PLAN (+44.1 mPD)

LEGEND :

- Ø 6" S.W. HOLE
- Ø 12" S.W. HOLE
- Ø 18" S.W. HOLE
- Ø 24" S.W. HOLE

NOTE :

- 1. UNLESS OTHERWISE SPECIFIED,
- 2. ALL LEVELS ARE IN MDD

No.	Description	By	Chk
1	AS PER DATE DEDUCTOR ON BUYERS		
2	GENERAL REVISION		
3			



Kier-Worfield Joint Vent

Kier-Leader-Kenworth Joint Venture



ARUP
Ove & Arup Partners Hong Kong Limited

CONTRACT NO. 06/2003/01
INGONG PING SEWAGE TREATMENT PLANT, TAIKAI SEWERS AND EFFLUENT EXPORT PIPELINE

PLAN LAYOUT FOR
WATER REUSE FACILITIES
(Sheet 3 of 6)

NO.	DATE	BY	CHK
1	06/09/03		
2			
3			



CONTROL PANEL FOR
SODIUM HYPOCHLORITE
DOSING SYSTEM &
COLOR DYE DOSING

21 SWL MONORAIL
W/ MANUAL CHAIN HOIST

150mm

Ø1200 D.I.

FLOOR PLAN (+441mPD)

ACCESS
MANHOLE

REFER TO DWG NO.:
PP-97/EM/CSD/EXT/001-E

TURN TO UNDERGROUND
TO TOILETS IN SEWAGE
TREATMENT PLANT

1. UNLESS OTHERWISE SPECIFIED
 2. ALL LEVELS ARE IN MFD

1	AT THE CAPS DOWNSIDE OF JOINTS	AN IN.
2	GENERAL LOCATION	AN IN.
3	DATE	BY

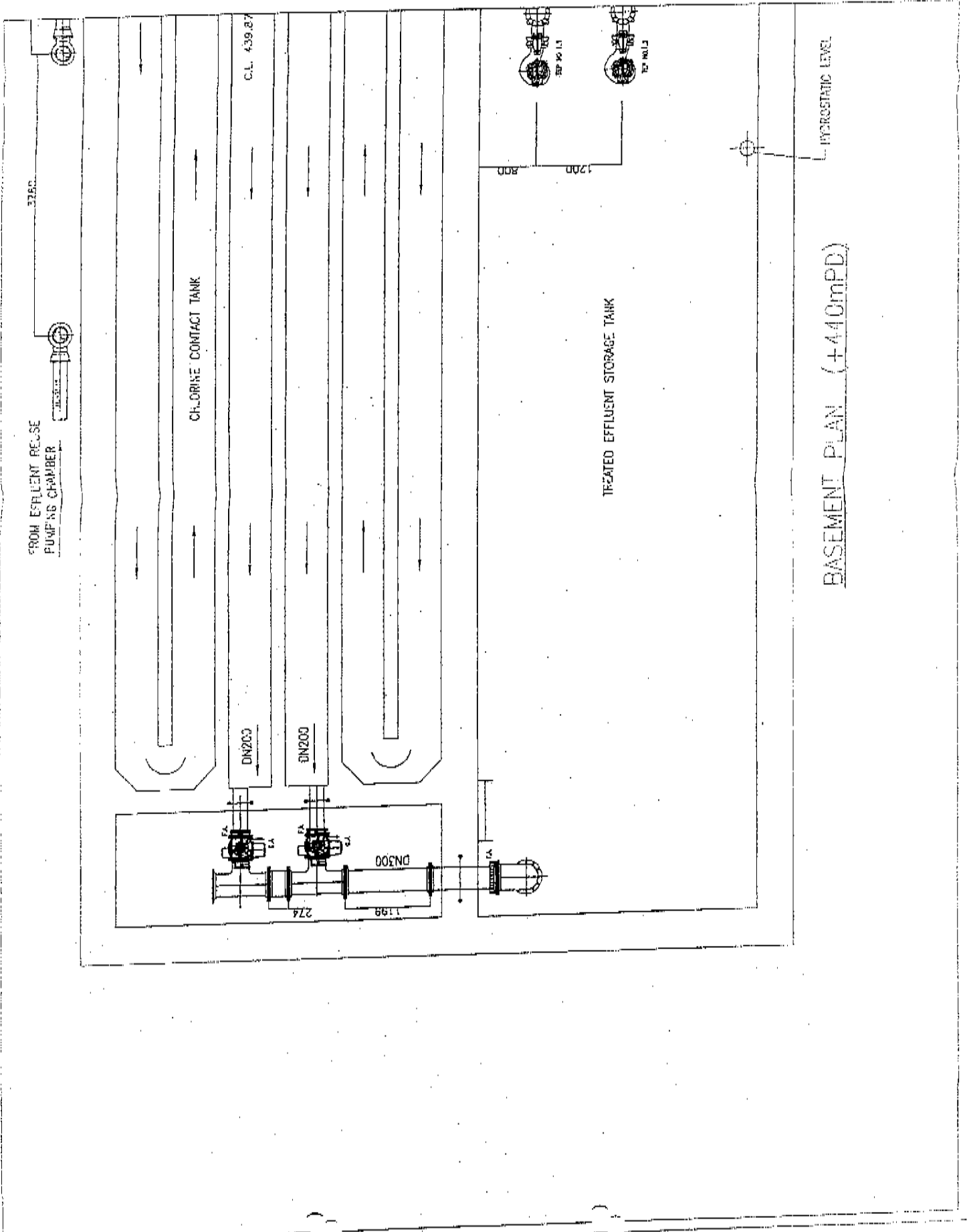
KBR
 Kier-Leader-Wolford Joint Vents
 Kier-Leader-Kenworth Joint
 Venture

ARUP
 Ove & Arup Partners Hong Kong
 Limited
 Paper No.

CONTRACT NO. DC/2003/01
 HONG KONG PIGS SEWAGE TREATMENT PLANT, TRUNK SEWERS AND EFFLUENT EXPORT PIPELINE

CONSTRUCTION
 CONSTRUCTION NO. DC/2003/01
 HONG KONG PIGS SEWAGE TREATMENT PLANT, TRUNK SEWERS AND EFFLUENT EXPORT PIPELINE

DATE	BY	CHECKED	DATE



LEGEND :

- 1. UNLESS OTHERWISE SPECIFIED,
- 2. ALL DIMENSIONS ARE IN METERS

1	NO. OF DAYS	DATE	BY
2	DESCRIPTION	DATE	BY
3	REVISION	DATE	BY

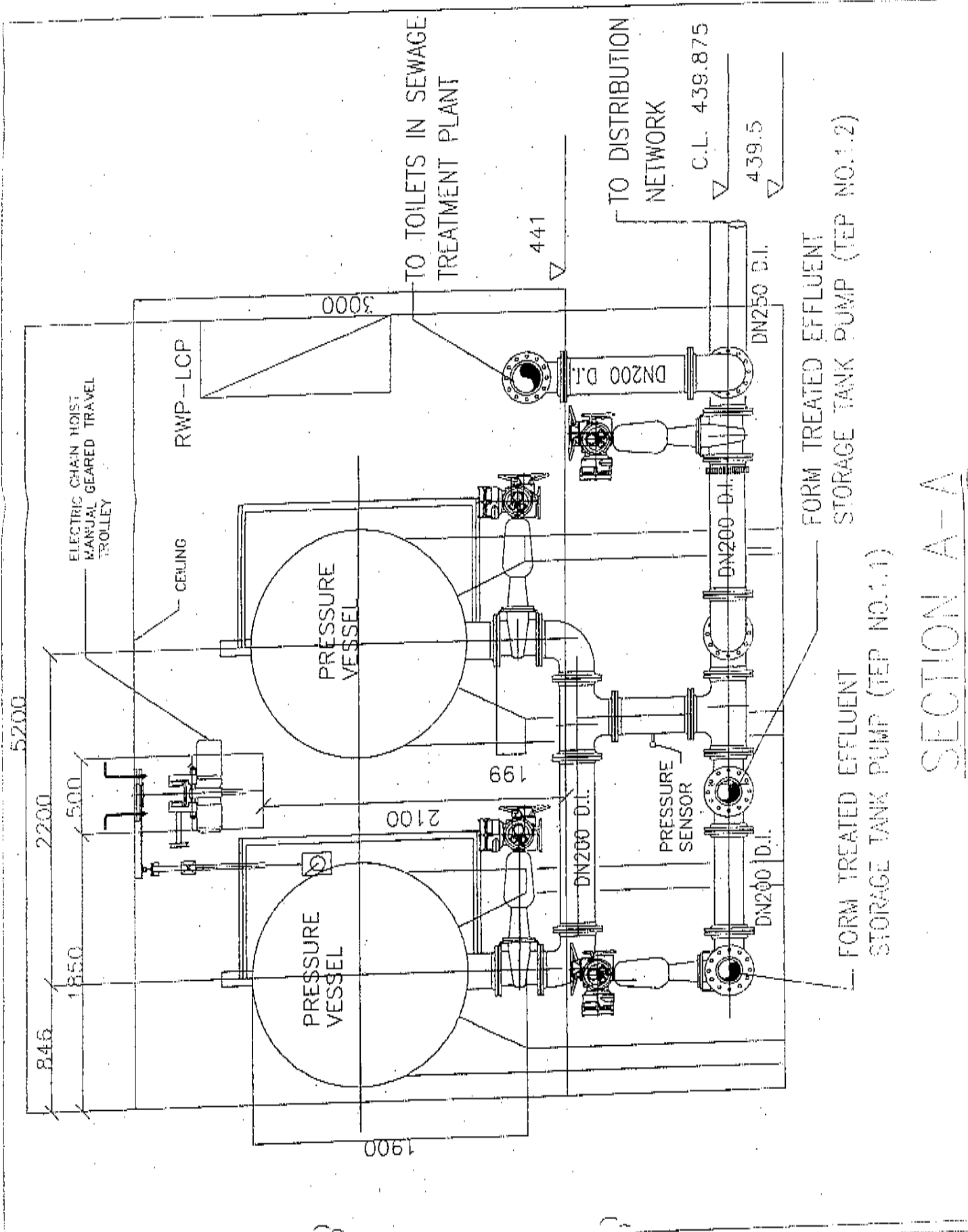
Kenworth - Watfield Joint Venture

Kenworth - Leader - Kenworth Joint Venture

ARUP
Ove & Arup Partners Hong Kong Limited

CONTRACT NO. DC/2003/01
NGONG PING SEWAGE TREATMENT PLANT, TRUNK SEWERS AND EFFLUENT EXPORT PIPELINE

FORM TANK - WOLT FEP WATER REUSE FACILITIES (Sheet 5 of 6)



SECTION A-A

LEGEND

- CG: CHECK DATE
- CV: CHECK VALUE
- FL: FLANGE ASSEMBLY
- FN: FLOW ARROW
- HE: HOLE
- LD: LINES DIMENSION SPECIFIC
- LD: ALL DETAILS USE III IMP

1	IS THE SHEET NUMBER OR NUMBER	IN THIS PROJECT	BY	DATE
2	GENERAL REVISION		BY	DATE
3	DESCRIPTION		BY	DATE



Kenworth-Watfield Joint Venture

Kier-Leader-Kenworth Joint Venture

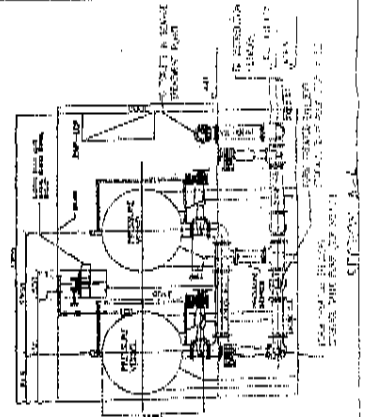
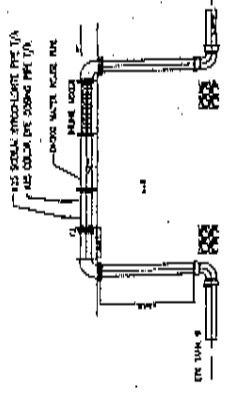
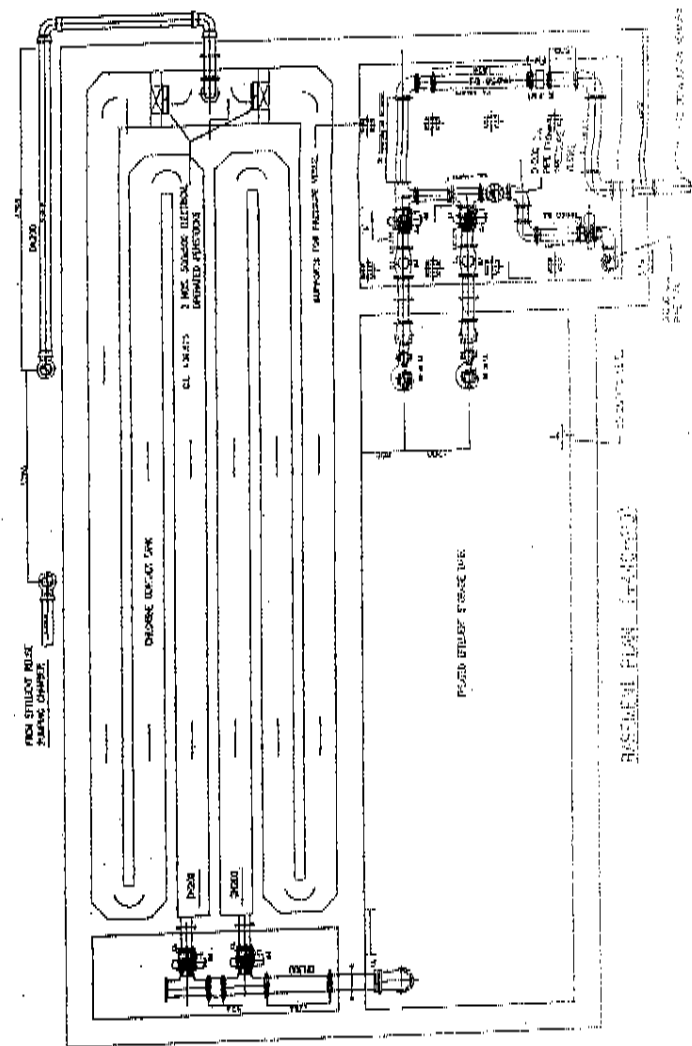
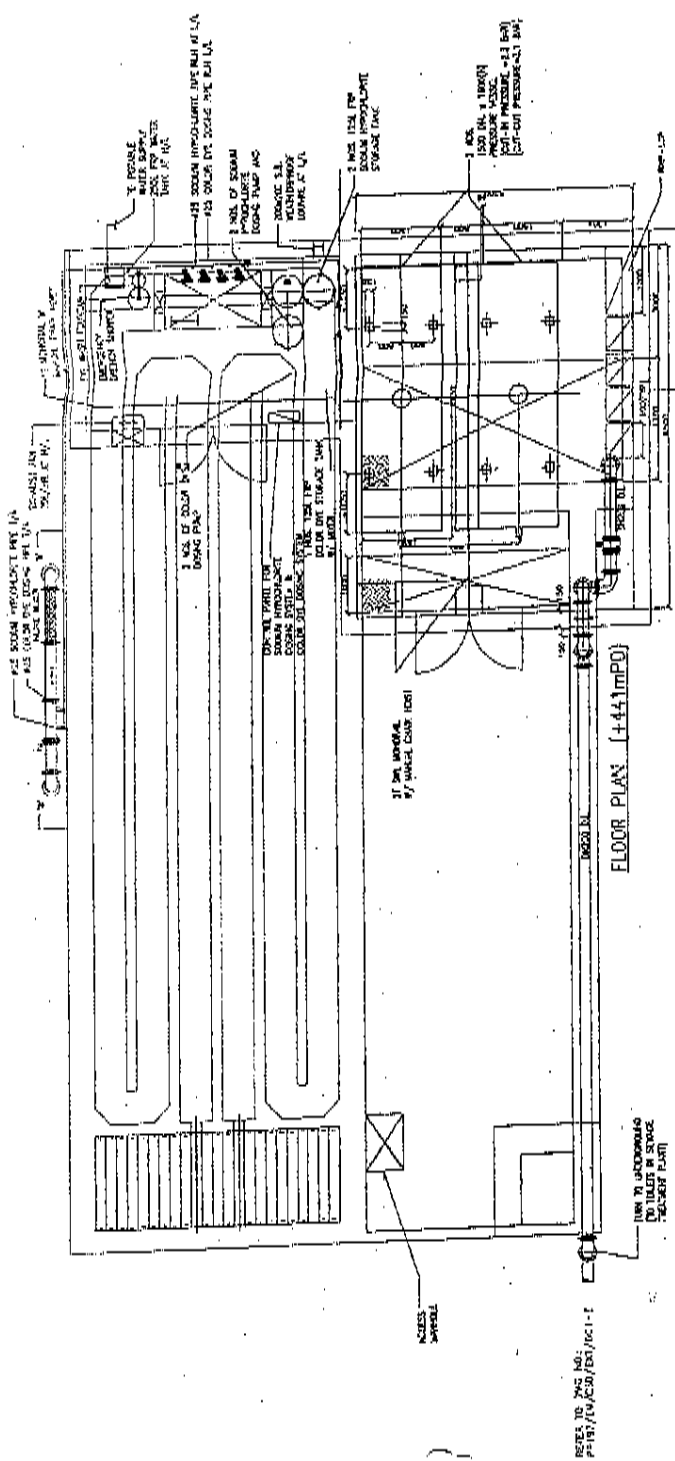


ARUP
Ove & Arup Partners Hong Kong Limited

CONTRACT NO. DC/2003/01
RONGTUNG SEWAGE TREATMENT PLANT, TRUNK SEWERS AND EFFLUENT EXPORT PIPELINE

FEH PLANT LAYOUT FOR WATER REUSE FACILITIES (Sheet 6 of 6)

PROJECT NO.	DC/2003/01
DATE	11/10/03
SCALE	AS SHOWN
DESIGNER	ARUP
CHECKER	ARUP
DATE	11/10/03



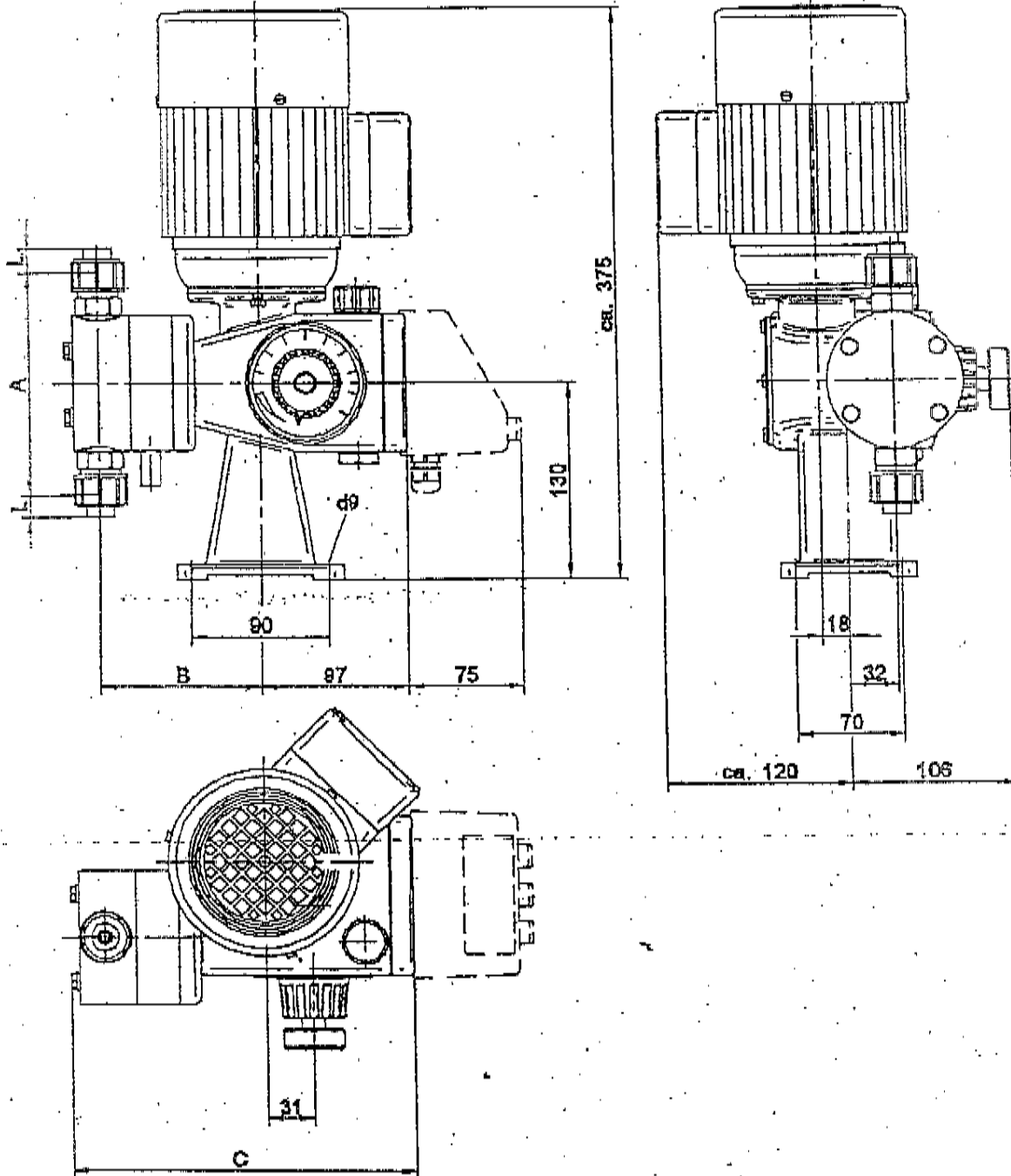
REFER TO THE MAIN PLAN FOR THE LOCATION OF THE WATER REUSE FACILITY IN THE TRUNK PLAN

SEE SHEET



MB 1 04 02 / 4

Dimensions MEMDOS E / DX 4...156



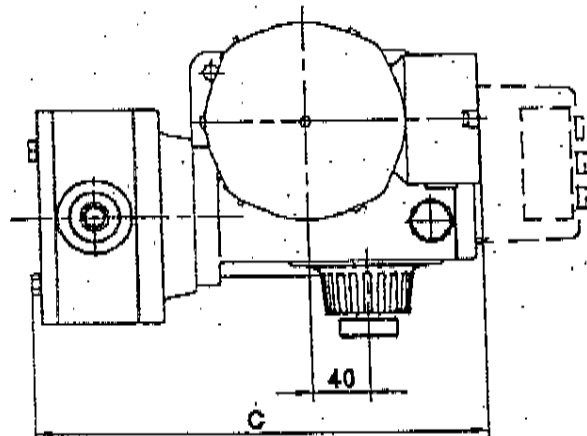
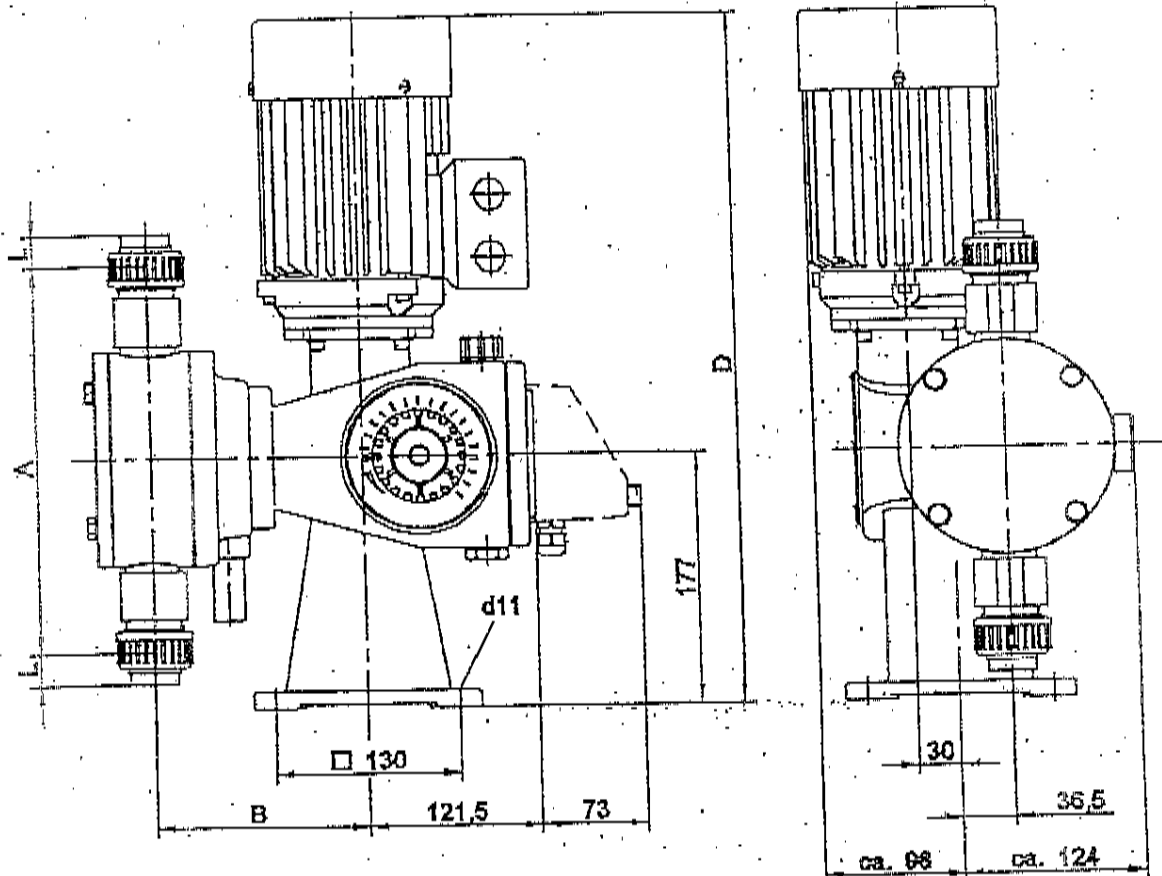
Diaphragm Metering Pump MEMDOS E / DX

Type	A	B	C
4 ... 26	108	95	212
50 ... 76	147	103	224
110 ... 156	243	117	259



MB 1 04 02 / 5.

Dimensions MEMDOS E / DX 160...380



Types	A	B	C	D
E 160...260	278	148	317	approx. 469
DX 160...260	278	148	317	approx. 486
E 300...380	318	153.5	320	approx. 469
DX 300...380	318	153.5	320	approx. 486

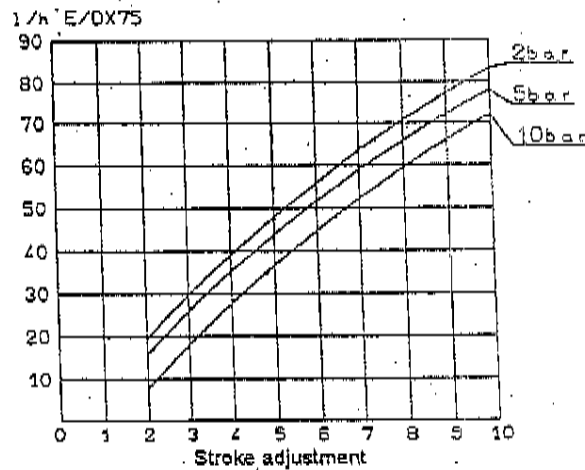
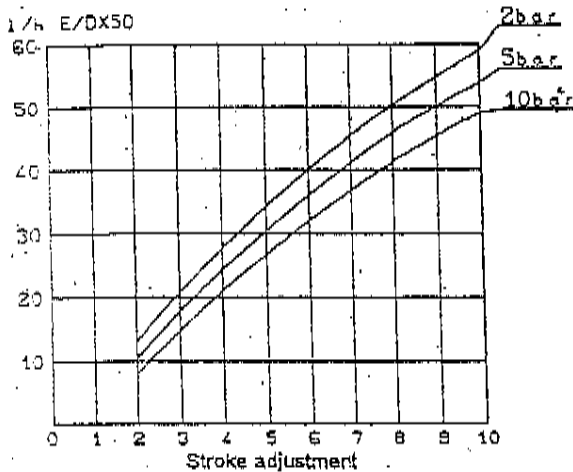
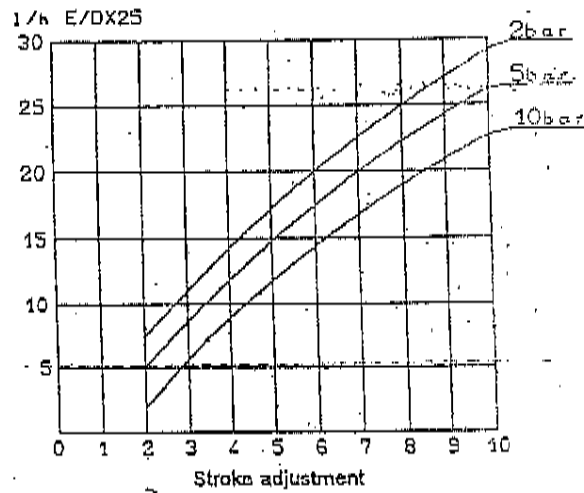
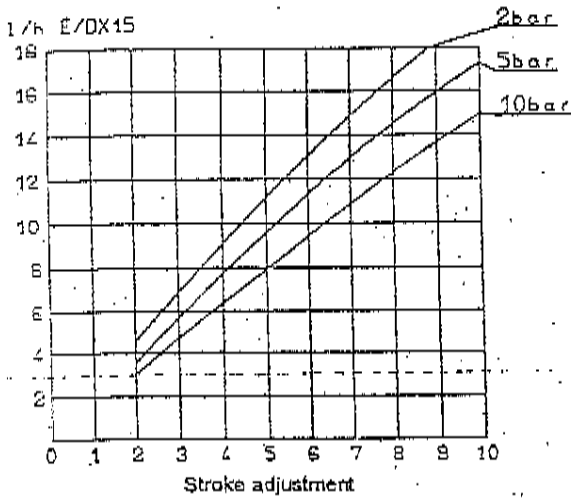
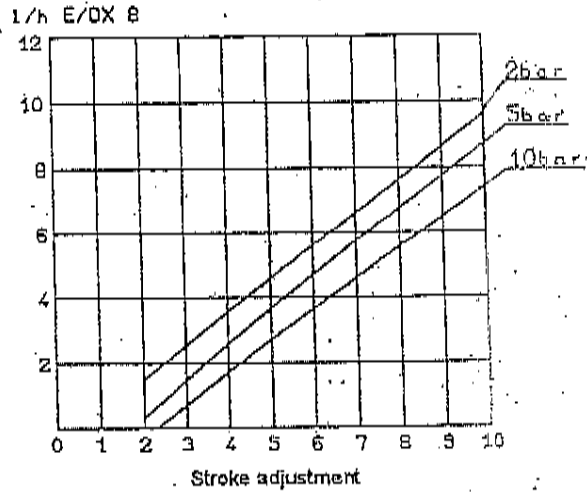
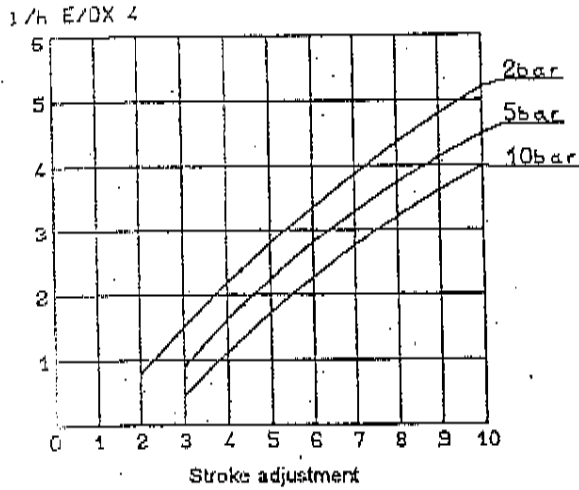
Diaphragm Metering Pump MEMDOS E / DX



MB 1 04 02 / 6

Performance curves MEMDOS 4...156

The flow rate depends on the viscosity of the medium and the hydraulic installation conditions. The performance curves refer to water at 20° C and a suction lift of 0.5m.

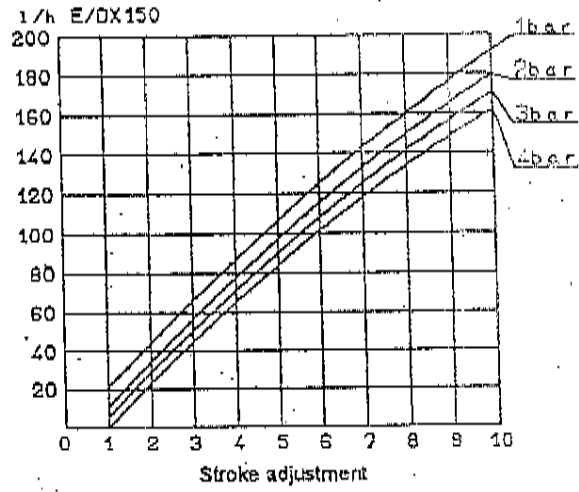
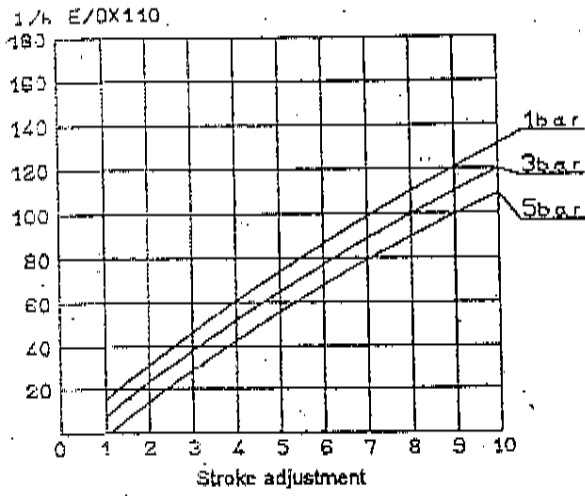


Diaphragm Metering Pump MEMDOS E / DX

Improved changes are always reserved without notice.



MB 1 04 02 / 7



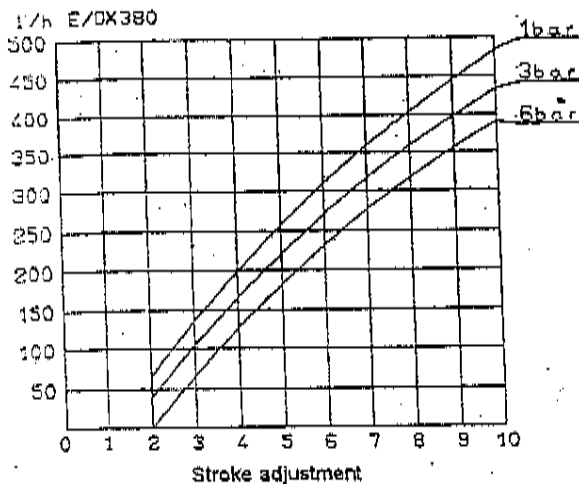
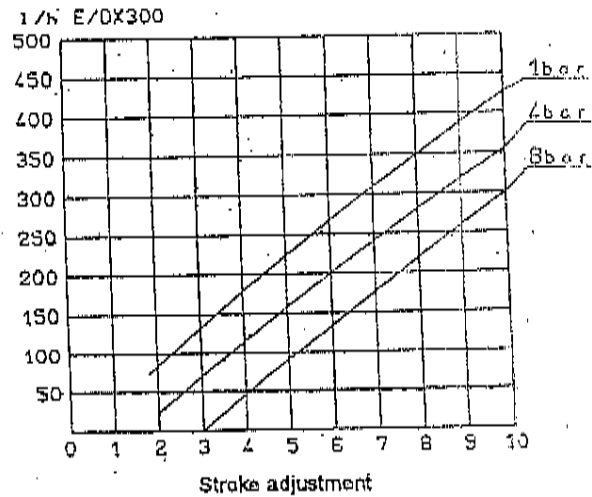
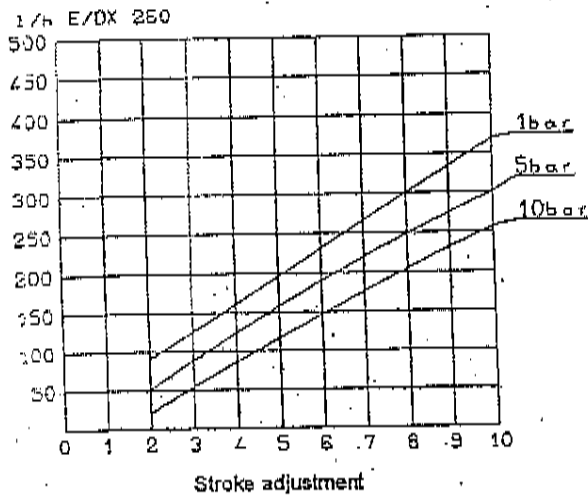
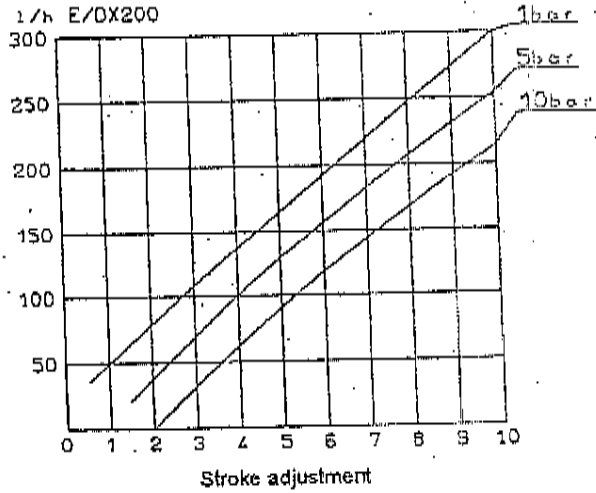
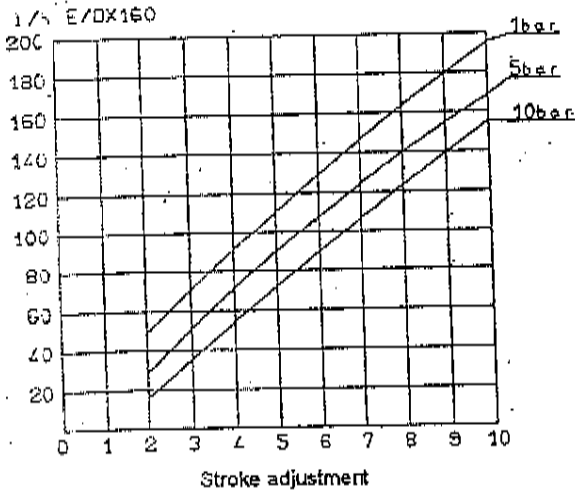
Diaphragm Metering Pump MEMDOS E / DX



MB 1 04 02 / 8

Performance MEMDOS E / DX 160...380

The flow rate depends on the viscosity of the medium and the hydraulic installation conditions. The performance curves refer to water at 20° C and a suction lift of 0.5m.



Improved changes are always reserved without notice.

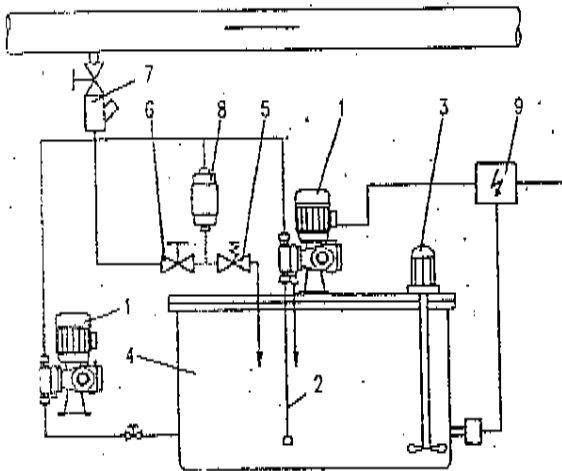
JESCO DOSIERTECHNIK GmbH & Co. KG

Diaphragm Metering Pump MEMDOS E / DX

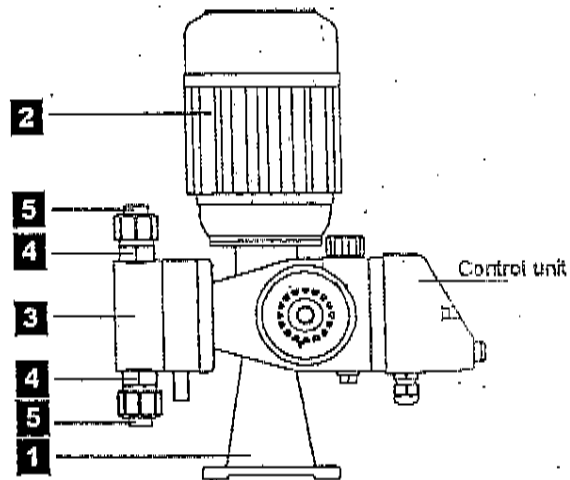


MB 1 04 02 / 9

Installation example



Selection tables



Legend

- 1 Metering pump E / DX MB 1 04 20
- 2 Suction line MB 1 22 01
- 3 Electric agitator MB 1 36 01
- 4 Tank MB 1 20 01
- 5 Relief valve MB 1 25 01
- 6 Diaphragm shutoff valve MB 1 24 01
- 7 Injection nozzle MB 1 23 01
- 8 Pulsation dampener MB 1 27 01
- 9 Switchbox upon request

In order to be able to offer the user a variety of pumps, these have been divided into the main functional groups. They can thus be assembled according to the user's individual requirements.

- 1** Drive **2** Motor **3** Head
- 4** Valves **5** Connections

The numbers on the pump drawing refer to the relevant selection tables.

Pump type	1	
	manual	
	E	DX
E / DX 4	34892	34960
E / DX 8	34893	34963
E / DX 15	34880	34961
E / DX 25	34889	34962
E / DX 26	35225	35241
E / DX 50	34872	34964
E / DX 75	34890	34965
E / DX 76	35226	35242
E / DX 110	34881	34967
E / DX 150	34891	34968
E / DX 156	35227	35243
E / DX 160	35047	35048
E / DX 200	34943	34969
E / DX 260	34944	34970
E / DX 300	34945	34971
E / DX 380	34946	34972

Diaphragm Metering Pump MENDOS E / DX



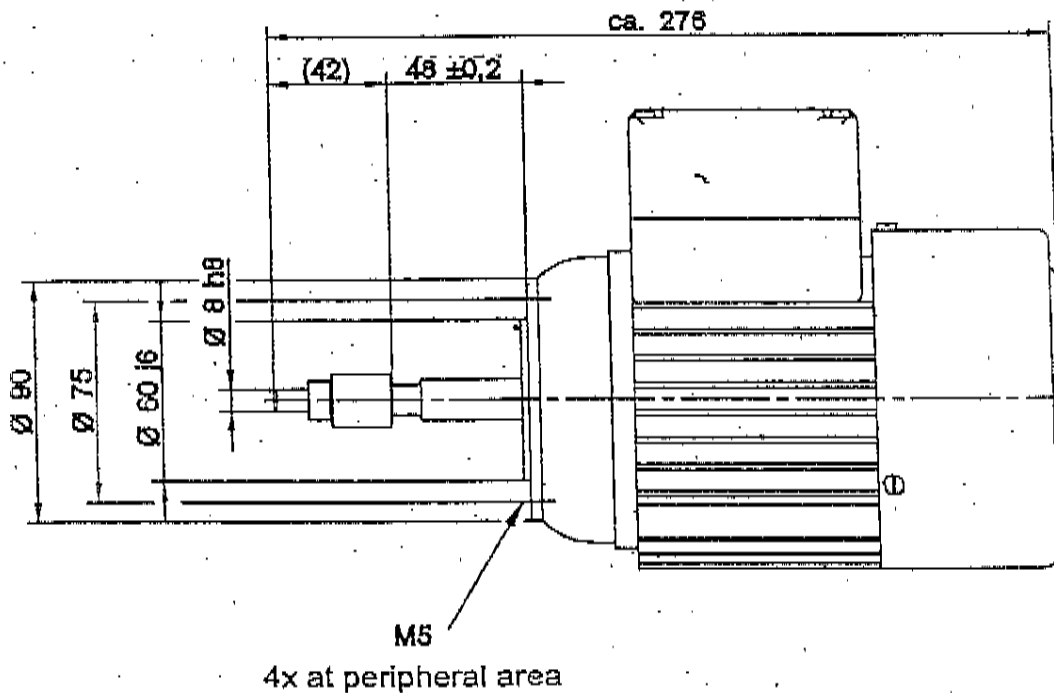
MB 1 04 02 / 10

Diaphragm Metering Pump MEMDOS E / DX

2				
Pump type	Motor type	Transformation	Pump type	Part No.
E / DX 4...156	Three-phase current 400 / 230 V, Bg 63 0,05 kw, 50 Hz, IP 55, ISO-F	55:1	E4	27522
		30:1	E8	31431
		15:1	E15 / 50	27697
		12:1	E26	35237
		10:1	E25	34884
	400 / 230 V, Bg 63 0,25 kW, 50 Hz, IP 55, ISO-F	55:1	E4*	32827
		30:1	E8*	32826
		15:1	E15* / 50* / 110	32531
		12:1	E26* / 76 / 156	35238
		10:1	E25* / 75 / 150	34913
	A.C. 230 V, Bg 63 0,05 kW, 50 Hz, IP 55, ISO-F	55:1	E/DX4	32220
		30:1	E/DX8	32134
		15:1	E/DX15	32190
		12:1	E/DX26	35239
		10:1	E/DX25	34914
230 V, Bg 63 0,12 kW, 50 Hz, IP 55, ISO-F	15:1	E/DX50 / 110	34917	
	12:1	E/DX76 / 156	35240	
	10:1	E/DX75 / 150	34915	
E / DX 160...380	Three-phase current 400 / 230 V, Bg 71 0,37 kW, 50 Hz, IP 55, ISO-F		E 160 - 380	79048
	A.C. 230 V, Bg 71 0,25 kW, 50 Hz, IP 55, ISO-F		E/DX 160 - 380	79057

*with frequency converter operation

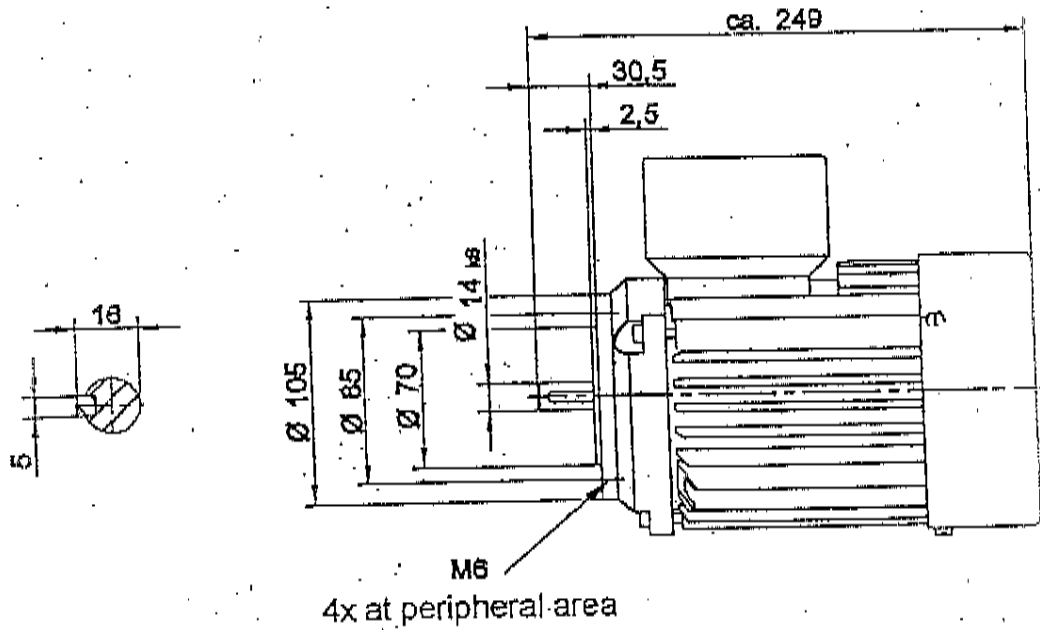
Motor MEMDOS E / DX 4...156





MB 1 04 02 / 11

Motor MEMDOS E / DX 160...380



Pump type	diameter	Diaphragm		Head	
		PVC	PVDF	PP	1.4571
E / DX 4	52	34882	34898	-	34899
E / DX 8	52	34882	34898	-	34899
E / DX 15	52	34882	34898	-	34899
E / DX 25	52	34882	34898	-	34899
E / DX 26	52	34882	34898	-	34899
E / DX 50	64	34873	-	-	34901
E / DX 75	64	34873	-	-	34901
E / DX 76	64	34873	-	-	34901
E / DX 110	90	-	-	34979	32890
E / DX 150	90	-	-	34979	32890
E / DX 156	90	-	-	34979	32890
E / DX 160	120	-	-	34711	23728
E / DX 200	120	-	-	34711	23728
E / DX 250	120	-	-	34711	23728
E / DX 300	150	-	-	34953	34952
E / DX 380	150	-	-	34953	34952

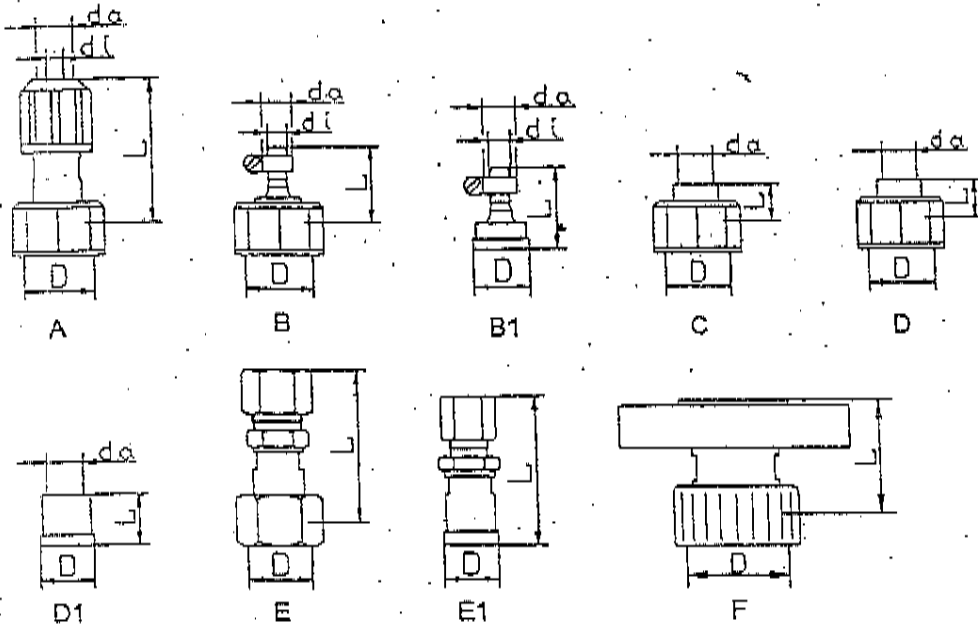
Pump type	E / DX 4...26 DN 4			E / DX 50...76 DN 6			E / DX 110...380 DN 10			
	PVC	PVDF	1.4571	PVC	1.4571	PP	1.4571			
Housing material	PVC	PVDF	1.4571	PVC	1.4571	PP	1.4571			
Seal material	Viton	PTFE	PTFE	Viton	Hypalon	AF	Viton	Hypalon	AF	
Double-ball valves	Suction valve	20890	28111	24029	18185	18187	26967	35051	34672	29694
	Discharge valve	20891	28112	24030	18186	18188	26968	35052	34673	29695
Spring-loaded valves	Suction valve	25087	29385	25089	25162	25161	28775	35055	34814	29696
	Discharge valve	25088	29384	25090	27517	27516	28776	35056	34815	29697

Diaphragm Metering Pump MEMDOS E / DX



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Pump type E / DX	DN	Fig.	D	di	da	L	Part No.		
							PVC	PVDF	1.4571
4 8 15 25 26	4	A	G5/8	4	6	28	20975	29387	-
		E		-	6	45	-	-	-
	6	A		6	8	30	25176	-	-
		A		6	9	34	34925	-	-
		A		6	12	55	32980	28124	-
		B		6	12	30	23092	-	23093
		C		-	10	15	23087	-	-
		C		-	12	15	23089	-	-
		D		-	G1/4	20	23088	29179	22999
		E		-	10	20	-	-	23090
		E		-	12	20	-	-	23091
50 75 76	6	A	G3/4	6	8	30	28159	-	-
		A		6	9	34	34926	-	-
		A		6	12	55	34922	-	-
		B		6	12	30	23342	-	-
	B1	d20	6	12	29	-	-	23426	
		C	G3/4	-	10	15	25167	-	-
				-	12	15	27518	-	-
				-	16	17	25625	-	-
				-	G1/4	20	25165	-	-
		D1	d20	-	G1/4	25	-	-	82105
		E1	-	8	54	-	-	27519	
110 150 156 160 200 260 300 380	8	C	G1 1/4	-	12	22	25923	-	-
	10	B		9	15	41	25921	-	25925
		C		-	16	22	27672	-	-
		D		-	G3/8	22	25930	-	27037
		B		16	24	50	25936	-	25935
	15	C		-	20	22	25937	-	-
		D		-	G1/2	22	25943	-	25944
		F		-	-	53	25956	-	25957
		C		-	25	22	33318	-	-
	20	D		-	G3/4	22	-	-	27689



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 JESCO DOSIERTECHNIK GmbH & Co. KG

Diaphragm Metering Pump MEMDOS E / DX



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Order examples.

Case 1

45 l/h of flocculant of watery consistency are to be metered into a settling tank.

The level of the supply tank is maximally 3m above the pump. Metering takes place against free discharge.

Solution:

PVC, Hypalon, EPDM and glass are resistant materials. Due to the positive supply (from above) and the free discharge (no backpressure), a backpressure valve must be fitted.

A MEMDOS E, size I, 0...50 l/h, with three-phase motor is chosen.

The pump consists of the following modules:

1 Drive	34872
2 Three-phase current	27697
3 PVC metering head	34873
4 PVC double-ball valves, Hypalon	
Suction valve	18187
Discharge valve	18188
5 Connections	
Suction side	19175
Discharge Side	19175

Case 2

150 l/h of a coloring substance are to be added proportionally to a process line. An analog 4...20 mA signal or 6000 contacts per hour are available as flow-proportional signal. The system pressure is 6 bar. No aggressive medium is used. The viscosity is, however, 500 mPa*s.

Solution:

PVC, Hypalon, EPDM and glass are resistant materials. As the viscosity exceeds 400 mPa*s, spring-loaded valves are required.

Due to the type of control, a MEMDOS DX 200 (0...208 l/h) is chosen.

As the pump is able to carry out 95 strokes/min., 5700 metering strokes are maximally possible per hour. This is insufficient compared to the incoming 0...6000. Therefore the pump is set so that it is activated by the analog signal.

It consists of the following modules.

1 Drive	34969
2 A.C.	79057
3 PP metering head	23722
4 PP spring-loaded valves, Hypalon	
Suction valve	26845
Discharge valve	27353
5 Connections	
Suction side	25937
Discharge Side	25937

Note:

If only contact making can be used, the pump must be selected as follows:

With the help of pulse division function, divisor 2, the aforementioned pump would have to carry out max. $6000/2=3000$ strokes. As a result the flow rate would be reduced to $208/5700 \times 3000 = 109$ l/h < 150 l/h. In this case, a MEMDOS DX 300 with 292 l/h at 8 bar would be appropriate, which can process 5700 contacts with its possible strokes per minute. With 3000 contacts the pump delivers $292/5700 \times 3000 = 154$ l/h by 8 bar and about 10 % more by 6 bar.

A precise adjustment is possible using the stroke length adjustment knob.

Diaphragm Metering Pump MEMDOS E / DX



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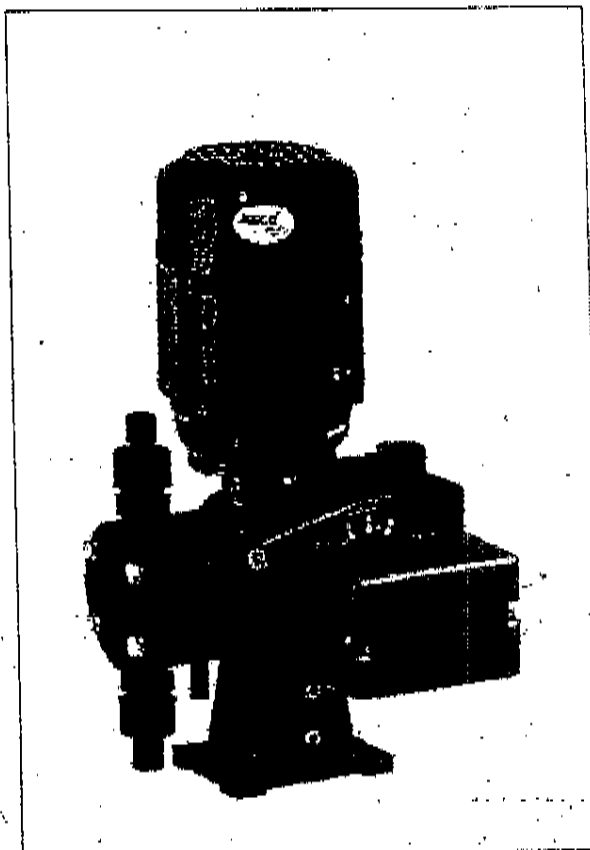
General

Metering pumps which are used as final control element in automatic control loops or controlled systems are equipped with electrical servomotors allowing to adjust the stroke length by means of sensing contacts or controllers with relay output.

Such pumps are identified by suffixing the letters ATE to the type designation:

Example: E 150 - ATE

The non-linearity of the performance curves of diaphragm metering pumps is maintained despite the linear mechanics of the stroke adjustment. For this reason, the performance curves of the metering pump must be taken into account in control systems without feedback of the metered result (proportional metering).



Technical data

Pump type	Memdos E 4 ... 156		Memdos E 160 ... 360	
	KNG 2.60	KNG 2.60 ST	KNG 2.100	KNG 2.120 ST
Servomotor	79073	79082	79080	79098
Part No.	79073	79082	79080	79098
Mechanical design	Reversible servomotor with self-locking step-down gear. Connections led out via cables (900 mm). Angle of rotation limited by two internal limit position switches.			
Use	For controllers with switching output (3-point step control).	For controllers with continuous output 0/2...10V or 0/4...20 mA (switchable).	For controllers with switching output (3-point step control).	For controllers with continuous output 0/2...10V or 0/4...20mA (switchable)
Torque	8 Nm		10 Nm	
Voltage	230VAC +/-10% 50/60 Hz	24 VAC +/-10% 50/60 Hz	230 VAC +/-10% 50/60 Hz	24 VAC +/-10% 50/60 Hz
Input impedance at voltage input	-	100 kOhm	-	100 kOhm
Burden at current input	-	500 Ohm	-	500 Ohm
Power consumption	4 VA	7.5 VA	4 VA	7.5 VA
Regulating time / bevel	180s (150s) / 270° = 0...100%		360s (300s) / 270° = 0...100%	
Load limit of the voltage output	-	max. 0.5 A	-	max. 0.5 A
Position repeating signal for remote display max.	0...1000 Ohm 2Watt at $t_u=40^\circ\text{C}$	0-10 VDC for control with 0...10 V and 0...20 mA, 2...10 VDC for control with 2...10 V and 4...20 mA.	0...1000 Ohm 2Watt at $t_u=40^\circ\text{C}$	0-10 VDC for control with 0...10 V and 0...20 mA, 2...10 VDC for control with 2...10 V and 4...20 mA.
Type of protection	IP 54			
Ambient temperature	-10 to +60° C			
Weight	0.8 kg			

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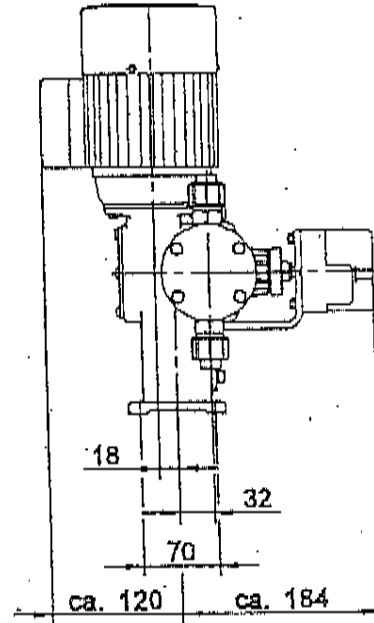
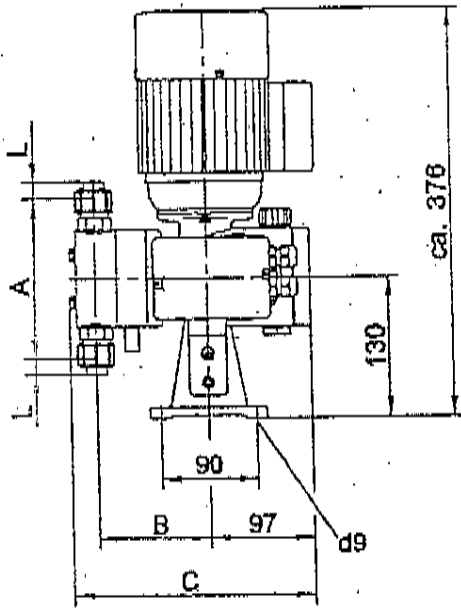
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Diaphragm Metering Pump MEMDOS E - ATE



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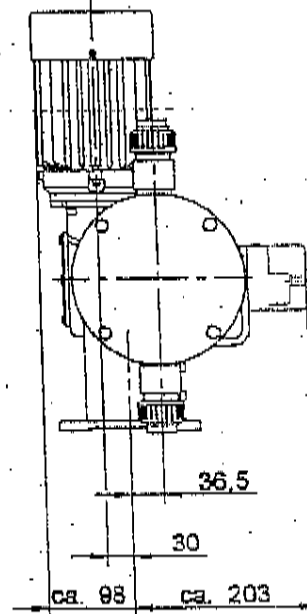
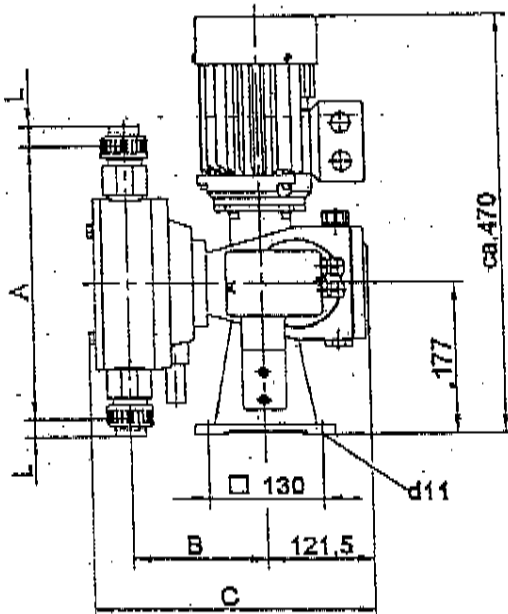
Dimensions E4 ... 156



Dimension L see MB 1 04 02 / 12

Type	A	B	C
4 ... 26	108	100,5	218,5
50 ... 76	149	103	224
110 ... 156	272	108	255

Dimensions E160 ... 380



Dimension L see MB 1 04 02 / 12

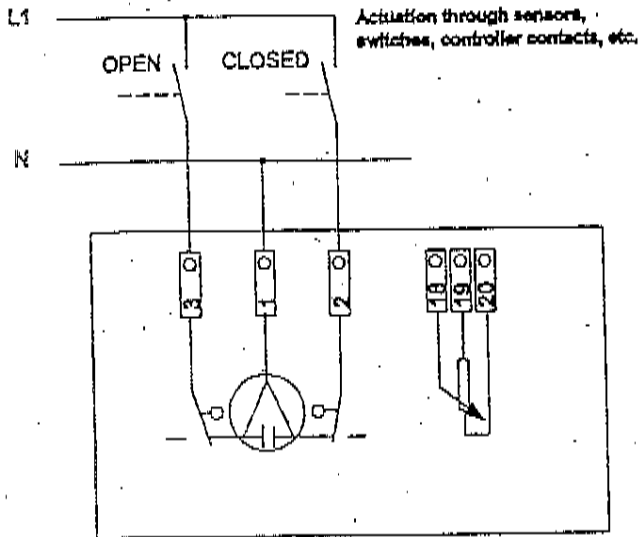
Type	A	B	C
E160...260	272	149,5	317
E300...380	324	152,5	320

Diaphragm Metering Pump MEMDOS E-ATE



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Wiring diagram KNG 2.60 / 2.120



Setting of coding switch KNG 2.60 / 2120 ST

x = Any switch position

1. Voltage input

0-10V at terminals 1 and 4

ON		x	x		x	x	x	x
OFF		x	x		x	x	x	x
	1	2	3	4	5	6	7	8

2-10V at terminals 1 and 4

ON		x	x		x	x	x	x
OFF		x	x		x	x	x	x
	1	2	3	4	5	6	7	8

2. Current input

0-20 mA at terminals 1 and 4

ON		x	x		x	x	x	x
OFF		x	x		x	x	x	x
	1	2	3	4	5	6	7	8

4-20 mA at terminals 1 and 4

ON		x	x		x	x	x	x
OFF		x	x		x	x	x	x
	1	2	3	4	5	6	7	8

3. Direction of rotation

0°-270° (default setting)

ON	x		x	x	x	x	x	x
OFF	x		x	x	x	x	x	x
	1	2	3	4	5	6	7	8

270°-0°

ON	x		x	x	x	x	x	x
OFF	x		x	x	x	x	x	x
	1	2	3	4	5	6	7	8

4. Output voltage

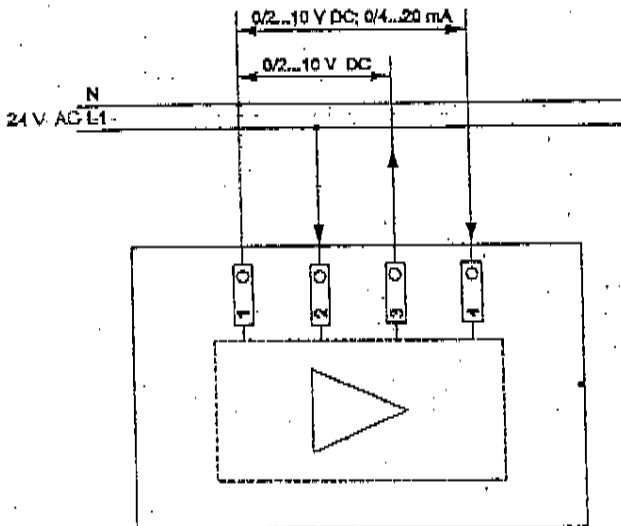
0-10V at terminals 1 and 3

ON				x			x	x
OFF				x			x	x
	1	2	3	4	5	6	7	8

2-10V at terminals 1 and 3

ON				x			x	x
OFF				x			x	x
	1	2	3	4	5	6	7	8

Wiring diagram KNG 2.60 / 2.120 ST

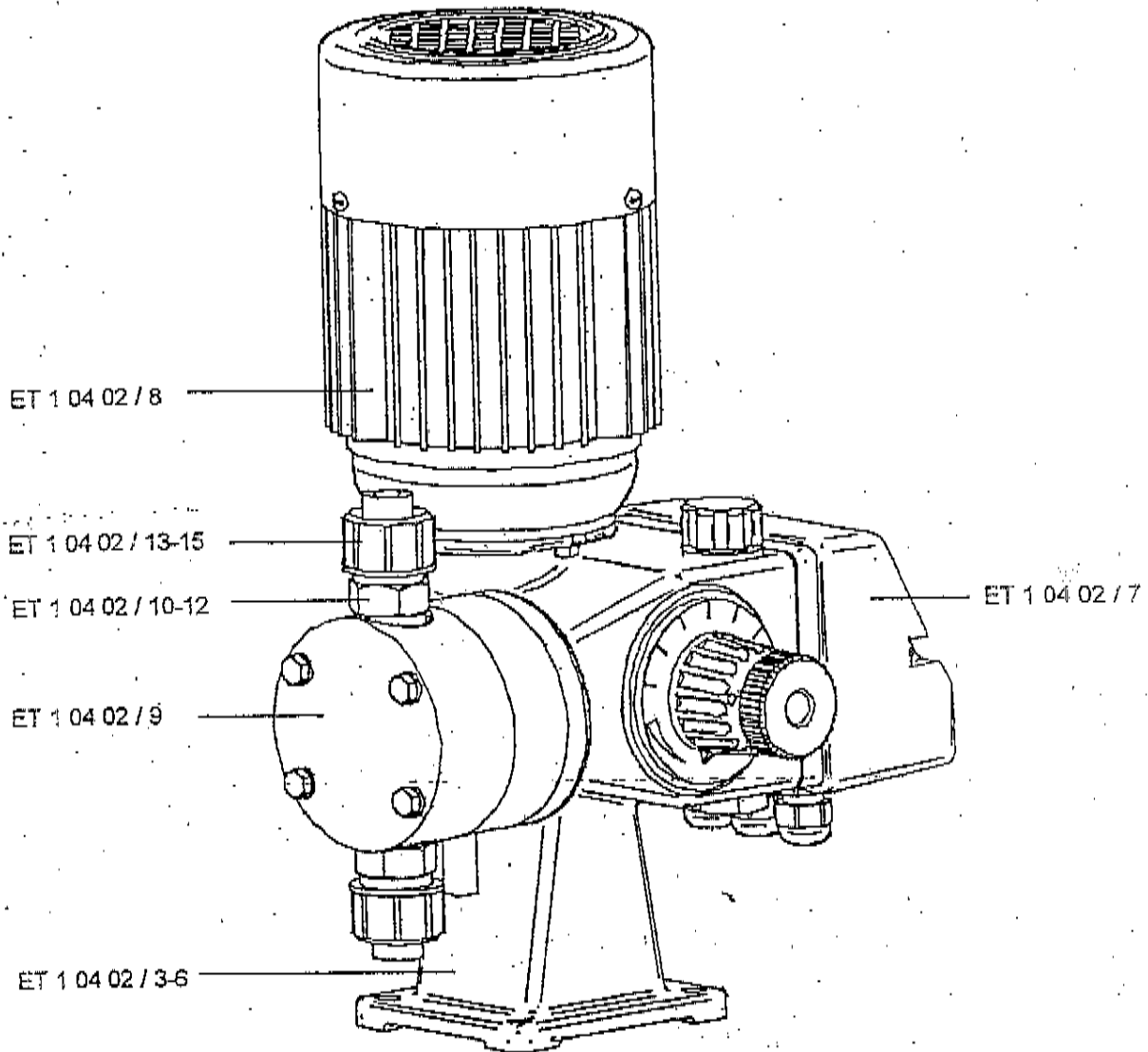


Diaphragm Metering Pump MEMDOS E-ATE



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General view of modules

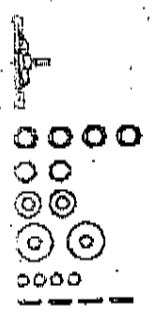
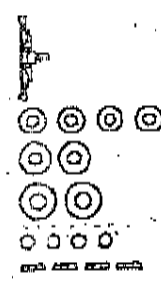
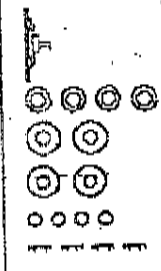


Diaphragm Metering Pump MEMDOS E / DX



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Spare parts kits

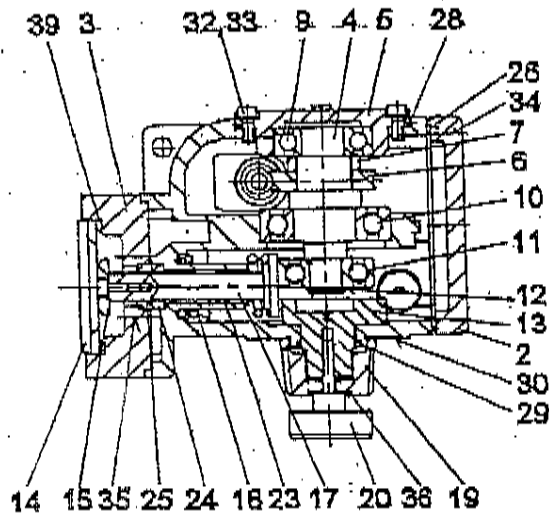
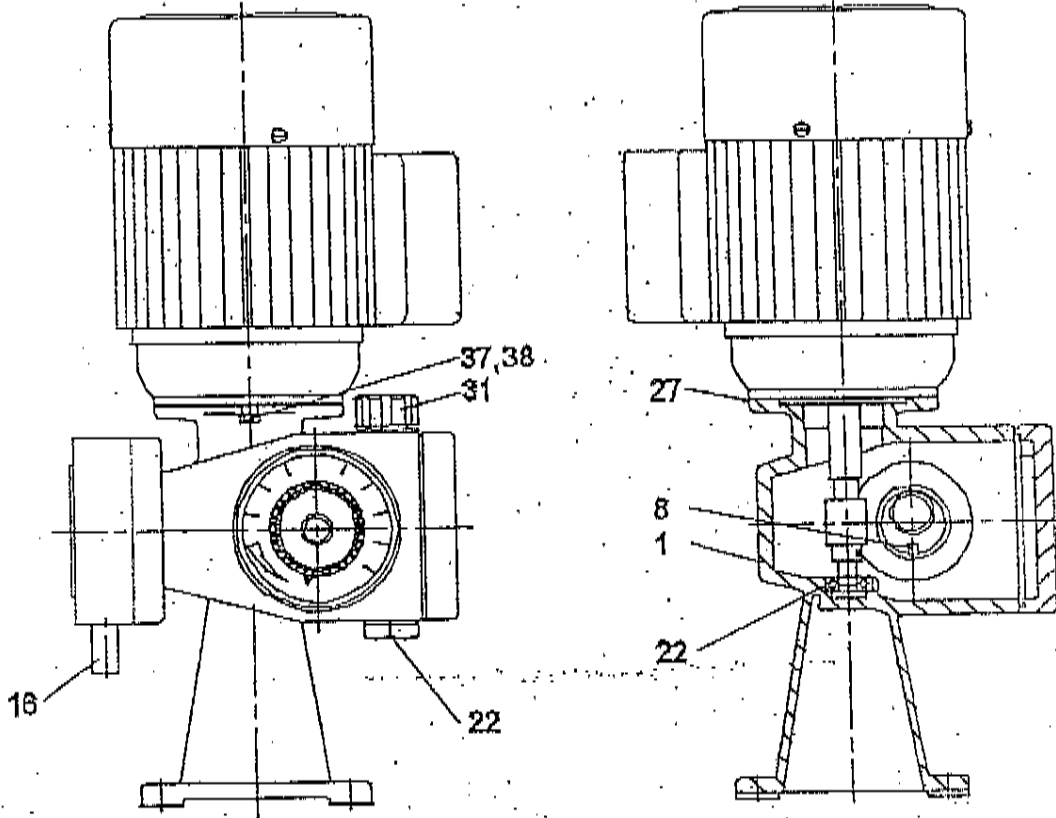
include:	Pump type:	Head/ Seal materials	Part No.
 Diaphragm Gaskets O-rings Valve balls Valve seat	E / DX 4...26	PVC / Viton	29750
		PVC / PTFE	29791
		PVC / EPDM	33698
		1.4571 / PTFE	29751
 Diaphragm Seals Valve balls Valve seat	E / DX 50...76	PVC / Hypalon	28274
		PVC / Viton	28275
		1.4571 / AF	28276
 Diaphragm Seals Valve balls Valve seat	E / DX 110...156	PP / Hypalon	28300
		PP / Viton	28301
		1.4571 / AF	28302
	E / DX 160...260	PP / Hypalon	28308
		PP / Viton	28309
		1.4571 / AF	28310
	E / DX 300...380	PP / Hypalon	28316
		PP / Viton	28317
		1.4571 / AF	28318

Diaphragm Metering Pump MEMDOS E / DX



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Drive Memdos E / DX4 ... 156



Diaphragm Metering Pump MEMDOS E / DX



ET 1.04.02/4

Item	Description	Material	Part No.	E / DX4	E / DX8	E / DX15	E / DX25	E / DX26	E / DX50	E / DX75	E / DX76	E / DX110	E / DX150	E / DX156
1	Gearbox	GKAlSi12	34850	1	1	1	1	1	1	1	1	1	1	1
2	Housing cover E *	GKAlSi12	34851	1	1	1	1	1	1	1	1	1	1	1
3	Diaphragm flange d52	PP	34877	1	1	1	1	1	-	-	-	-	-	-
	Diaphragm flange d64	PP	34863	-	-	-	-	-	1	1	1	-	-	1
	Diaphragm flange d90	AlCuMg	34878	-	-	-	-	-	-	-	-	1	1	1
4	Eccentric shaft 6mm stroke	9SMnPb28K	34867	1	1	1	1	1	-	-	-	-	-	-
	Eccentric shaft 9mm stroke	9SMnPb28K	34875	-	-	-	-	-	1	1	1	1	1	1
5	Bearing flange	AlCuMg	34862	1	1	1	1	1	1	1	1	1	1	1
6	Worm wheel 30:2	Bronze	18159	-	-	1	-	-	1	-	-	1	-	-
	Worm wheel 55:1	Bronze	18112	1	-	-	-	-	-	-	-	-	-	-
	Worm wheel 10:1	Bronze	34883	-	-	-	1	-	-	1	-	-	-	-
	Worm wheel 12:1	Bronze	35186	-	-	-	-	-	1	-	-	1	-	1
	Worm wheel 30:1	Bronze	31422	-	1	-	-	-	-	-	-	-	-	-
7	Spacer	9SMnPb28K	34871	1	1	1	1	1	1	1	1	1	1	1
8	Adjusting spring	St	83406	1	1	1	1	1	1	1	1	1	1	1
9	Grooved ball bearing	St	86090	1	1	1	1	1	1	1	1	1	1	1
10	Grooved ball bearing	St	86137	1	1	1	1	1	1	1	1	1	1	1
11	Grooved ball bearing	St	86138	1	1	1	1	1	1	1	1	1	1	1
12	Retaining ring	Spring steel	84009	1	1	1	1	1	1	1	1	1	1	1
13	Adjusting eccentric 6mm stroke	IXEF	34853	1	1	1	1	1	-	-	-	-	-	-
	Adjusting eccentric 9mm stroke	IXEF	34854	-	-	-	-	-	1	1	1	1	1	1
14	Diaphragm d52	EPDM/PTFE	81464	1	1	1	1	1	-	-	-	-	-	-
	Diaphragm d64	EPDM/PTFE	81465	-	-	-	-	-	1	1	1	-	-	-
	Diaphragm d90	EPDM/PTFE	81466	-	-	-	-	-	-	-	-	1	1	1
15	Support plate	Brass	28977	-	-	-	-	-	1	1	1	-	-	-
16	Leakage pipe d8	PP	34865	1	1	1	1	1	-	-	-	-	-	-
	Leakage pipe d10 assembly	PP/Viton	25174	-	-	-	-	-	1	1	1	-	-	-
	Leakage pipe d16 assembly	PP/Viton	25190	-	-	-	-	-	-	-	-	1	1	1
17	Diaphragm rod M4	1.4305	34868	1	1	1	1	1	1	1	1	-	-	-
	Diaphragm rod M8	1.4305	34876	-	-	-	-	-	-	-	-	1	1	1
18	Pressure spring	Spring steel	10119	1	1	1	1	1	1	1	1	1	1	1
19	Adjusting knob	Plastic	34855	1	1	1	1	1	1	1	1	1	1	1
20	Knurled knob	Plastic	31024	1	1	1	1	1	1	1	1	1	1	1
21	Grooved ball bearing	St	86001	1	1	1	1	1	1	1	1	1	1	1
22	Threaded plug	Plastic	88232	1	1	1	1	1	1	1	1	1	1	1
23	Sleeve bearing bushing	MB1415DU	34870	2	2	2	2	2	2	2	2	2	2	2
24	Compact seal	AU	80814	1	1	1	1	1	1	1	1	1	1	1
25	Stripper	Simritan	81744	1	1	1	1	1	1	1	1	1	1	1
26	Gasket	NBR	81745	1	1	1	1	1	1	1	1	1	1	1
27	Gasket	Klingerit	81235	1	1	1	1	1	1	1	1	1	1	1
28	O-ring	NBR	80816	1	1	1	1	1	1	1	1	1	1	1
29	O-ring	NBR	80815	1	1	1	1	1	1	1	1	1	1	1
30	Scale	Plastic	87412	1	1	1	1	1	1	1	1	1	1	1
31	Oil gauge	Plastic	88221	1	1	1	1	1	1	1	1	1	1	1
32	Screw	A2	83606	4	4	4	4	4	4	4	4	4	4	4
33	Washer	Copper	84191	4	4	4	4	4	4	4	4	4	4	4
34	Screw	A2	83268	6	6	6	6	6	6	6	6	6	6	6
35	Screw	A2	83619	4	4	4	4	4	-	-	-	4	4	4
36	Cup spring	1.4310	84179	1	1	1	1	1	1	1	1	1	1	1
37	Hex. head screw	A2	83157	3	3	3	3	3	3	3	3	3	3	3
38	Washer	A2	84189	3	3	3	3	3	3	3	3	3	3	3
39	Diaphragm insert	PPO	29462	1	1	1	1	1	-	-	-	-	-	-

* incl. sealing pos. 26

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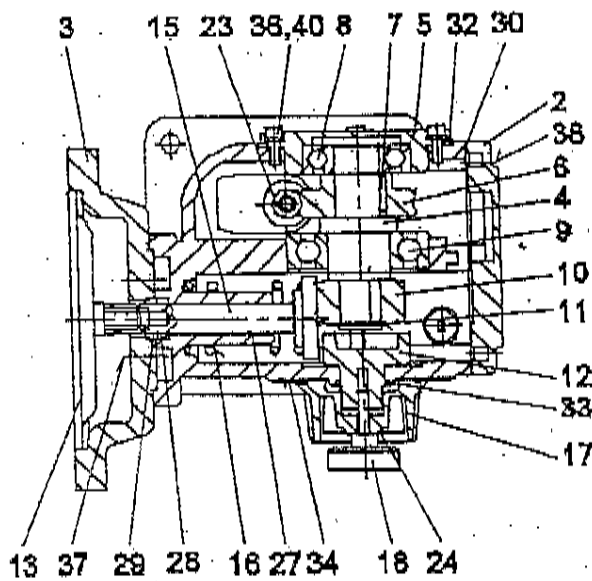
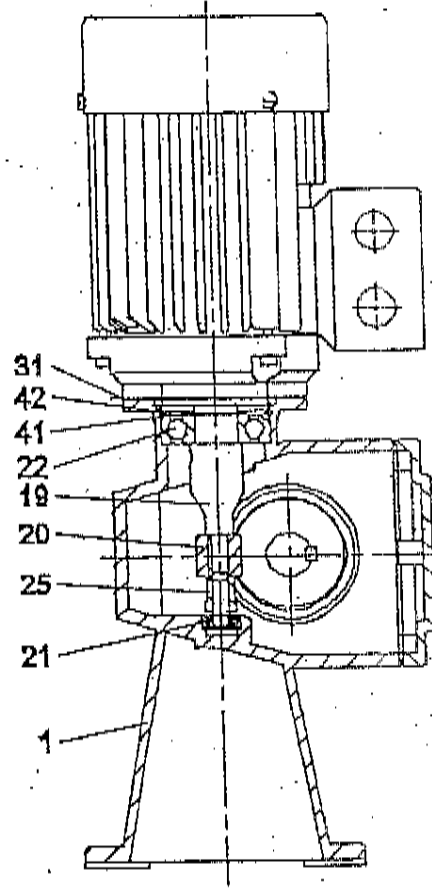
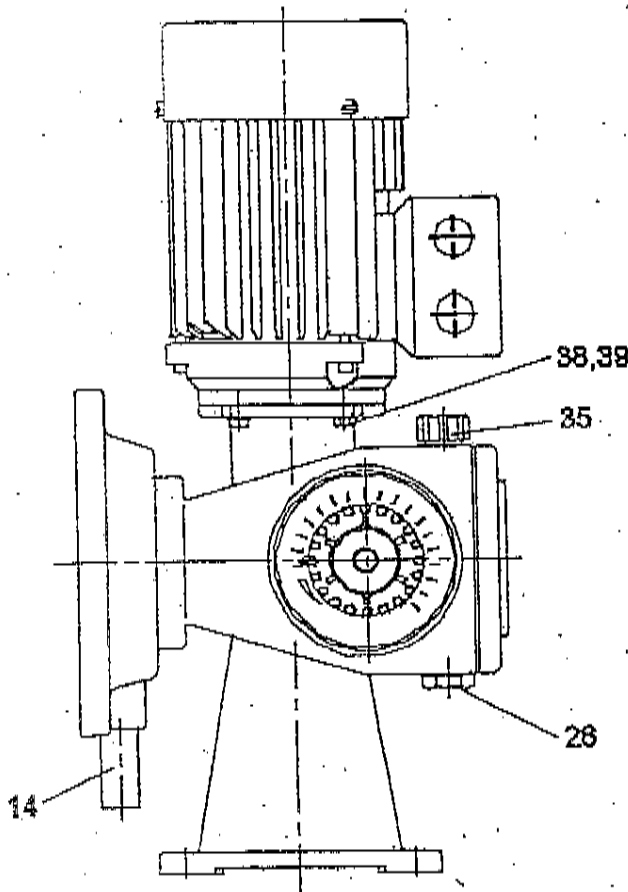
Diaphragm Metering Pump MEMDOS E / DX



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Drive Memdos E / DX160 ... 380

Diaphragm Metering Pump MEMDOS E / DX





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Item	Description	Material	Part No.	E / DX160	E / DX200	E / DX260	E / DX300	E / DX360
1	Gearbox	GKAlSi12	34929	1	1	1	1	1
2	Housing cover E*	GKAlSi12	34930	1	1	1	1	1
3	Diaphragm flange, diaphr. d120	GKAlSi12	34955	1	1	1	—	—
	Diaphragm flange, diaphr. d150	GKAlSi12	34954	—	—	—	1	1
4	Eccentric shaft, 10mm stroke	9SMnPb28K	34938	1	1	1	1	1
5	Bearing flange	AlCuMg	34958	1	1	1	1	1
6	Worm wheel i=20	Bronze	34989	1	—	—	—	—
	Worm wheel i=15	Bronze	34990	—	1	—	1	—
	Worm wheel i=12	Bronze	35043	—	—	1	—	1
7	Adjusting spring	St	83488	1	1	1	1	1
8	Grooved ball bearing	St	86003	1	1	1	1	1
9	Grooved ball bearing	St	86118	1	1	1	1	1
10	Backing bearing	St	86139	1	1	1	1	1
11	Locking washer	Spring steel	84210	1	1	1	1	1
12	Adjusting eccentric, 10mm stroke	IXEF	34920	1	1	1	1	1
13	Diaphragm d120	EPDM/PTFE	81467	1	1	1	—	—
	Diaphragm d150	EPDM/PTFE	81468	—	—	—	1	1
14	Leakage pipe assembly d21	PP/Viton	25193	1	1	1	1	1
15	Diaphragm rod M12	1.4305	34986	1	1	1	1	1
16	Pressure spring	Spring steel	34996	1	1	1	1	1
17	Adjusting knob	Plastic	34923	1	1	1	1	1
18	Knurled knob	Plastic/St	35142	1	1	1	1	1
19	Pinion shaft	45S20K	34994	1	1	1	1	1
20	Worm i=20	9SMnPb28K	31557	1	—	—	—	—
	Worm i=15	9SMnPb28K	34991	—	1	—	1	—
	Worm i=12	9SMnPb28K	35044	—	—	1	—	1
21	Grooved ball bearing	St	86001	1	1	1	1	1
22	Grooved ball bearing	St	86140	1	1	1	1	1
23	Adjusting spring	St	83675	1	1	1	1	1
24	Plate spring	1.4310	84179	1	1	1	1	1
25	Nutter M10x1	St	35173	1	1	1	1	1
26	Threaded plug	Plastic	88232	1	1	1	1	1
27	Sleeve bearing bushing	MB1615DU	34997	2	2	2	2	2
28	Compact seal	AU	80820	1	1	1	1	1
29	Stripper	Simritan	81751	1	1	1	1	1
30	Gasket	NBR	81746	1	1	1	1	1
31	Gasket	AF	81752	1	1	1	1	1
32	O-ring	NBR	80598	1	1	1	1	1
33	O-ring	NBR	80815	1	1	1	1	1
34	Scale	Plastic	87584	1	1	1	1	1
35	Oil gauge	Plastic	88228	1	1	1	1	1
36	Screw	A2	83668	10	10	10	10	10
37	Screw	A2	83664	4	4	4	4	4
38	Screw	A2	83668	4	4	4	4	4
39	Washer	A2	84160	4	4	4	4	4
40	Washer	Copper	84206	4	4	4	4	4
41	Retaining ring	Spring steel	84003	1	1	1	1	1
42	Retaining ring	Spring steel	84004	1	1	1	1	1

* incl. sealing pos. 30

Diaphragm Metering Pump MEMDOS E / DX



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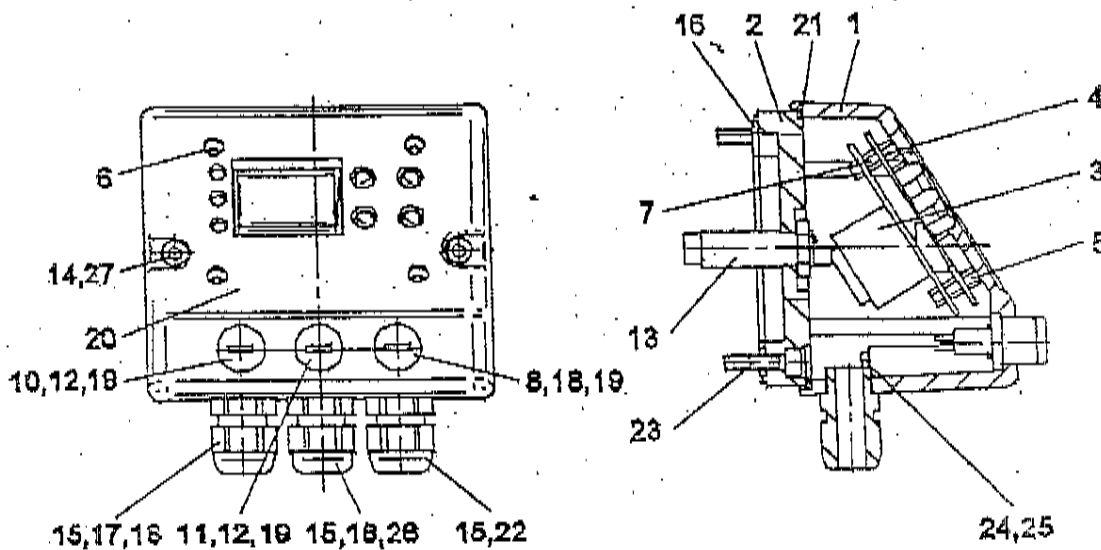
Control unit

Item	Description	Material	Qty	Part No.
1	Electronic housing assembly	GKAlSi12/PPO	1	34852
2	Gear cover Memdos DX 4...156*	GKAlSi12	1	34856
	Gear cover Memdos DX 160...380*	GKAlSi12	1	34931
3	Electronics 230 V		1	79043
4	Spacing bolt M3x5	Brass nickel-pl.	4	83848
5	Spacing bolt M3x10	Plastic	2	83849
6	Oval flat-head screw	A2	4	83847
7	Spacing bolt M3x6	Plastic	2	83854
8	Coaxial Cinch socket	Misc.	1	33879
9	Dummy plug	PE	1	25084
10	Jack socket	Plastic	1	78946
11	Stereo jack socket	Plastic	1	33878
12	Dummy plug	Ms58	2	29115
13	Approximation initiator	Misc.	1	79050
14	Screw	A2	2	83035
15	Union PG9	PA black	3	78904
16	Cover seal DX 4...156	NBR	1	81745
	Cover seal DX 160...380	NBR	1	81746
17	Mains cable	Misc.	1	79075
18	Insulating nozzle	Plastic	6	78916
19	Dummy plug PG7	PS black	2	78788
20	Display film		1	34928
21	Foam rubber	EPDM	0.4m	97183
22	Warning alarm cable	Neoprene	1	78800
23	Screw DX 4...156	A2	6	83268
	Screw DX 160...380	A2	6	83668
24	Oval-head screw	A2	1	83070
25	Toothed washer	Spring st. tinned	1	84133
26	Motor connecting cable	Misc.	1	79051
27	Washer	Copper	2	84191

* incl. sealing pos. 16

Connecting cable for external control part no. 25096

Connecting cable for remote switchoff part no. 35119



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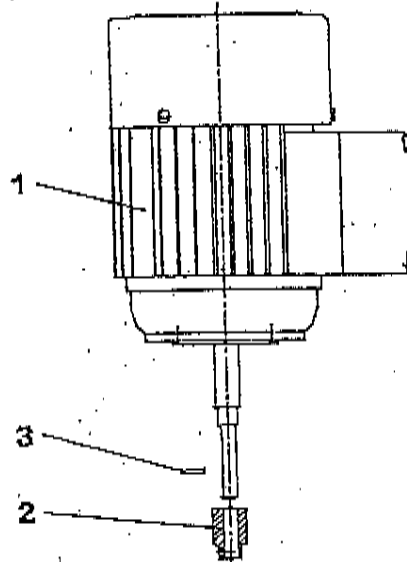
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Diaphragm Metering Pump MEMDOS E / DX

JESCO®

ET 1 04 02 / 8

Motor



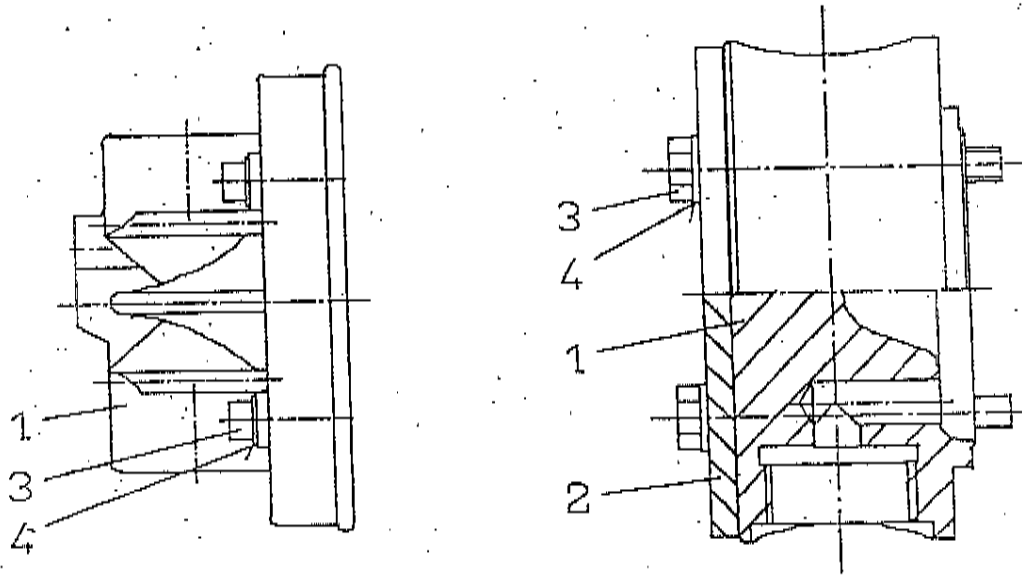
Pump type	Motor assembly			Motor Gear	Worm shaft	Adapter sleeve
	Electrical data	Part.No.	ratio	Pos. 1 Part. No.	Pos. 2 Part. No.	Pos. 3 Part. No.
E4	Three-phase 400/230V, 50Hz, 0,05kW Bg63, IP55, ISO-F	27522	55:1	77700	11380	83414
E8		31431	30:1		29551	
E15/50		27697	15:1		11376	
E26		35237	12:1	79076	35185	
E25		34884	10:1	77700	34885	
E4	400/230V, 50Hz, 0,25kW Bg63, IP55, ISO-F	32827	55:1	78959	11380	
E8		32826	30:1		29551	
E15/50/110		32531	15:1		11376	
E76/156		35238	12:1	79077	35185	
E25/75/150		34913	10:1	78959	34885	
E/DX4	A.C. 230V, 50Hz, 0,05kW Bg63, IP55, ISO-F S601	35082	55:1	79056	11380	
E/DX8		35083	30:1		29551	
E/DX15		35084	15:1		11376	
E/DX26		35239	12:1	79078	35185	
E/DX25		34914	10:1	79056	34885	
E/DX50/110	230V, 50Hz, 0,12kW Bg63, IP55, ISO-F S601	34917	15:1	78689	11376	
E/DX76/156		35240	12:1	79079	35185	
E/DX75/150		34915	10:1	78689	34885	
E160...380	Three-phase 400/230V, 50Hz, 0,37kW Bg71, IP55, ISO-F	79048	Part of gear	79048	Part of gear	-
E/DX160...380	A.C. 230V, 50Hz, 0,25kW Bg71, IP55, ISO-F, S601	79057		79057		

Diaphragm Metering Pump MEMDOS E / DX



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Head Assembly



Item	Description	Qty	Head Material				
			PVC	PVDF	PP	1.4571	
1	Diaphragm housing	1	E / DX 4...26	22399	28689	—	21613
			E / DX 50 ... 76	18113	—	—	23912
			E / DX 110 ... 156	—	—	34966	32902
			E / DX 160...260	—	—	34709	22394
			E / DX 300 and 380	—	—	34950	34951
2	Pressure plate	1	E / DX 110 ... 156 *	—	—	32903	—
			E / DX 160...260	—	—	18453	—
			E / DX 300 and 380	—	—	34995	—
3	Screws	4	E / DX 4...26	83794	83794	—	83482
			E / DX 50 ... 76	83644	—	—	83644
			E / DX 110 ... 156	—	—	83495	83685
			E / DX 160...260	—	—	83495	83685
			E / DX 300 and 380	—	—	83495	83542
4	Washers	4	E / DX 4...26	84143	84183	—	84143
			E / DX 50 ... 76	84160	—	—	84160
			E / DX 110 ... 156	—	—	84131	84131
			E / DX 160 ... 380	—	—	84174	84174

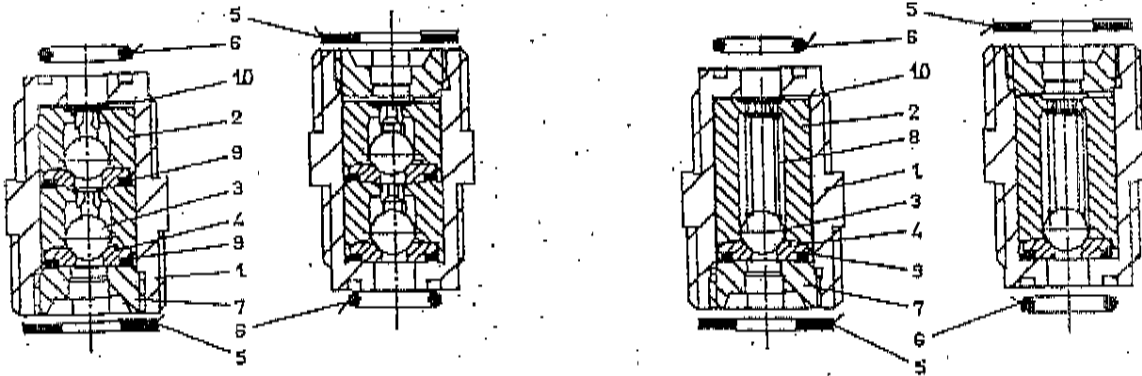
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Diaphragm Metering Pump MEMDOS E / DX



ET 1 04 02 / 10

DN 4 valves for E / DX 4 ... 26



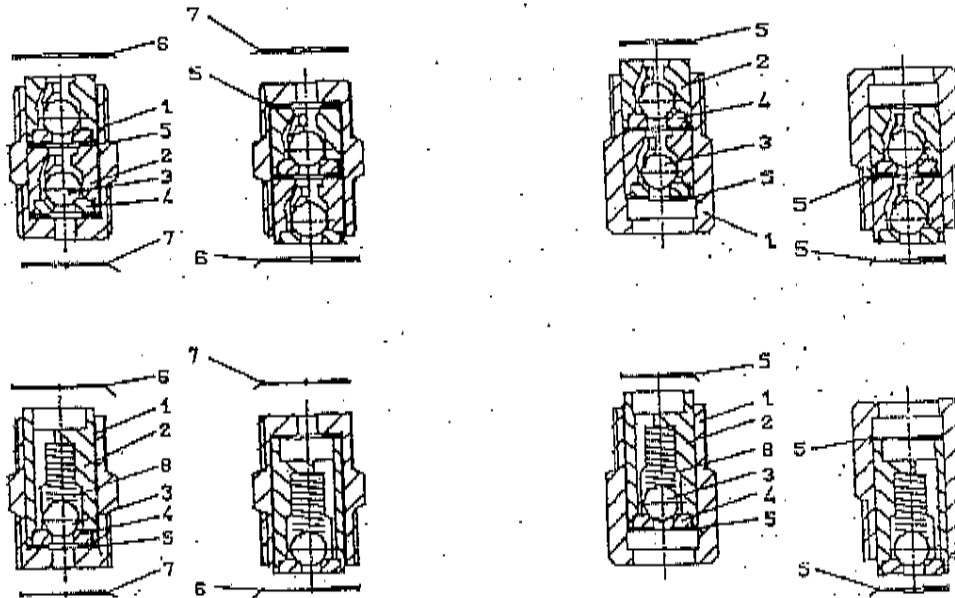
Item	Description	Material	Part No.	Double-ball valve			Spring-loaded valve		
				PVC	PVDF	1.4571	PVC	PVDF	1.4571
1	Valve body	PVC	20845	1	—	—	1	—	—
		PVDF	28108	—	1	—	—	1	—
		1.4571	19289	—	—	1	—	—	1
2	Ball guide	PVC	19294	2	—	—	—	—	—
		PVDF	28109	—	2	—	—	—	—
		1.4571	19293	—	—	2	—	—	—
		PVC	24066	—	—	—	1	—	—
		PVDF	29386	—	—	—	—	1	—
3	Valve ball	1.4571	24067	—	—	—	—	—	1
		Glas	29778	2	—	—	1	—	—
		PTFE	25247	—	2	—	—	1	—
4	Valve seat	1.4401	18044	—	—	2	—	—	1
		PVDF	81460	2	2	2	1	1	1
5	Gasket	Viton	81371	1	—	—	1	—	—
		PTFE	81580	—	1	—	—	1	—
		PTFE	81677	—	—	1	—	—	1
6	O-ring	Viton	81384	1	—	—	1	—	—
		PTFE	80617	—	1	1	—	1	1
7	Plug	PVC	19299	1	—	—	1	—	—
		PVDF	28110	—	1	—	—	1	—
		1.4571	24031	—	—	1	—	—	1
8	Valve spring	Hastelloy	25081	—	—	—	1	1	1
9	O-ring	Viton	80013	2	—	—	1	—	—
		PTFE	80627	—	2	2	—	1	1
10	Gasket	Viton	81526	1	—	—	1	—	—
		PTFE	81585	—	1	1	—	1	1
Suction valve assembly				20890	28111	24029	25087	29385	25089
Discharge valve assembly				20891	28112	24030	25088	29384	25090

Diaphragm Metering Pump MEMDOS E / DX



ET 1 04 02 / 11

DN 6 valves for E / DX 50 ... 76



Item	Description	Material	Part No.	Double-ball valve						Spring-loaded valve			
				Suction valve			Discharge valve			Suction valve		Discharge valve	
				PVC	1.4571		PVC	1.4571		PVC	1.4571	PVC	1.4571
				Seal material: H=Hypalon, V=Viton, AF=asbestos-free									
	H	V	AF	H	V	AF	H	V	AF	H	V	AF	
	18187	18185	26967	18186	18186	26968	25161	25162	28775	27516	27517	28776	
1	Valve housing	PVC	18189	1	1	—	1	1	—	1	1	—	1
		1.4571	19601	—	—	1	—	—	1	—	—	—	1
2	Ball guide	PVC	82405	2	2	—	2	2	—	—	—	—	—
		1.4581	82102	—	—	2	—	—	2	—	—	—	—
		PVC	23412	—	—	—	—	—	1	1	—	1	1
		1.4571	25169	—	—	—	—	—	—	—	1	—	—
3	Valve ball	Ceramic	10017	2	2	—	2	2	—	1	1	—	1
		1.4401	10136	—	—	2	—	—	2	—	—	1	—
4	Valve seat	PVC	82406	2	2	—	2	2	—	1	1	—	1
		1.4571	82103	—	—	2	—	—	2	—	—	1	—
5	Gasket	Hypalon	81037	2	—	—	2	—	—	1	—	—	1
		Viton	81138	—	2	—	—	2	—	—	1	—	—
		AF	81625	—	—	3	—	—	3	—	—	2	—
6	Gasket	Hypalon	81033	1	—	—	1	—	—	1	—	—	1
		Viton	81285	—	1	—	—	1	—	—	1	—	—
		AF	81626	—	—	1	—	—	1	—	—	1	—
7	Gasket	Hypalon	81041	1	—	—	1	—	—	1	—	—	1
		Viton	81141	—	1	—	—	1	—	—	1	—	—
8	Valve spring	Hastelloy	25082	—	—	—	—	—	—	1	1	1	1

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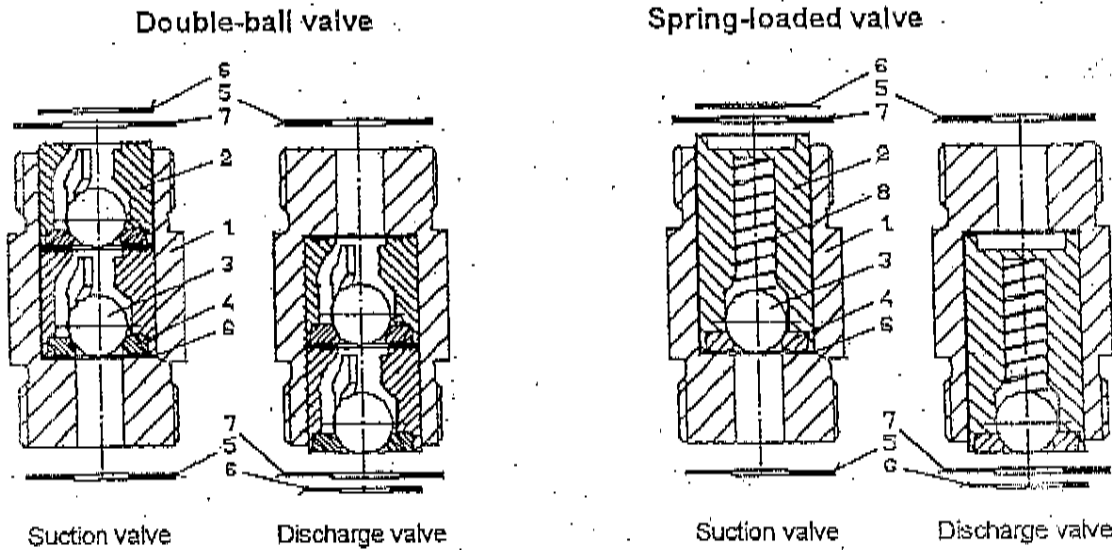
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Diaphragm Metering Pump MEMDOS E / DX



ET 1 04 02 / 12

DN 10 valves E / DX 110...380



Item	Description	Material	Part No.	Double-ball valve						Spring-loaded valve					
				Suction			Discharge			Suction			Discharge		
				PP	1.4571	PP	1.4571	PP	1.4571	PP	1.4571	PP	1.4571		
				Dichtungswerkstoff: H=Hypalon, V=Viton, AF=asbestfrei											
				H	V	AF	H	V	AF	H	V	AF	H	V	AF
				99672	35051	29694	34673	35052	29695	34814	35055	29696	34815	35056	29697
1	Valve housing	PP	34665	1	1	—	1	1	—	1	1	—	1	1	—
		1.4571	32449	—	—	1	—	—	1	—	—	1	—	—	1
2	Ball guide	PP	34142	2	2	—	2	2	—	—	—	—	—	—	—
		1.4581	82112	—	—	2	—	2	—	—	—	—	—	—	—
		PP	22882	—	—	—	—	—	—	1	1	—	1	1	—
		1.4581	22881	—	—	—	—	—	—	—	—	1	—	—	1
3	Valve ball d 16	Glass	82457	2	2	—	2	2	—	1	1	—	1	1	—
		1.4401	82114	—	—	2	—	—	2	—	—	1	—	—	1
4	Valve seat	PP	82456	2	2	—	2	2	—	1	1	—	1	1	—
		1.4571	82113	—	—	2	—	—	2	—	—	1	—	—	1
5	Gasket	Hypalon	81035	1	—	—	1	—	—	1	—	—	1	—	—
		Viton	81198	—	1	—	—	1	—	—	1	—	—	1	—
		AF	81629	—	—	1	—	—	1	—	—	1	—	—	1
6	Gasket	Hypalon	81238	2	—	—	2	—	—	1	—	—	1	—	—
		Viton	81276	—	2	—	—	2	—	—	1	—	—	1	—
		AF	81627	—	—	3	—	—	3	—	—	2	—	—	2
7	Gasket	Hypalon	81239	1	—	—	1	—	—	1	—	—	1	—	—
		Viton	81277	—	1	—	—	1	—	—	1	—	—	1	—
8	Valve spring	Hastelloy	32577	—	—	—	—	—	—	1	1	1	1	1	1

Diaphragm Metering Pump MEMDOS E / DX



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Connections for Memdos E / DX 4... 26

Conn. type	Material	Size	Conn. Assbly Part No.	Item	Spare parts		
					Description	Part No.	
	PVC	4/6	20975	1	Union nut	88116	
				2	Connection	88012	
				3	Clamping ring	88003	
				4	Union nut	88004	
		6/8	25176	1	Union nut	82087	
				2	Connection	31370	
	PVDF	6/9	34925	1	Union nut	88116	
					2	Connection	88199
					3	Clamping ring	34762
		6/12	32980	1	Union nut	88116	
					2	Connection	32572
					3	Clamping ring	32571
4/6	29387	1	Union nut	28120			
			2	Connection	88028		
			3	Clamping ring	88003		
6/12	33161	1	Union nut	88117			
			2	Connection	32572		
			3	Clamping ring	33571		
	PVC	6/12	23092	1	Union nut	82087	
				2	Tubing conn.	18042	
	1.4571	6/12	23093	1	Union nut	19303	
	PVC	10	23087	2	Cemented conn.	82014	
				1	Union nut	82087	
	12	23089	1	Union nut	82087		
2			Cemented conn.	82013			
	PVC	G 1/4	23088	1	Union nut	82087	
				2	Threaded conn.	82185	
	PVDF	G 1/4	29179	1	Union nut	28120	
2					Threaded conn.	28292	
	1.4571	10	23090	1	Union nut	88038	
				2	Cutting ring	88039	
	12	23091	1	Union nut	88040		
2				Cutting ring	88041		

Diaphragm Metering Pump MEMDOS E / DX



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Connections for Memdos E / DX 50...76

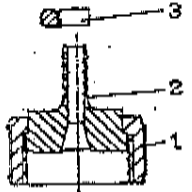
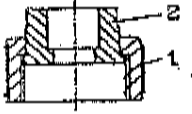
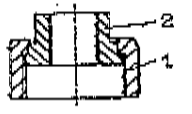
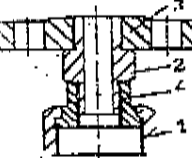
Conn. type	Material	Size	Conn. Assbly Part No.	Item	Spare parts					
					Description	Part No.				
	PVC	6/8	28159	1	Union nut	82156				
				2	Connection	88012				
				4	Union nut	88004				
				6/9	34326	1	Union nut	82156		
						2	Connection	88199		
						3	Clamping ring	34762		
						4	Union nut	34696		
						6/12	34922	1	Union nut	82156
								2	Connection	32572
				3	Clamping ring	32571				
	PVC	6/12	23342	1	Union nut	82156				
				2	Tubing connection	18042				
				3	Hose clamp	82398				
	1.4571	6/12	23426	1	Hose liner	18268				
				2	Hose clamp	82398				
	PVC	10	25167	1	Union nut	82156				
				2	Cemented conn.	82014				
			12	27518	1	Union nut	82156			
					2	Cemented conn.	82013			
			16	25625	1	Union nut	23685			
					2	Flange bushing	22508			
	PVC	G 1/4	25165	1	Union nut	82156				
				2	Threaded conn.	82185				
	1.4571	G 1/4	82105	1	Flange bushing	82105				
	1.4571	8	27519	1	Union nut	88036				
				2	Cutting ring	88037				

Diaphragm Metering Pump MEMDOS E / DX

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Connections for E / DX 110...380

	Conn. type	Material	Size	Conn. Assbly Part No.	Item	Spare parts			
						Description	Part No.		
	B	PVC	ø 9/15	25921	1	Union nut	82213		
					2	Tubing conn.	25920		
					3	Hose clamp	82398		
		ø 16/26	25936	1	Union nut	82213			
				2	Tubing conn.	25934			
				3	Hose clamp	82413			
	1.4571	ø 9/15	25925	1	Union nut	29518			
				2	Tubing conn.	25928			
				3	Hose clamp	82398			
	ø 16/26	25935	1	Union nut	29518				
			2	Tubing conn.	25933				
			3	Hose clamp	82413				
	C	PVC	ø 12	25923	1	Union nut	82213		
					2	Cemented conn.	25922		
					ø 16	27672	1	Union nut	82213
							2	Cemented conn.	27846
	ø 20	25937	1	Union nut	82213				
			2	Cemented conn.	25931				
	ø 25	33318	1	Union nut	82213				
			2	Cemented conn.	82952				
	D	PVC	G 1/2	25943	1	Union nut	82213		
					2	Threaded conn.	25940		
		G 3/8	25930	1	Union nut	82213			
				2	Threaded conn.	21900			
		1.4571	G 1/2	25944	1	Union nut	29518		
					2	Threaded conn.	25938		
		G 3/8	27037	1	Union nut	29518			
				2	Threaded conn.	27038			
		G 3/4	27689	1	Union nut	29518			
				2	Threaded conn.	27690			
	F	PVC	DN 15	25956	1	Union nut	82213		
					2	Flanged conn.	32178		
					3	Flange	14264		
					1.4571	DN 15	25957	1	Union nut
		2	Flanged conn.	21309					
		3	Flange	14200					
		4	Threaded conn.	25938					

Diaphragm Metering Pump MEMDOS E / DX

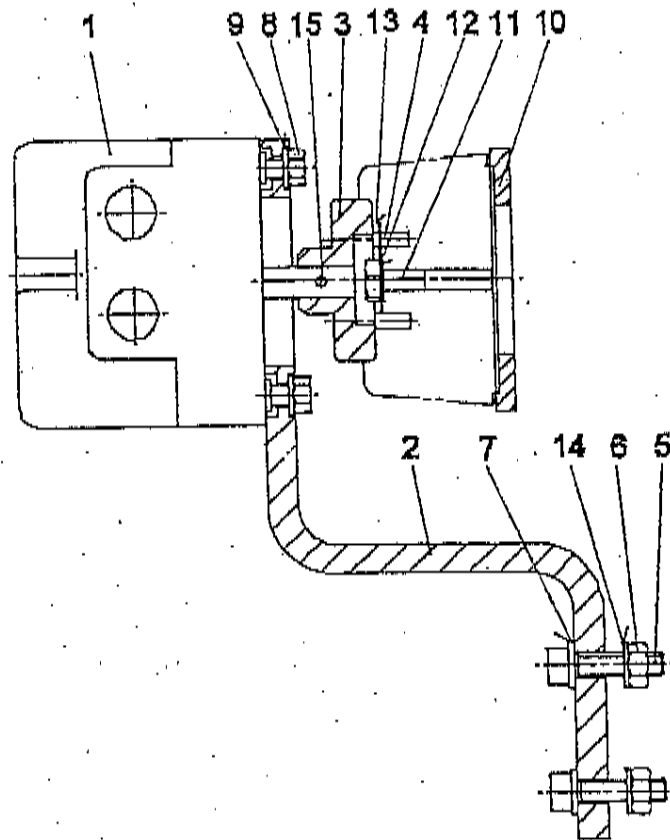
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ET10402 / 16

Servomotor



Item	Description	Material	Part No.	E/DX4...156	E/DX160...380
1	ATE electrical servomotor	misc.	79073	1	-
			79080	-	1
2	Mounting brackets	Al	35204	1	-
		St37	35233	-	1
3	Coupling	1.4571	35205	1	1
4	Straight pin	A4	83866	2	2
5	Socket head cap screw	A2	83619	2	-
			83680	-	2
6	Hex nut M6	A2	83395	2	2
7	Washer d6.4	A4	84203	2	2
8	Hex nut M5	A2	83616	2	2
9	Washer d5.3	A4	84202	2	2
10	Sliding washer	PE	35209	1	-
			35234	-	1
11	Hex bolt	A2	83630	1	1
12	Spring washer	1.4310	84179	1	1
13	Locking plate	St galv.	84172	1	1
14	Toothed washer	A2	84145	2	2
15	Locking sleeve	1.4310	83867	1	1



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Keep the operating instructions of the metering pump and the accessories readily accessible.

List of contents

1. Scope of delivery
2. Technical data
3. Installation
4. Electrical connection of pump
5. Safety instructions
6. Startup
7. MEMDOS DX control unit
8. Maintenance
9. Troubleshooting

1. Scope of delivery

Be careful when unpacking the metering pump and order-related accessories in order not to miss small parts. Compare the scope of delivery to the delivery not. If there are any discrepancies, try to find out the reason.

For the transportation of the metering pumps, no special fittings are required. It is, however, advisable to choose a transportation method, which is appropriate for the weight of the metering pumps (e.g. wagon). During transportation without oil, the metering pump should be lying. Otherwise it must be tightened to the transportation device.

Technical data

Types	MEMDOS E / DX 4...156											MEMDOS E / DX 160...380					
	4	8	15	25 ¹⁾	29 ¹⁾	50	75 ²⁾	76 ²⁾	110	150 ²⁾	156 ²⁾	160	200	250 ²⁾	300	380 ²⁾	
Capacity at max. pressure	l/h	4	7.5	15	23	24	48	72	73	107	160	162	156	208	263	292	393
Stroke volume	ml/str	2.6			8.5			19			38.5		51.2		54.5		
Max. pressure	bar	10						5		4		10		8		6	
Stroke freq.	1/min	26	48	95	142	144	95	142	144	95	142	144	71	95	120	95	120
Diaphragm-ø	mm	52			64			90			120		150				
Hublänge	mm	6			9								10				
Suction lift	mbar	900			800			700			600		450				
Max. ambient temperature ³⁾	°C	40															
Leistung E (3~)	W	50			250			370									
Leistung DX (1~)	W	50			120			250									
Weight plastic	kg	7.4			7.6			10.2			18.0		19.0				
Memdos E		8.0			9.2			18.2			26.0		31.0				
Weight SS	kg	8.2			8.4			11.0			22.0		23.0				
Memdos DX		8.8			10.0			19.0			30.0		35.0				

¹⁾ Special sizes for 60 Hz operation. Flow rate and stroke frequency data refer to 60Hz operation.

²⁾ Not suitable for 60Hz operation.

³⁾ Max. ambient temperature for PVC metering head 40°C and for PP or stainless steel metering heads 60°C (for a short time 80°C).

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3. Installation

For selection of a pump during construction of a plant as well as for installation and operation, the local rules must be observed. This applies to the selection of suitable pump materials, the handling of the chemicals and the electrical installation. At the same time the technical data of the metering pump according to the above tables must be considered, and the plant must be designed correspondingly (e.g. pressure loss in lines depending on nominal diameter and length).

Both, the designer and the user are responsible to make sure that the whole plant including the metering pump is constructed so that neither plant equipment nor buildings are severely damaged in the case of chemical leakage due to the failure of wear parts (e.g. diaphragm rupture) or burst tubing. When constructing chemical plants, the installation must be carried out so that no consequential damages appear which are unreasonably high even if the metering pump fails. We recommend installing leakage probes and containment tanks.

Metering pumps are produced according to highest quality standards and have a long service life. Nevertheless some parts are subject to wear (e.g. diaphragm, valve seats, valve balls). To ensure long operating life, visual checks are required regularly. Operating and maintenance personnel must be able to access the pump easily. Periodic maintenance protects the metering pump against shutdowns.

To increase the metering accuracy and reliability, we recommend using additional fittings. These include backpressure valves, relief valves, leakage probes, chemical low level indicators and particularly pulsation dampeners against pressure fluctuations, as shown in the following installation example.

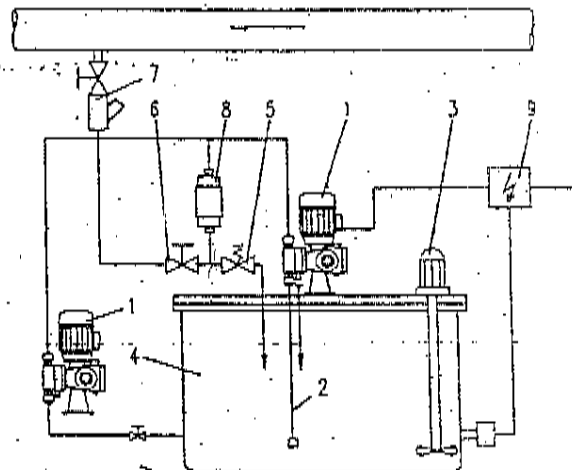
Always use appropriate tools for the installation of plastic connecting parts. In order to avoid damage, never apply excessive force. Plastic parts (especially PVC parts) can be screwed and unscrewed more easily if the thread is lubricated with vaseline or silicone grease before.

Note: For this purpose, the compatibility with the chemical to be metered must be checked. Ambient temperatures exceeding 40°C are not permitted. Radiant heat of apparatus and heat exchangers must be kept in limits allowing the pump to sufficiently dissipate its own heat. Exposure to direct sunlight must be avoided. If the pump is installed outside, provide an enclosure to protect it against weather.

Mount the pump so that the suction and discharge valve are in vertical position. To ensure that the pump stands firm, fasten it with screws on an appropriate foundation.

The system piping must not exert any force on the connections and valves of the metering pump. To avoid incorrect metering after the process is finished, provide an electric and hydraulic interlocking system.

Installation example



Legend

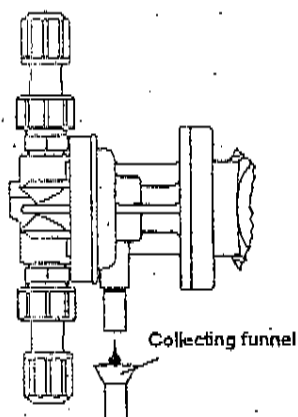
1 Metering pump E/DX	MB 1 04 02
2 Suction line	MB 1 22 01
3 Electric agitator	MB 1 36 01
4 Tank	MB 1 20 01
5 Relief valve	MB 1 25 01
6 Diaphragm shutoff valve	MB 1 24 01
7 Injection nozzle	MB 1 23 01
8 Pulsation dampener	MB 1 27 01
9 Switchbox	upon request

Diaphragm Metering Pump MEMDOS E / DX



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Drain pipe



Drainage or leakage from the separating chamber must be routed with a certain downward slope to the containment tank. By no means must the drain pipe be returned directly to the chemical through the tank cover because otherwise effervescent media might enter the pump gear. The drain pipe may only be routed to a collecting tank free of gases (with a downward slope) or to a collecting funnel - also with a downward slope - above which the pipe ends at a sufficient distance. Leakage can be returned via the funnel through the tank cover. Besides, possible leakage can be seen at the funnel.

4. Electrical connection of pump

- The electrical connection of the pump must be made according to the local rules and may only be carried out by technical personnel.
- Cable type and cable cross section of the supply lines must be selected according to the motor data.
- The cable passage to the motor terminal box must be made professionally. We recommend gland screw connections with traction relief.
- The required protection class must be ensured by professional installation of the electrical connections.

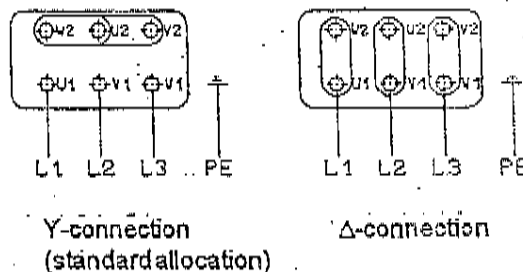
Electrical connection data (other types upon request)

Pump size	Voltage [Volt]	Power [Watt]	Current [A]
Memdos E4 ... 50	400/230 3~ 50 Hz	50	0.50/0.87
Memdos E/DX4 ... 26	230 1~ 50 Hz	50	0.70
Memdos E50 ... 156	400/230 3~ 50 Hz	250	0.90/1.55
Memdos E/DX50 ... 156	230 1~ 50 Hz	120	1.15
Memdos E160 ... 380	400/230 3~ 50 Hz	370	1.06/1.84
Memdos E/DX160 ... 380	230 1~ 50 Hz	250	2.25

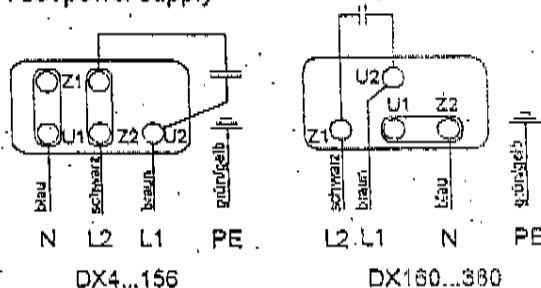
Wiring diagram of the drive motor - 3-phase power supply

Attention!

To avoid early wear of the gear drive adhere to the correct rotation direction of the motor by all means: looking at the fan wheel, counterclockwise.



- A.C. power supply



- Special versions

For other special versions please refer to the corresponding separate circuit diagrams.

- The electrical connection of the MEMDOS DX is shown and described in chapter 7, MEMDOS DX control unit.

Diaphragm Metering Pump MEMDOS E / DX



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5. Safety instructions

- When working on metering equipment, observe the local safety rules (e.g. wear personal protective clothes).
- Before working on the metering pump and plant, disconnect it from the main power supply and secure it against reconnection. Before the voltage supply is switched on again, the metering lines must be connected so that chemical left in the metering head cannot spurt out.
- The metering head of the pump as well as connections and lines in the plant may be under pressure. Working on the metering plant requires special safety precautions and may only be carried out by instructed technical personnel.
- Before startup, all screwed connections must be checked for correct tightness and, if necessary, must be tightened up using appropriate tools.
- If connections at the metering head are unscrewed during operation for venting or other reasons, leaking chemical must be removed completely. This is the only way to avoid the danger of physical injury and corrosion at the metering pump. Leaking chemical may also destroy the diaphragm at its mounting points.
- When changing the chemical, check whether the materials used for the metering pump and the other plant parts are chemically resistant. If there is the danger of a chemical reaction between different media, a thorough cleaning first is mandatory.
- To operate the pump mount the fan shell in order to ensure sufficient cooling of the motor.

Note:

Under certain operating conditions, the drive motor of the DX version might warm up considerably. To avoid unintentional contact, provide an appropriate device.

6. Startup

1. Before starting the metering pumps all works mentioned in the "Installation" section must be carried out. At the same time the safety instructions must be observed.
2. The MEMDOS E metering pump is switched on by a control to be installed externally. The MEMDOS DX has its own control. The electrical connection and the different possibilities of control are described in chapter 7, MEMDOS DX control unit.
3. The manual or electrical capacity adjustment must be set to maximum stroke to improve priming. During first priming no backpressure should be applied. For this purpose we recommend to install a relief valve on the discharge side of the metering pump.
4. A previously installed priming aid must be filled with chemical first. If the pump is not priming, turn out the discharge valve and fill water or chemical (if not dangerous!) into the metering head. Remount valve and start priming.
5. If a venting facility is available as separate unit, open it and wait until liquid escapes. Then close it again. In the case of effervescent liquids allow the liquid to escape permanently (approx. 1 drop for 1...3 strokes).
6. When correct operation is achieved, set to required output by means of the adjusting knob. For first approximation refer to the performance curves shown in MB 1 04 02. Depending on the installation and the chemicals used, these values may differ and must be checked under operating conditions.
7. The manufacturer of the metering equipment is not responsible for damages due to excessive or low flow rates resulting from faulty pump settings or incorrect and insufficient installation of peripheral fittings.

Diaphragm Metering Pump MEMDOS E / DX

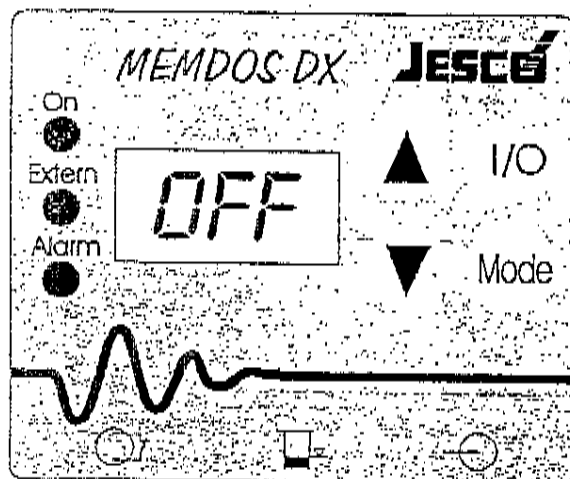
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7. MEMDOS DX control unit

Operating panel

The operating panel has two green LEDs for operation and external control, one red LED for alarm, one 3-digit multifunctional display and four keys for settings. The inputs for remote switchoff, low level indication and external control are located below the display.



Remote switchoff External control
Low level indication

Switchon / off

The pump is switched on / off using the I/O key. While disconnected the display shows *OFF*. By opening the contact for remote switchoff the pump is also turned off. The Extern LED is on.

Operating modes

To select the operating mode, press the Mode key. The display shows the designation of an operating mode which can be changed using keys ▼ and ▲.

Internal operation: *INT* appears in the display, and after releasing the Mode key, the set stroke frequency is shown. The latter can be modified using keys ▼ and ▲. The value is changed at an increasing speed with the key pressed.

External control: The display shows the multiplier *11.154* or the divisor *21.641*. After releasing the Mode key, the number of strokes still to be carried out is indicated in the case of multiplication operation. In the case of division operation, the number of received input pulses is shown. The Extern LED is on.

0/4...20mA control signal: It is possible to choose between a 0...20 mA or 4...20 mA standard signal (display *0.20* or *4.20*). After releasing the Mode key, the stroke frequency corresponding to the current appears in the display. The Extern LED is on. If the current exceeds 20 mA (display *DPL*) or decreases below 4mA in the range of 4...20 mA (display *E-1*), the Alarm LED lights up, the alarm relay is actuated and the pump stops.

Alarm

The pump allows to control the metering process. An alarm is indicated visually in the display and forwarded by the warning alarm relay.

Low level alarm signaling: The Alarm LED blinks and the alarm relay is actuated. The display shows *E-L*.

Low level main alarm: The Alarm LED is on and the alarm relay is actuated. The pump stops. The display shows *E-L*.

Internal error: The pump carries out a self-check which switches off the pump, if no stroke has been carried out two seconds after startup of motor (e.g. in the case of excessively high backpressure) or if the stroke sensor does not work (display *E-2*). The alarm is reset by removing the mains plug. In addition, it is possible to connect a diaphragm failure sensor (display *E-H*) and a metering monitoring unit (display *E-F*).

Factory setting

These settings should only be made if the electronic unit is replaced.

Max. number of strokes: Keep the keys Mode and I/O pressed while applying voltage and set the maximum number of pump strokes using keys ▼ and ▲. After releasing the Mode key, normal operation starts.

Alarm relay: If the keys Mode and ▲ are pressed while applying voltage (display *RED*), the relay is currentless in the case of error and *OFF*, when pressing the keys Mode and ▼, the relay pulls up in the case of error (display *RE*).

Diaphragm Metering Pump MEMDOS E / DX

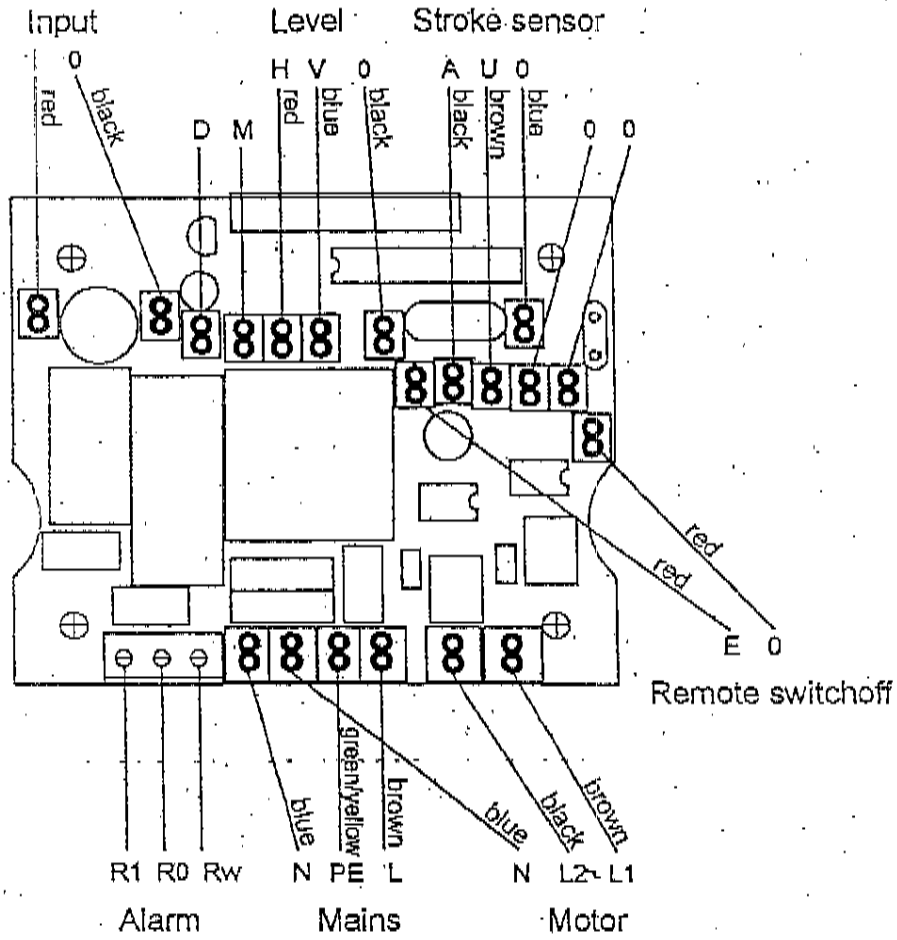


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Diaphragm Metering Pump MEMDOS E / DX

Circuit diagram

Important note: When exchanging the electronic unit, only remove the plug connectors not the cable!



- R0 Break contact
- R1 Make contact
- Rw Change over contact



MB 1 23 01 / 1

General

Injection fittings are used to inject the chemical delivered by the metering pump into the system to be treated.

Injection Pipe

The injection pipe (I) allows the metering chemical to be injected into the centre of the piping system, to ensure uniform mixing.

Non-Return Valve

The non-return valve (R) prevents liquid from flowing backward from the system under pressure into the metering plant or metering tank. All sizes are available in the form of a single-ball non-return valve with an opening pressure of approx. 0.1 bar. Special types with an opening pressure of approx. 1.2 bar are also available.

Shutoff Valve

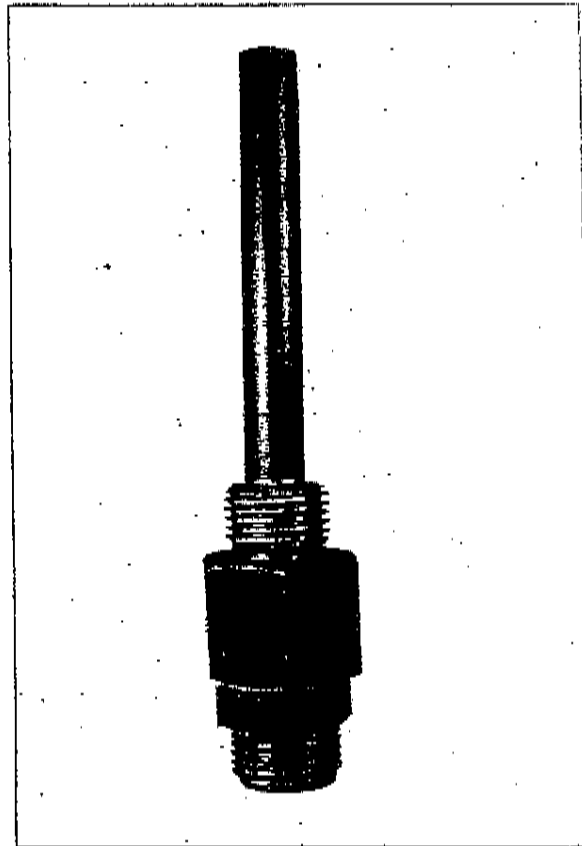
A shut-off valve (A) allows to separate the metering installation, including the non-return valve, from the plant under pressure. Due to the shut-off valve the non-return valve can be maintained after being separated from the system. Prior to longer periods of standstill it should be closed since the sealing of the non-return valve may be affected by dirt particles or wear.

Cooling Pipe

In mixed assemblies, where the metering plant fittings and pipes are of plastic and the plant itself is of steel or other metals, because the liquid temperatures are higher, a cooling pipe (K) can be used to radiate the heat. This allows plastic fittings and pipes to be connected to the plant.

Connections

The transition from the injection fitting to the metering pipe can be made in various ways, using the connections listed on MB 1 23 01 / 4. The individual elements described before are available in functional combinations and have appropriate type codes for identification.



Selection Criteria

The determining factors for selecting the appropriate injection fitting are the chemical flow, the chemical resistance and the heat resistance. PVC injection fittings may be used for temperatures of up to 40°C; other types up to 80°C; and with a cooling pipe up to 120°C.

PVC-version: $p_{max} = 10$ bar

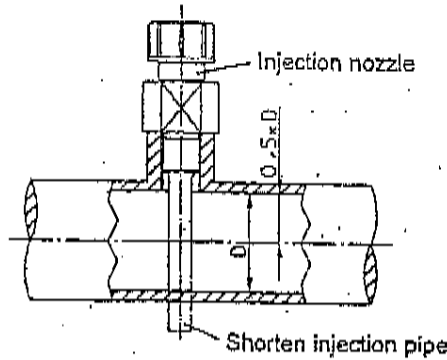
Stainless steel version:

Normal version: $p_{max} = 40$ bar

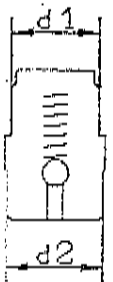
Injection Fittings I-R-A-F



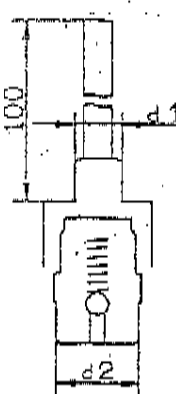
MB 1 23 01 / 2



Type R (Non-Return Valve)

	DN	lth*	d1	d2	PVC		1.4571		
					Viton	Hypalon	PTFE	AF/ Viton	Hypalon
					4	70	G 1/2	G 5/8	12325087
6	150	G 3/4	G 1	12325694	12326859	-	12326860	-	
10	400	G 1 1/4	G 1 1/4	12325707	12326845	-	12326866	-	
15	900	G 1	G 1 1/4	12325719	12326861	-	-	12326862	
25	2600	G 1 1/2	G 1 1/2	12325732	12326863	-	-	12326864	

Type IR (Injection Fitting with Non-Return Valve)

	DN	lth*	d1	d2	PVC		1.4571		
					Viton	Hypalon	PTFE	AF/ Viton	Hypalon
					4	70	G 1/4	G 5/8	12325744
G 1/2	12325692	12334942	12326925	-			-		
G 3/4	12325747	12335300	12326926	-			-		
6	150	G 1/2	G 1	12325779	12326865	-	12326868	-	
		G 3/4		12325703	12326866	-	12326869	-	
		G 1		12325780	12326867	-	12326870	-	
10	400	G 1	G 1 1/4	12325792	12326877	-	12326880	-	
		G 1 1/4		12325711	12326878	-	12326881	-	
		G 1 1/2		12325793	12326879	-	12326882	-	
15	900	G 1	G 1 1/4	12325883	12326891	-	-	12326894	
		G 1 1/2		12325814	12326892	-	-	12326895	
		G 2		12325723	12326893	-	-	12326896	
25	2600	G 1 1/2	G 1 1/2	12325880	12326907	-	-	12326909	
		G 2		12325737	12326908	-	-	12326910	

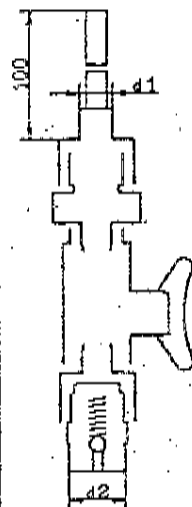
* Flow values only valid with uniform flow. Without pulsation dampener the max. flow rate for motor pumps amounts to 1/3 and for solenoid pumps to 1/5 of the indicated value.

Injection Fittings I-R-A-F



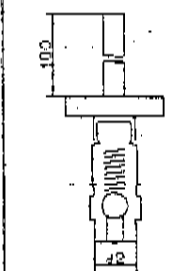
MB 1 23 01 / 3

Type IRA (Injection Fitting with Non-Return Valve and Shutoff Valve)



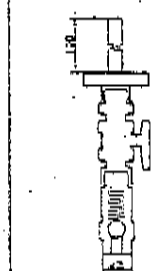
DN	l/h*	d1	d2	PVC		1.4571		
				Viton	Hypalon	PTFE	AF/ Viton	Hypalon
4	70	G 1/4	G 5/8	12325748	12335301	12326930	-	-
		G 1/2		12325691	12335302	12326931	-	-
		G 3/4		12325749	12335303	12326932	-	-
6	150	G 1/2	G 1	12325781	12326871	-	12326874	-
		G 3/4		12325704	12326972	-	12326875	-
		G 1		12325782	12326873	-	12326876	-
10	400	G 1	G 1 1/4	12325794	12326883	-	12326886	-
		G 1 1/4		12325714	12326884	-	12326887	-
		G 1 1/2		12325795	12326885	-	12326888	-
15	900	G 1	G 1 1/4	12325882	12326897	-	-	12326900
		G 1 1/2		12325815	12326898	-	-	12326901
		G 2		12325726	12326899	-	-	12326902
25	2600	G 1 1/2	G 1 1/2	12325876	12326911	-	-	12326913
		G 2		12325741	12326912	-	-	12326914

Type IRF (Injection Fitting with Non-Return Valve and Flange Connection)



DN	l/h*	d2	PVC		1.4571
			Viton	Hypalon	Hypalon
10	400	G 1 1/4	-	12327742	-
15	900	G 1 1/4	12325966	12326903	12326904
25	2600	G 1 1/2	12325969	12326915	12326916

Type IRAF (Injection Fitting with Non-Return Valve, Shutoff Valve and Flange Connection)



DN	l/h	d2	PVC		1.4571	
			Viton	Hypalon	AF/ Viton	Hypalon
10	400	G 1 1/4	12326313	12326889	12326890	-
15	900	G 1 1/4	12325967	12326905	-	12326906
25	2600	G 1 1/2	12325971	12326917	-	12326918

* Flow values only valid with uniform flow. Without pulsation dampener the max. flow rate for motor pumps amounts to 1/3 and for solenoid pumps to 1/5 of the indicated value.

Order Example:

An injection fitting with shutoff valve is required to be used with a MINIDOS A 24, for phosphate metering into a potable water pipe (max. 10 bar). A connection sleeve with G 1/2 is available. Supply line: tubing Id=4; od=6. From the IRA table on this page, size DN 4 up to 50 l/h, with d₁=G 1/2 is chosen. PVC version, type IRA, consisting of injection pipe, shutoff valve and non-return valve. Part Number 12325691. From table Cooling Pipe (K) and Connections on MB 1 23 01 / 4, for a 4/6 tubing, the connection, Part Number 20975 is selected.

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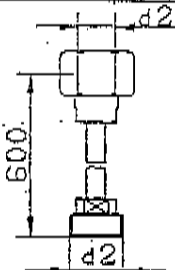
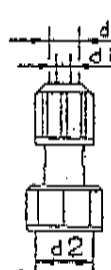
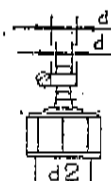
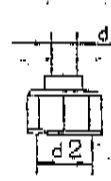

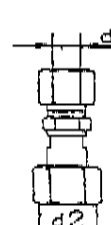
Improved changes are always reserved without notice.

Injection Fittings I-R-A-F



MB 1 23 01 / 4

Cooling Pipe (K) and Connections

	DN	d2	di/da	da	PVC	14571
Cooling pipe 	4	G 5/8	-	-	-	25849
	6	G 1	-	-	-	25853
	10	G 1 1/4	-	-	-	25892
	15		-	-	-	25893
	25	G 1 1/2	-	-	-	25903
Tubing connection 	4	G 5/8	4/6	-	20975	-
			6/8	-	25176	-
			6/12	-	19180	-
	6	G 1	6/12	-	25902	-
Hose liner 	4	G 5/8	6/12	-	23092	23093
	6	G 1	6/12	-	25908	25909
			9/15	-	32470	-
	10	G 1 1/4	9/15	-	25921	25925
	15		16/26	-	25936	25935
	25	G 1 1/2	25/34	-	25947	25949
PVC cemented connection 	4	G 5/8	-	10	23087	-
			-	12	23089	-
	6	G 1	-	10	25911	-
			-	12	22137	-
	10	G 1 1/4	-	12	25923	-
	15		-	20	25937	-
25	G 1 1/2	-	32	25950	-	
Threaded connection 	4	G 5/8	-	G 1/4	23088	22999
	6	G 1	-	G 1/4	27259	25914
			-	G 3/8	25915	31096
	10	G 1 1/4	-	G 3/8	25930	27037
	15		-	G 1/2	25943	25944
	25	G 1 1/2	-	G 3/4	-	25953
-			G 1	-	27036	
Stainless steel piping connection 	4	G 5/8	-	6	-	24959
			-	10	-	23090
	6	G 1	-	8	-	25913
	10	G 1 1/4	-	12	-	27039
			-	18	-	25938
	25	G 1 1/2	-	22	-	25952
-			28	-	27035	

Injection Fittings I-R-A-F



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Pressure Loading and Relief Valves

Introduction

Pressure Loading and Relief Valves are fittings for dosing plants. They are used, according to the user's requirements, to increase dosing accuracy or to protect the plant against excess pressure.

Where the supply pressure is higher than the dosing pressure, dosing is not possible without a pressure loading valve.

Important

This fitting must not be used as a non-return valve to prevent reverse flow.

Design

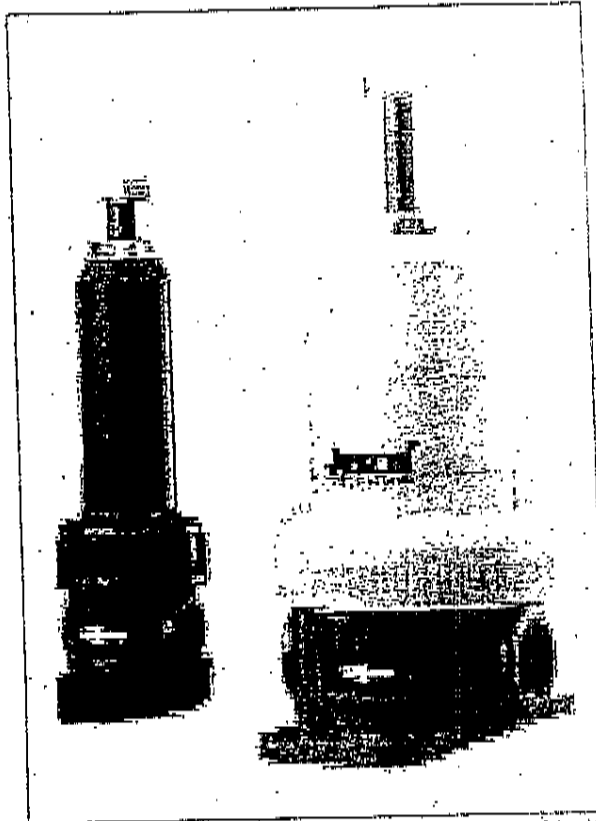
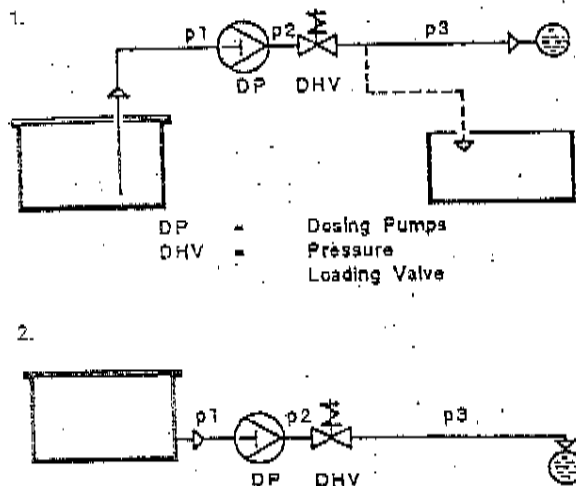
The fittings are spring loaded diaphragm valves with a small proportional range. In the uPVC and stainless steel models, the spring cover is made of PPh.

Pressure Loading Valve

Pressure sustaining Valves are required if the dosing pump has to deliver against sharply fluctuating system pressures, or into 'open-ended' systems (diag. 1). In the first case, the dosing accuracy would be unnecessarily reduced (especially in the case of diaphragm dosing pumps). In the second case, excess delivery can easily occur, since - due to inertia - the accelerated delivery medium continues to flow, unrestricted, although the delivery stroke is completed. There would likewise be an uncontrollable flow if the supply pressure upstream of the suction valve is higher than the system pressure. Here again the pressure loading valve is used to create an artificially higher system pressure for the benefit of the dosing pump (diag. 2).

A pressure sustaining valve is not necessary where a hose injection fitting or spring-loaded ball injection fitting is used and the resulting back-pressure is sufficient (the injection fitting opening pressure).

Examples of Pressure Loading Valves in use

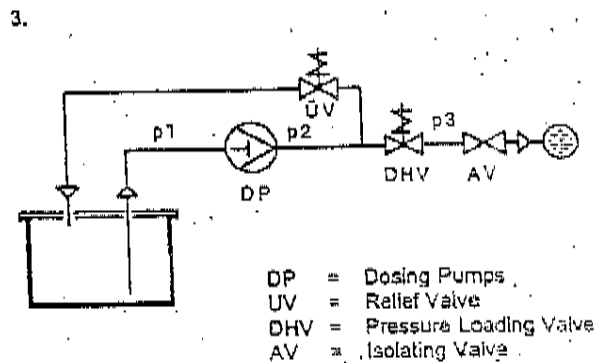


Relief Valve

Relief Valves act as safety measure, protecting the dosing pump and the associated fittings and pipes. They prevent an excessive pressure rise in the system upstream of the dosing pump, such as may occur for example if isolating valves are closed although the pump is still running. They should therefore always be included (diag. 3).

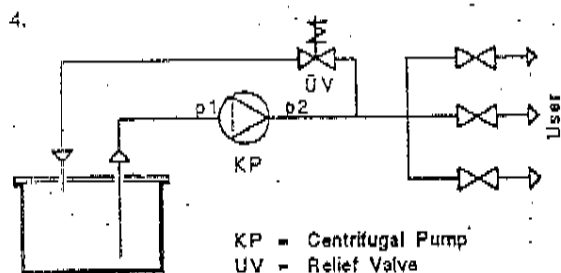
Relief valves can also be used where constant pressure is to be maintained in a supply line fed by a centrifugal pump. All the medium that is not taken up is returned to the tank via the relief valve (diag. 4).

Examples of Relief Valves in use





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Relief valves are not absolutely necessary where the pump has a closed piston-diaphragm system with an integrated internal relief valve.

However, in plants where frequent relief is likely to occur, a relief valve should be provided even with piston-diaphragm pumps.

Selection

The selection criteria are:

1. Flow rating
2. Pressure
3. Permissible pressure drop in valve
4. Aggressive nature of the medium
5. Temperature of the medium
6. Type of connection

Flow Rating

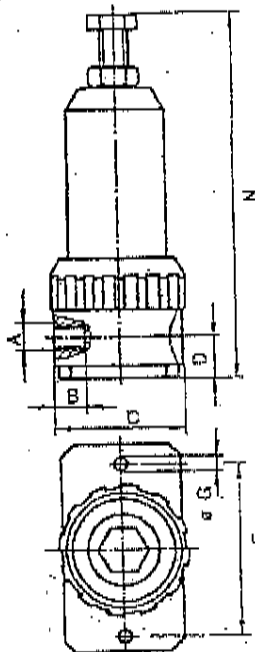
The flow rating shown in the selection table applies to a constant flow of water and similar liquids, with reference to viscosity and density, as obtained with centrifugal pumps or reciprocating dosing pumps fitted with an adequate pulsation damper.

Where the flow is not constant (dosing pumps without pulsation damper), the supply rating of the dosing pump should be multiplied by 2 to 3 before selection the fitting.

Pressure Relationship

Pressure loading valves are set by preloading the spring at the desired opening pressure. This pressure must be such that during maximum flow no pressure occurs higher than is permissible for the dosing pump or other equipment in use.

Dimensions



DN	A	B	C	D	N mm	F	Ø G
6	G 1/4	10	40	23	142	65.5	4.5
10	G 3/8	12	55	19	147	72	7
15	G 1/2	16	75	22	152	92	7

Valve Selection Table

The valves shown in the table allow for a pressure increase, for maximum flow, of approx. 1 bar above the opening pressure set.

It is important to note that increasing back-pressure does not lead to increasing pump pressure (as long as it remains below the set pressure), since the back-pressure also works against the spring in the opening direction.

Valves PN 10; max. 50 °C

Q* l/h	DN	Casing/Diaphragm Materials		
		PVC/ PTFE	PVDF/ PTFE	1.4571/ PTFE
75	6	12532000	12532001	12532002
200	10	12532003	12532004	12532005
500	15	12532008	12532007	12532008

* Q= refer to paragraph on Flow Rating

Order Example

A uPVC pressure loading valve is required for a A 24 dosing pump with no pulsation damper. As there is pulsation in use, the flow is
24 l x 3 = 72 l.

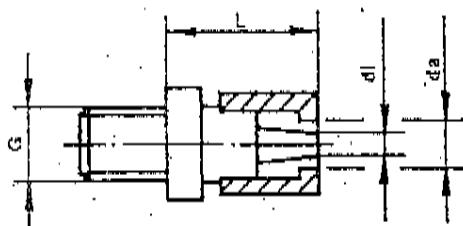
Choice: DN 6 (75 l/h)
Part No: 12532000

Pressure Loading and Relief Valves

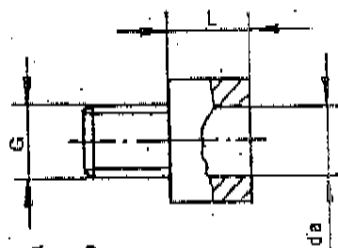


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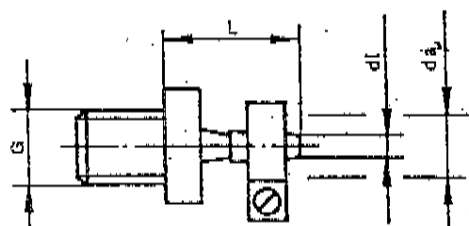
Connection Selection Table



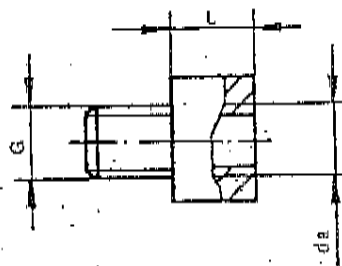
Type A
Hose Clamp Connection



Type B
Hose clip Connection



Type C
Solvent-cement jointed pipe Connection



Type D
Threaded Connection

Connection A	DN	Pipe Conn.			PVC			1,4305	
		L	di	da	Type A	Type B	Type C	Type B	Type D
G 1/4	6	22	4	6	28125**	—	—	—	—
		35	6	8	26489	—	—	—	—
		24	6	8	—	—	—	26494	—
		44	6	12	26487*	—	—	—	—
		24	6	12	—	—	—	26495	—
		20	—	8	—	—	—	26497	—
		20	—	10	—	—	—	18995	—
G 3/8	10	18	—	12	—	—	21839	—	
		35	9	15	—	32462	—	—	
		32	9	15	—	—	—	26500	
		18	—	12	—	—	82900	—	
		18	—	16	—	—	82902	—	
		18	—	20	—	—	82900	—	
G 1/2	15	28	—	G 1/2	—	—	—	82958	
		43	16	26	—	32461	—	—	
		55	16	26	—	—	—	29376	
		20	—	16	—	—	18932	—	
		21	—	20	—	—	19143	—	
		25	—	25	—	—	19581	—	
		30	—	G 3/4	—	—	—	82135	

* 29796 (PVDF)
** 28125 (PPH)

Pressure Loading and Relief Valves

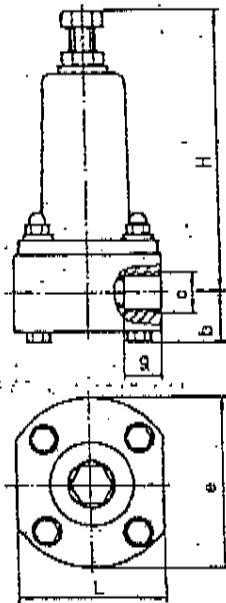


MB 1 25 01 / 4

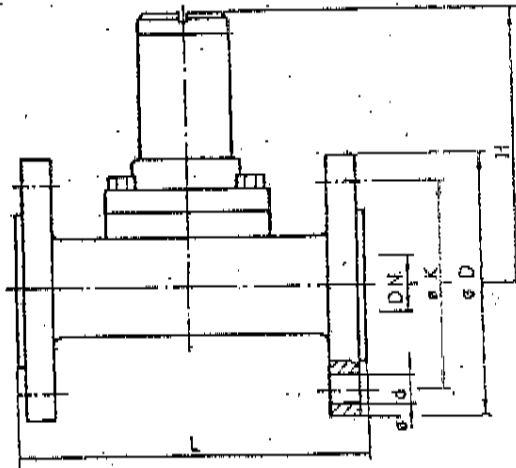
Selection

Q l/h	DN	Valve housing:	
		PP (Plastic)	1.4571 (SS)
850	25	12521366	12531199
1400	32	12521368	12532446
2250	40	12521370	12532447
3600	50	12521372	12532448
5000	65	12521374	—
max. °C		40	50
max. bar		10	16

Plastic Construction
DN 25 ... 65
Stainless Steel Construction
DN 25



Stainless Steel Construction
Dn 32 ... 50

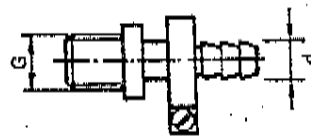


Dimensions

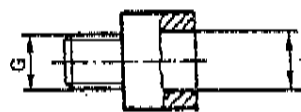
DN	PP						1.4571						D	k	d
	H	b	a	g	a	L	H	b	c	g	e	f			
25	240	41	G 1	20	149	140	235	32	G 1	30	149	140	—	—	—
32	242	41	G 1 1/4	22	149	140	165	—	DN 32	—	—	180	140	100	18
40	252	48	G 1 1/2	22	159	152	180	—	DN 40	—	—	200	150	110	18
50	260	48	G 2	27	170	156	185	—	DN 50	—	—	230	165	125	18
65	284	56	G 2 1/2	28	190	172	—	—	—	—	—	—	—	—	—

Connections

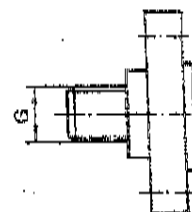
Type	DN	d	Size	PVC	1.4571
B	25	G 1	25	22694	—
D	25	G 1	ø 32	19384	—
	32	G 1 1/4	ø 40	20981	—
	40	G 1 1/2	ø 50	21380	—
F	25	G 1	—	21406	31194
	32	G 1 1/4	—	21410	—
	40	G 1 1/2	—	21414	—
	50	G 2	—	21418	—
	65	G 2 1/2	—	21418	—



Hose spigot
Type B



Solvent-cement jointed pipe
Connection
Type D



Flanged
Connection
Type F

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Pressure Loading and Relief Valves

JESCO®

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Spring loaded pressure loaded and relief valve in stainless steel (1.4571)

Flow Rate: DN 6 40 l/h
DN 10 100 l/h

Installation in any direction

Valve seat material: DN 6 Viton
DN 10 Polyamid

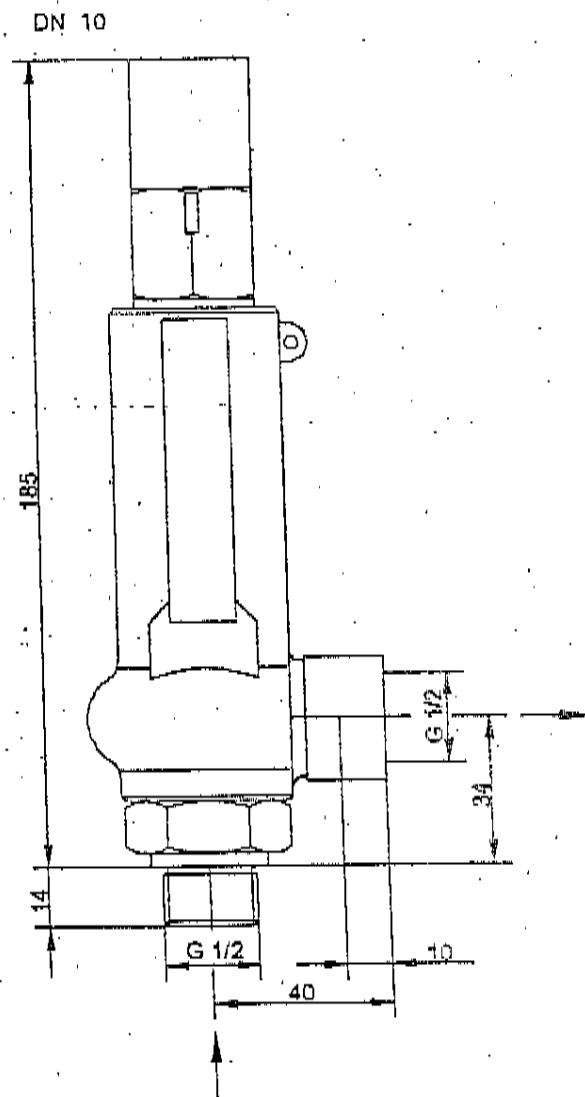
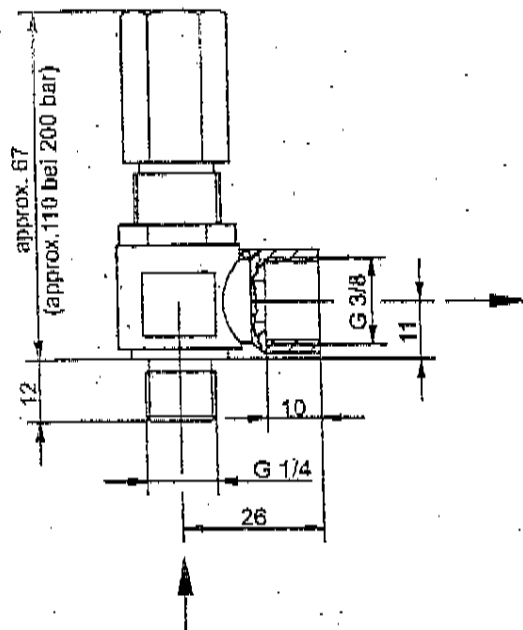
Opening pressure adjustable between: DN 6 0,5 and 200 bar
DN 10 16 and 300 bar

Temperature: DN 6 120 °C max.
DN 10 50 °C max.

DN	Pressure range [bar]	Valve compl. Part No.	Spring Part No.	Valve seat Part No.
6	0,5 ... 2	12532421	32420	80085
	2 ... 15	12510269	19366	
	16 ... 25	12524121	19807	
	26 ... 37	12524125	20796	
	38 ... 48	12524124	20797	
	49 ... 65	12524122	19808	
	66 ... 90	12524123	19809	
	91 ... 120	12331900	31929	
10	121 ... 200	12531901	31980	80792
	*16 ... 300	12532444	32624	

*) Please specify operating or blowoff pressure when ordering.

DN 6:



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Pressure Loading and Relief Valves

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General

Pressure fluctuations in hydraulic piping systems and fittings result in uneven operating conditions of tandem-connected consumers. If the amplitude of these fluctuations is large enough, the line network may even be disturbed or torn out of its anchoring. Pulsation frequencies which correspond to the resonance of the piping system are particularly critical. If increasing pressure peaks are not dampened, immense damages will be caused.

When using piston and diaphragm metering pumps, it is normal for pulsations to occur, the intensity of which grows with the length of the line. The smaller the line diameter, the larger the pressure peaks. When planning metering systems, especially if rigid piping is going to be used instead of flexible tubing, it is recommended to integrate pulsation dampeners. They are a simple and also effective way to reduce pressure fluctuations to a harmless level.

The function of the pulsation dampener is based on energy-converting compression and expansion of a gas cushion. A portion of the media being transported is stored and released to the piping system if the pressure decreases.

In general, a difference is made between pulsation dampeners with separating diaphragm and those without separating diaphragm.

For pulsation dampeners without separating diaphragm, the liquid is in direct contact with the gas cushion resulting from the compressed air accumulated before. After startup, the compressed air is reduced to its dampening volume. As the compressed air is gradually dissolved in the liquid, venting under pressureless condition is necessary from time to time. This disadvantage can be avoided by using pulsation dampeners with separating diaphragm. Here an elastic diaphragm separates the media from the dampening gas cushion which is thereby protected against absorption.

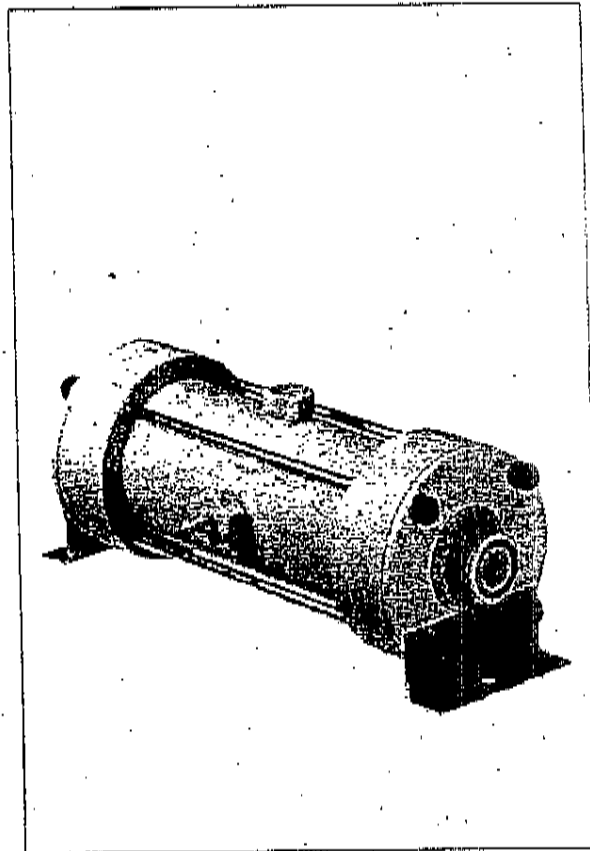
Discharge side of the pump

On the discharge side, metering pumps force the delivery of the media with all their power. Depending on the line length and fitting characteristics, important pressure peaks may occur, which must be smoothed by using pulsation dampeners.

Suction side of the pump

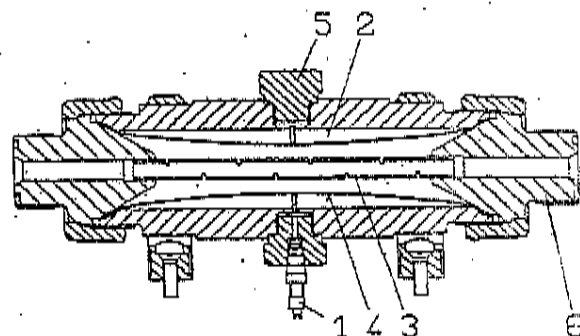
The liquid supply on the suction side must ensure that the liquid follows the suction stroke of the diaphragm or piston immediately.

The suction stroke acceleration may, however, be high so that the liquid mass in the suction line cannot follow the stroke. In this case, a cavity occurs in the column of liquid (cavitation).



Pulsation dampeners installed directly below the suction valve as „suction air chambers“ cause the liquid to flow smoothly through the suction line so that the medium reaches the metering pump with the lowest pressure loss possible.

Functional diagram



Any flow direction

- 1 Gas charging valve
- 2 Gas cushion
- 3 Support pipe
- 4 Separating diaphragm
- 5 Pressure gauge connection
- 6 Liquid connection

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Pulsation Dampener PDS



MB 1 27 01 / 2

Pulsation Damper PDS

Pulsation dampener with tube-type diaphragm (PDS)

(registered design GM 80 11 452)

The PDS pulsation dampener described in this documentation has a separating diaphragm consisting of a tube which is positioned concentrically within a cylindrical plastic housing. The medium flows in this tube while the gas cushion is located outside the tube, in the annular gap between the tube and the plastic housing.

The advantage of this design is the possibility of manufacturing the pulsation dampener from a variety of plastics. The PDS is installed close to the pump either by means of a tee-fitting or integrating it in the supply line so that the fluid flows directly through. The PDS 80 can be mounted directly on the discharge valve.

Compressed air is used for filling. By no means must oxygen be used.

During filling according to BW 1 27 01, the pressure of the gas cushion is measured via a pressure gauge connected to the filling device. It is recommended to provide the PDS with a pressure gauge for operation as well.

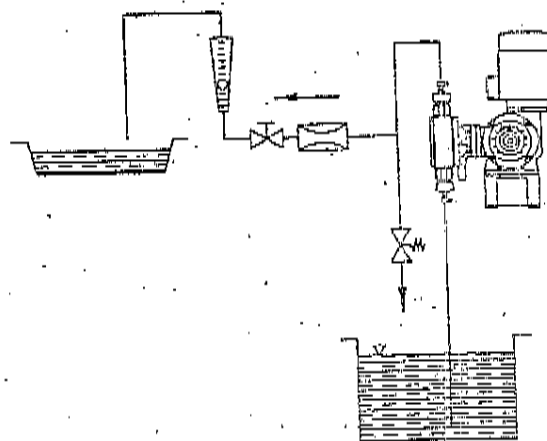
Dimensioning of the pulsation dampener

If the pulsation dampener is used to reduce destructive pressure peaks, it is sufficient to choose a size which allows the remaining pressure fluctuations to be about 10% of the average operating pressure. This value has been taken into consideration in the table.

The flow rates per stroke, on which the table values are based, can be found in the data sheets of the metering pumps. The larger the pulsation dampener, the better the dampening effect.

Dampening for flow meters

If the pulsation dampener is used to ensure constant flow for a flow meter, it might be necessary to install a throttle after the pulsation dampener. If, due to relatively short lines or a free outlet, the back pressure becomes too small, such a valve is particularly required in order to store the liquid smoothly in the pulsation dampener. The following installation is recommended.



Dimensioning diagram

The diagram shown on the next page helps to determine the size of the pulsation dampener in dependence of the stroke volume of the pump and the required smoothing level of the metering flow or the existing pressure fluctuations. The actual dampening capacity, however, is influenced by numerous parameters which can be neither precisely defined nor foreseen. In some cases, it might become necessary to change the system design or add supplementary fittings in order to solve a dampening problem.

Type	Stroke volume ⁽¹⁾ up to ...ml/stroke	Perm. operating pressure [bar]
PDS 80	15	10
PDS 250	40	10
PDS 750	120	10
PDS2500	400	10
PDS7500	1200	4

⁽¹⁾ applicable for the remaining 10 % fluctuation of the nominal pressure in the case of single-head pumps

Initial pressure max. 6 bar
 Operating pressure max. 10 bar
 Temperature max. 50 °C



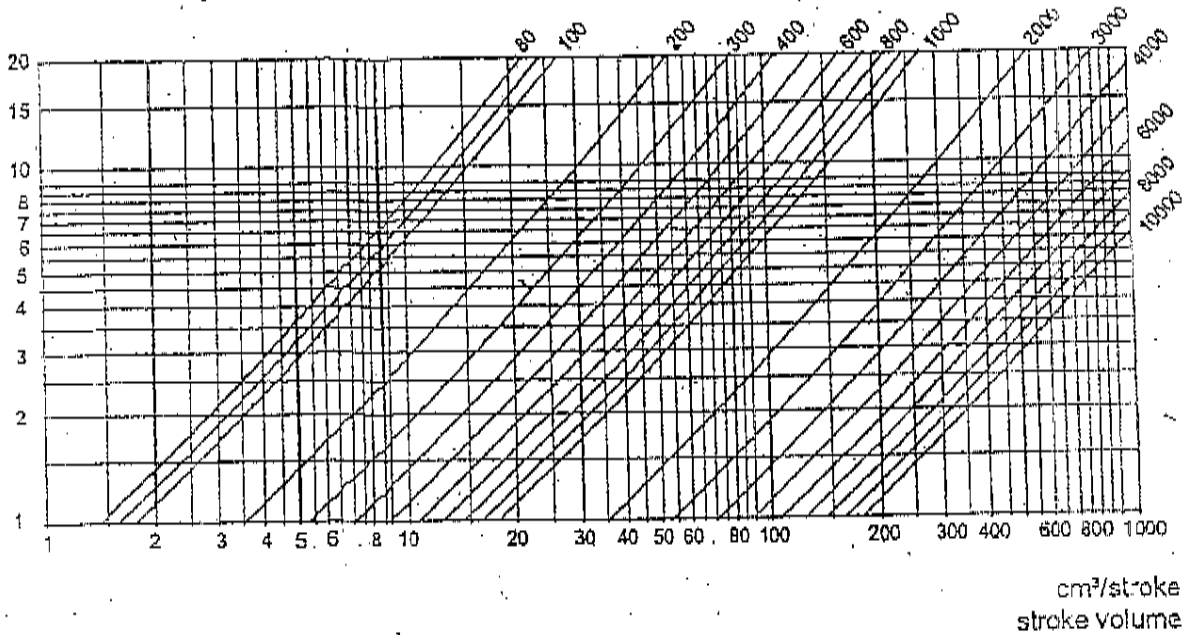
MB 1 27 01 / 3

Pulsation Dampener PDS

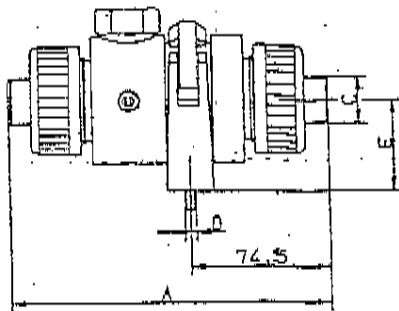
Dimensioning diagram

+/- % pressure or metering flow fluctuations around the average value

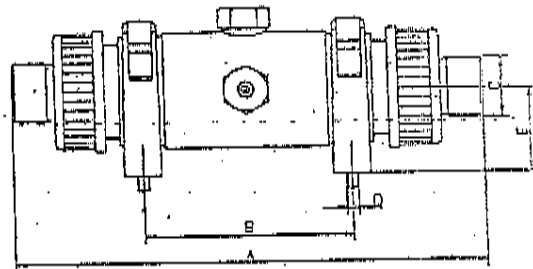
Size of the pulsation dampener V_0 / cm^3



Dimensional drawings



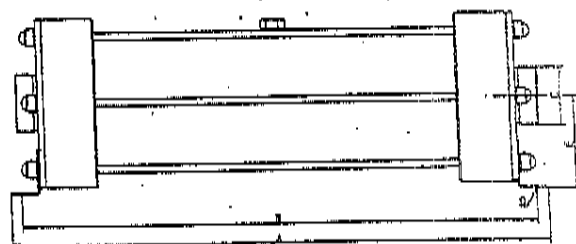
PDS 80



PDS 250

Dimensional tables

Type	Dimensions				
	A	B	C	D	E
PDS 80	172	-	G 3/4	M 6	50
PDS 250	314	140	G 1 1/4	M 8	64
PDS 750	363	347	G 1 1/4	ø 9	71.5
PDS2500	641	525	G 2	ø11	99.5
PDS7500	720	710	G 2 3/4	ø13	125.5



PDS 750 ... 7500

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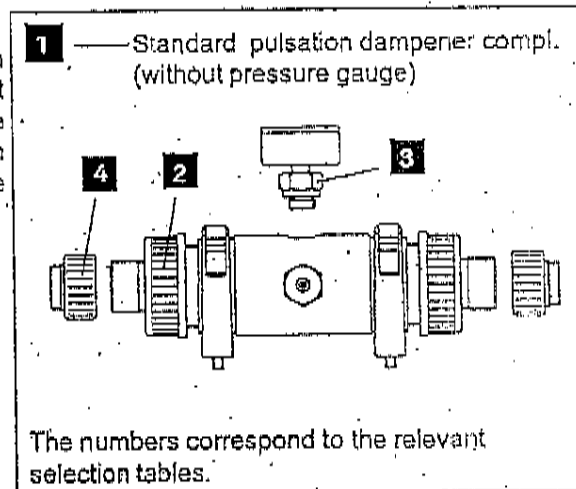
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Selection tables

To be able to offer the optimum version for each application, the PDS has been divided into the most important functional groups. Depending on the requirements, the different modules can be chosen from Tables 2 to 4. Standard pulsation dampeners are listed in Table 1.

- 1** Standard pulsation dampener
2 Pulsation dampener (basic unit without connections)
3 Pressure gauge, complete
4 Connections / or 1 x dummy plug



1						
Type	Diaphragm material	d ₁ (input)	d ₂ (output)	Stroke volume ⁽¹⁾ up to ... ml/stroke	PVC Part No.	PP Part No.
PDS 80	Hypalon	G 5/8 i	d 6/12	15	12701007	-
PDS 80	Viton	G 5/8 i	d 6/12	15	12701010	-
PDS 80	Hypalon	G 3/4 i	d 6/12	15	12701049	-
PDS 80	Viton	G 3/4 i	d 6/12	15	12701055	-
PDS 80	Hypalon	d 6/12	d 6/12	15	12701169	-
PDS 80	Viton	d 6/12	d 6/12	15	12701170	-
PDS 250	Hypalon	d 20 i	d 20 i	40	12702085	12701085
PDS 250	Viton	d 20 i	d 20 i	40	12702097	12701097
PDS 750	Hypalon	d 20 i	d 20 i	120	12702171	12701171
PDS 750	Viton	d 20 i	d 20 i	120	12702172	12701172
PDS 2500	Hypalon	d 40 i	d 40 i	400	12702133	12701133
PDS 2500	Viton	d 40 i	d 40 i	400	12702180	12701180
PDS 7500	Hypalon	d 63 i	d 63 i	1200	12702145	12701145
PDS 7500	Viton	d 63 i	d 63 i	1200	12702146	12701148

⁽¹⁾ applicable for remaining 10% fluctuation of the nominal pressure in the case of single-head pumps

2						
Type	Diaphragm material	Connection f. basic unit	Rec. for Ø / DN	Perm. operating pressure [bar]	PVC Part No.	PP Part No.
PDS 80	Hypalon	G 3/4 a	16 / 10	10	32814	33297
PDS 80	Viton	G 3/4 a	16 / 10	10	32819	33298
PDS 250	Hypalon	G 1 1/4 a	25 / 20	10	33276	32815
PDS 250	Viton	G 1 1/4 a	25 / 20	10	33275	32820
PDS 750	Hypalon	G 1 1/4 a	25 / 20	10	33632	32816
PDS 750	Viton	G 1 1/4 a	25 / 20	10	33631	32821
PDS 2500	Hypalon	G 2 a	40 / 32	10	33634	32817
PDS 2500	Viton	G 2 a	40 / 32	10	33633	32822
PDS 7500	Hypalon	G 2 3/4 a	63 / 50	4	33636	32818
PDS 7500	Viton	G 2 3/4 a	63 / 50	4	34599	34615

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Pulsation Dampener PDS



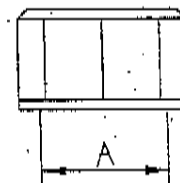
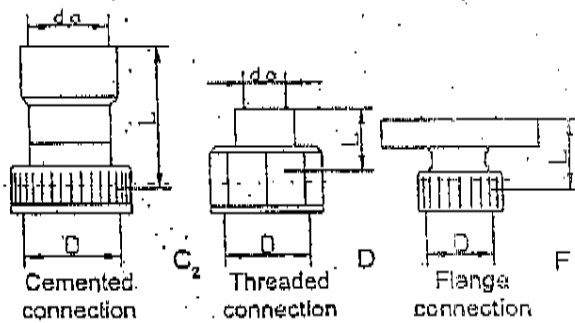
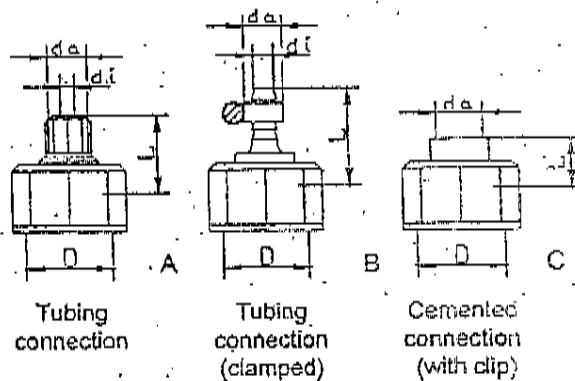
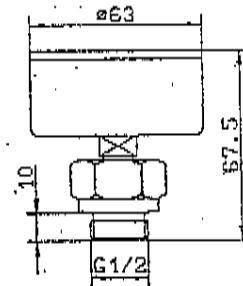
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3		
Pressure gauge complete with connection		
Measuring range	without glycerine dampening	with glycerine dampening
0...6 bar	32949	32948
0...16 bar	32951	32950

Do not use a pressure gauge for suction air chamber applications!

4								
Type	Fig.	D	di	da	L	PVC	PP	
PDS 80	A	G 3/4	4	6	24	19480	34846	
			6	8	30	28159	-	
			6	9	30	34926	34708	
			6	12	55	19175	-	
	B	G 3/4	6	12	30	23342	-	
			C	-	10	15	25167	-
				-	12	15	27518	-
	D	G 3/4	-	16	17	25625	33793	
			-	G 1/4	20	25165	34676	
	PDS 250	B	G 1 1/4	9	15	41	26921	-
PDS 750	C	16		26	50	25936	35694	
		-		12	22	25923	-	
		-		16	22	27672	27664	
D	G 1 1/4	-		20	22	25937	35490	
		-		G 3/8	28	25930	33797	
PDS 2500	C ₂	G 2	-	G 1/2	22	25943	33798	
			-	-	47	25956	-	
			-	-	32	29	32932	-
PDS 7500	C ₂	G 2 3/4	-	40	29	32933	-	
			-	50	90	32934	-	
			-	63	41	32936	-	

4		
Type	Dummy plug	
	Dimension A	Part No.
PDS 80	G 3/4	32941
PDS 250	G 1 1/4	32947
PDS 750	G 1 1/4	32947
PDS 2500	G 2	32973
PDS 7500	G 2 3/4	32974



If the pulsation dampener is connected via a tee-fitting a dummy plug is required.

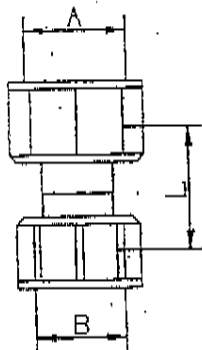
Pulsation Dampener PDS



MB 1 27 01 / 6

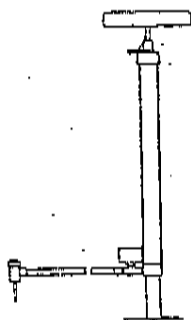
Pulsation Dampener PDS

PDS 80 with screwed connection for direct pump mounting

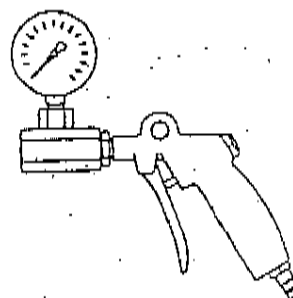


Screwed PDS 80 connection for direct pump mounting			
A	B	L	Part No.
G 3/4	G 5/8	32	32937
G 3/4	G 3/4	30	32938

Filling devices



Filling device for compressed air up to 6 bar; supply by foot pump;
Part No.: 12724332

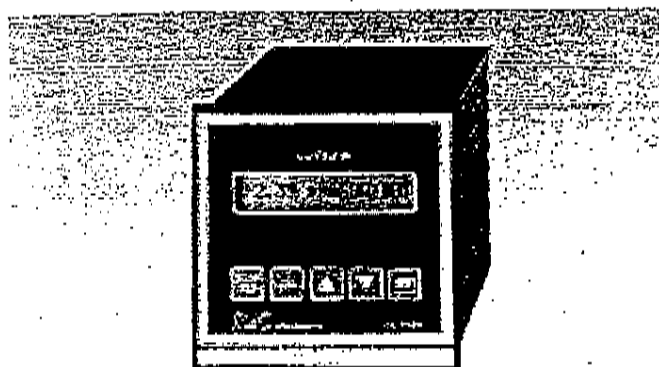


Filling device for compressed air up to 6 bar; supply by compressed air system;
Part No.: 12724321

Electrochemical Monitors

CL 7685.010

Residual Chlorine - D.Ozone controller
for selective membraned sensors



the following to the common Features/Specifications
the 7685 Series shown overleaf

- Applications:
 - drinking water
 - water treatment
 - bottling industry
 - OEM
- Input from selective membraned sensors:
 - Free Chlorine, Chlorine dioxide, Combined Chlorine, D.Ozone
 - Total Chlorine gas sensing method
- Input from Pt100 3 wires
- Ranges: 0/2 PPM - 0/20 PPM - 0/200 PPM autoranging
- Filter software
- Calibration mode: immediate or postponed
- Calibration parameters display
- Dual set-point and alarm conditions display
- Temperature display
- Automatic or manual Temperature compensation
- Isolated output:
 - 0/20 mA or 4/20 mA selectable
 - programmable input on the span
- Automatic, manual or simulated operation
- Dual Set-point:
 - Selectable actions
 - ON/OFF
 - PFM pulse frequency modulation
 - PWM pulse width modulation
 - hysteresis, delay, and min/max programmable functions
- Automatic overload protection and reset
- Extractable terminal block
- 96x96 (1/4 DIN) housing

Specifications

Input Current
160 nA/PPM at 20 °C

*** Scales**
0/2.000 PPM - 0/20.00 PPM - 0/200.0 PPM
(Cl₂, ClO₂, D.O₂, SO₂*)
Zero adjustment: ± 200 nA
Cell sensitivity: 12.5/250 %
* Polarization: -200 mV (0/-1250 mV)
* Temperature Coefficient: 0/4.0 %/°C
* Filter software: 0.6/99.9 Sec

Temperature
Input: Pt100 3 wires
Measuring and compensation range: -2/52 °C
Resolution: 0.1 °C
Zero adjustment: ± 1 °C

Set-point A and B
* Selectable action: ON/OFF - PFM - PWM

PFM/PWM action
Proportional Band: 0/10 % of the scale
Pulse frequency: 0/120 pulse/min
Pulse width: 0/99.9 sec.

Option 091.3711
Dual analog output
The user may select the Temperature output

The technical specifications may be changed without notice

Accessories

CL 7901
Flow cell and sensor for Free Chlorine

OZ 7901
Flow cell and sensor for D. Ozone

Sensors available
For Combined Chlorine, Sulfite.
For Total Chlorine gas sensing method.



Spares

0012.000066 Chlorine sensor
0012.050005 Membranes kit of 10 for Chlorine
0012.090011 Electrolyte 125 cc. for Chlorine
0012.000042 D. Ozone sensor
0012.050002 Membranes kit of 10 for D. Ozone
0012.090008 Electrolyte 125 cc. for D. Ozone
0012.000043 Flow cell
0012.030029 Cable 7.5 mt.
0012.050004 OR and screws kit

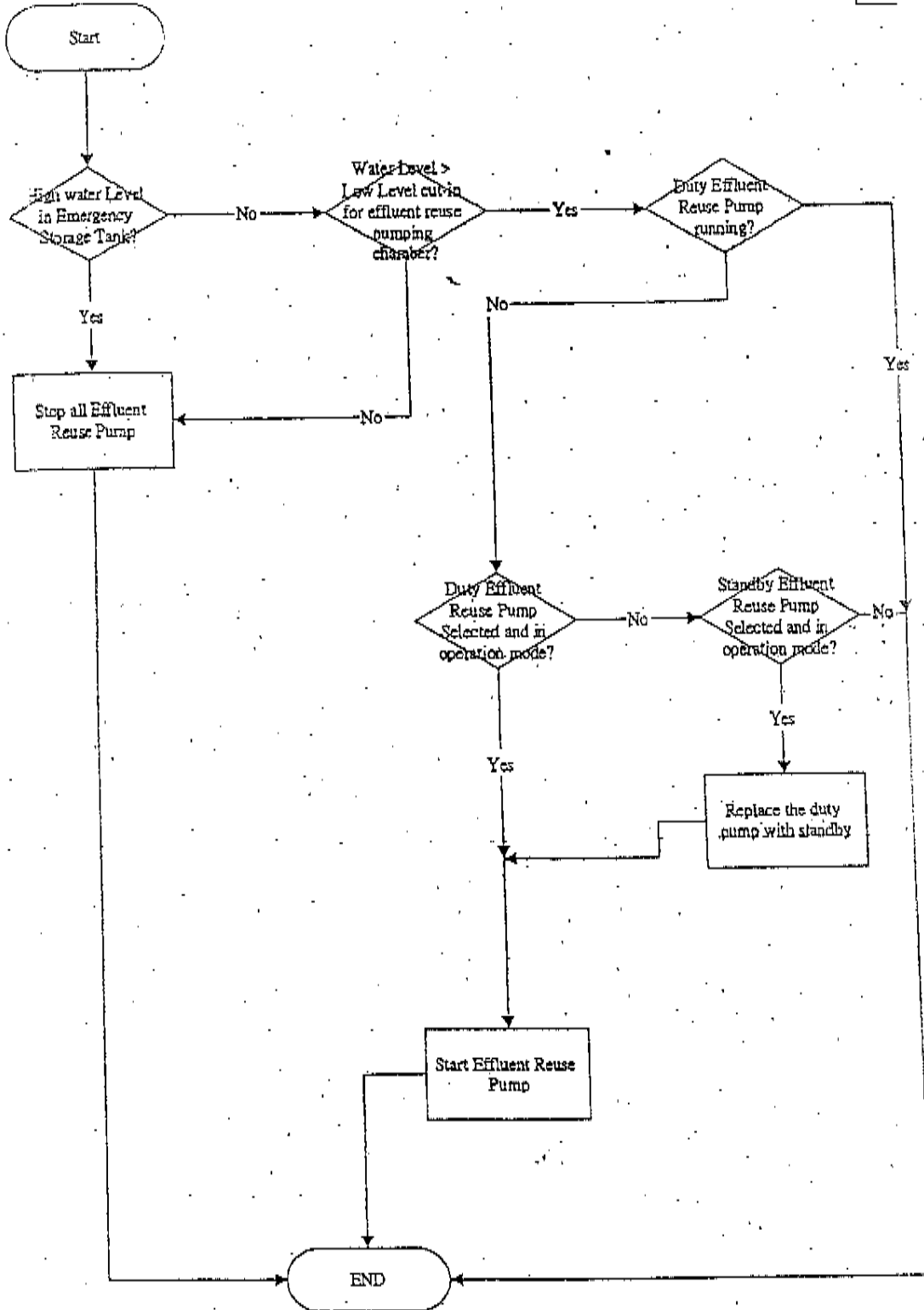
Contract No. : DC/2003/01
Ngong Ping Sewage Treatment Works

Operation Manual
Revision : Final
Date : 20 July 2006

3.1.2 Control Philosophy

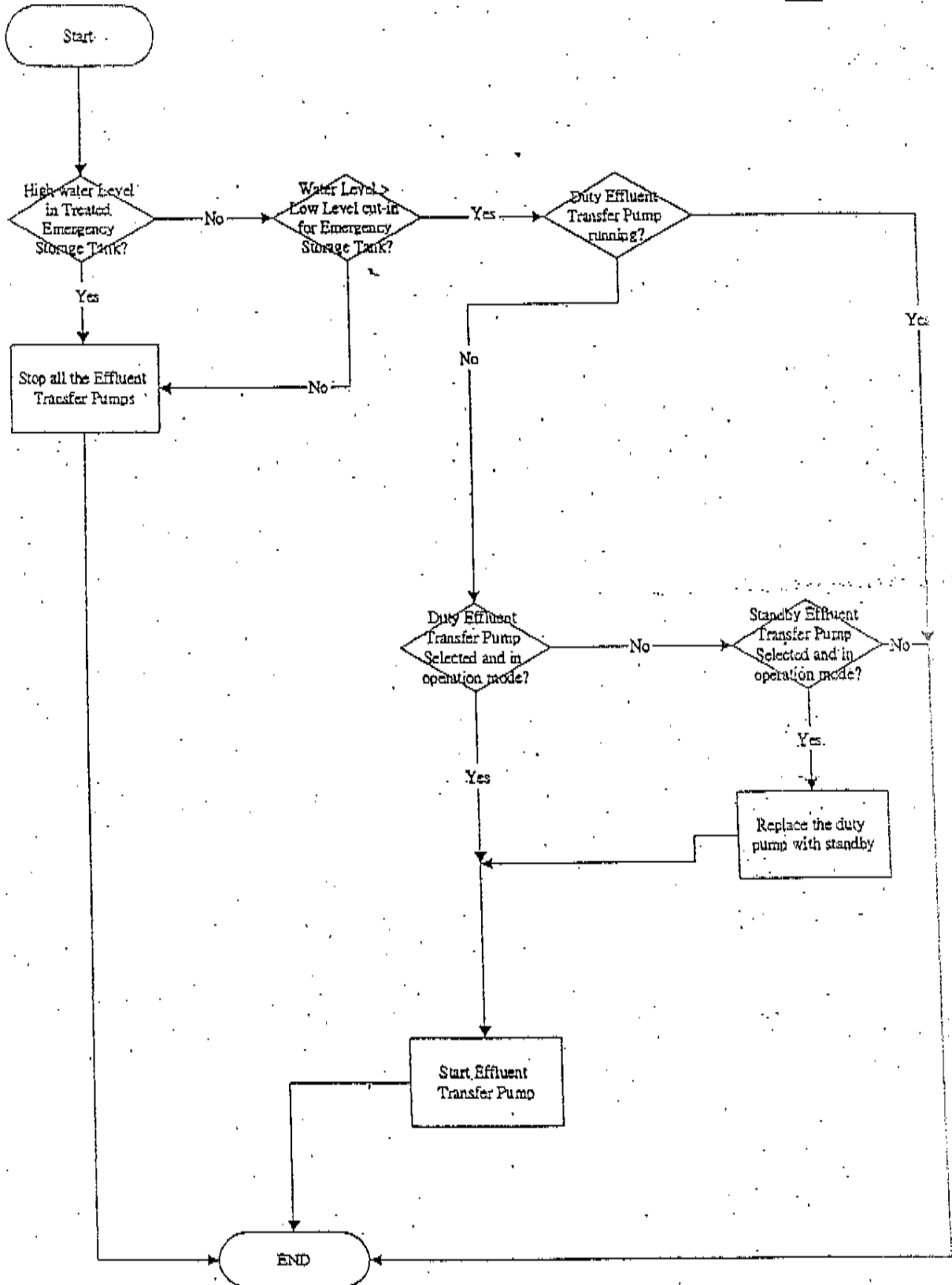
Pumping Chamber (ERP)

Remarks:
Pump in normal operation if
1) Pump in auto PLC mode (PA)
2) Pump in non-fault condition
3) Relative valve in auto PLC mode (PA)
4) Relative valve in non-fault condition



Storage Tank (ETK)

Remarks:
1) Pump in normal operation if
2) Pump in auto PLC mode (PA)
3) Relative valve in auto PLC mode (PA)
4) Relative valve in non-fault condition

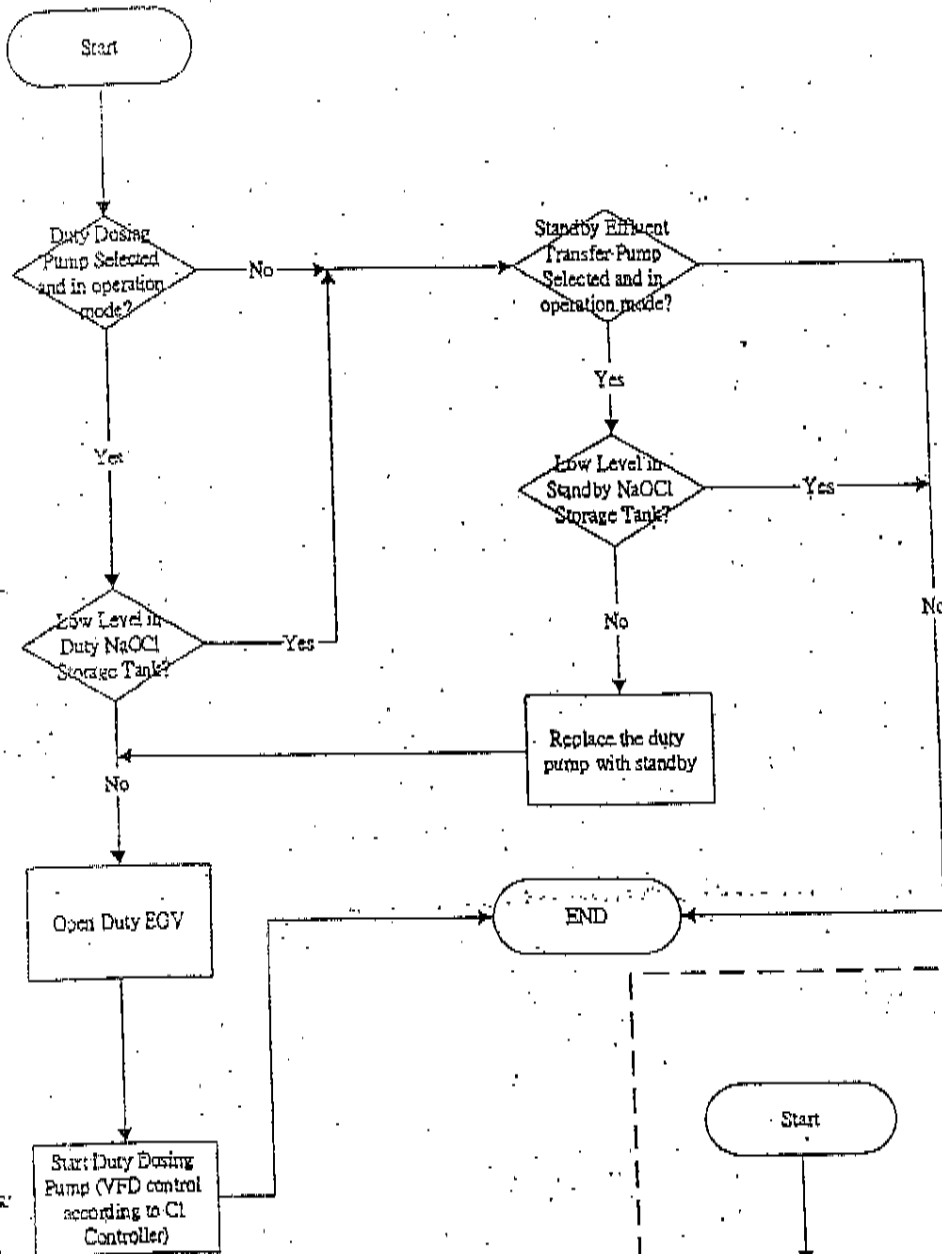


Control Philosophy of Dosing Pumps in NaOCl Dosing System

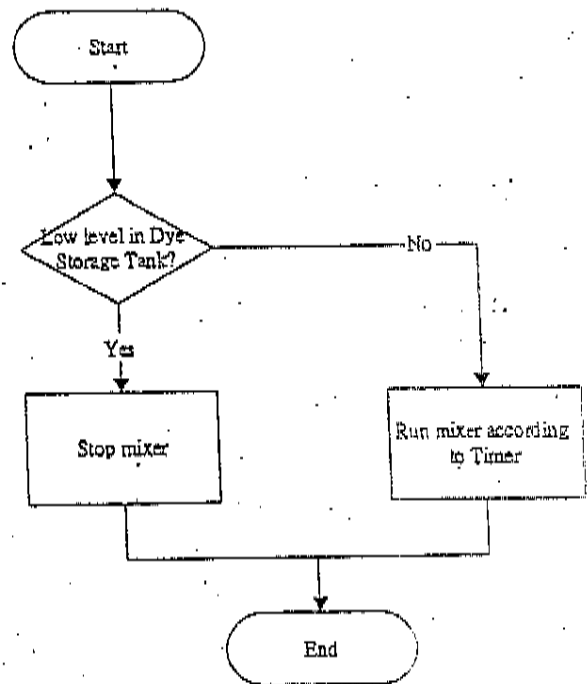
Rev. A

Dosing Pump

Remarks:
 Pump in normal operation if
 1) Pump in auto PLC mode (PA)
 2) Pump in non-fault condition
 3) Relative valve in auto PLC mode (PA)
 4) Relative valve in non-fault condition



Mixer in Dye Storage Tank

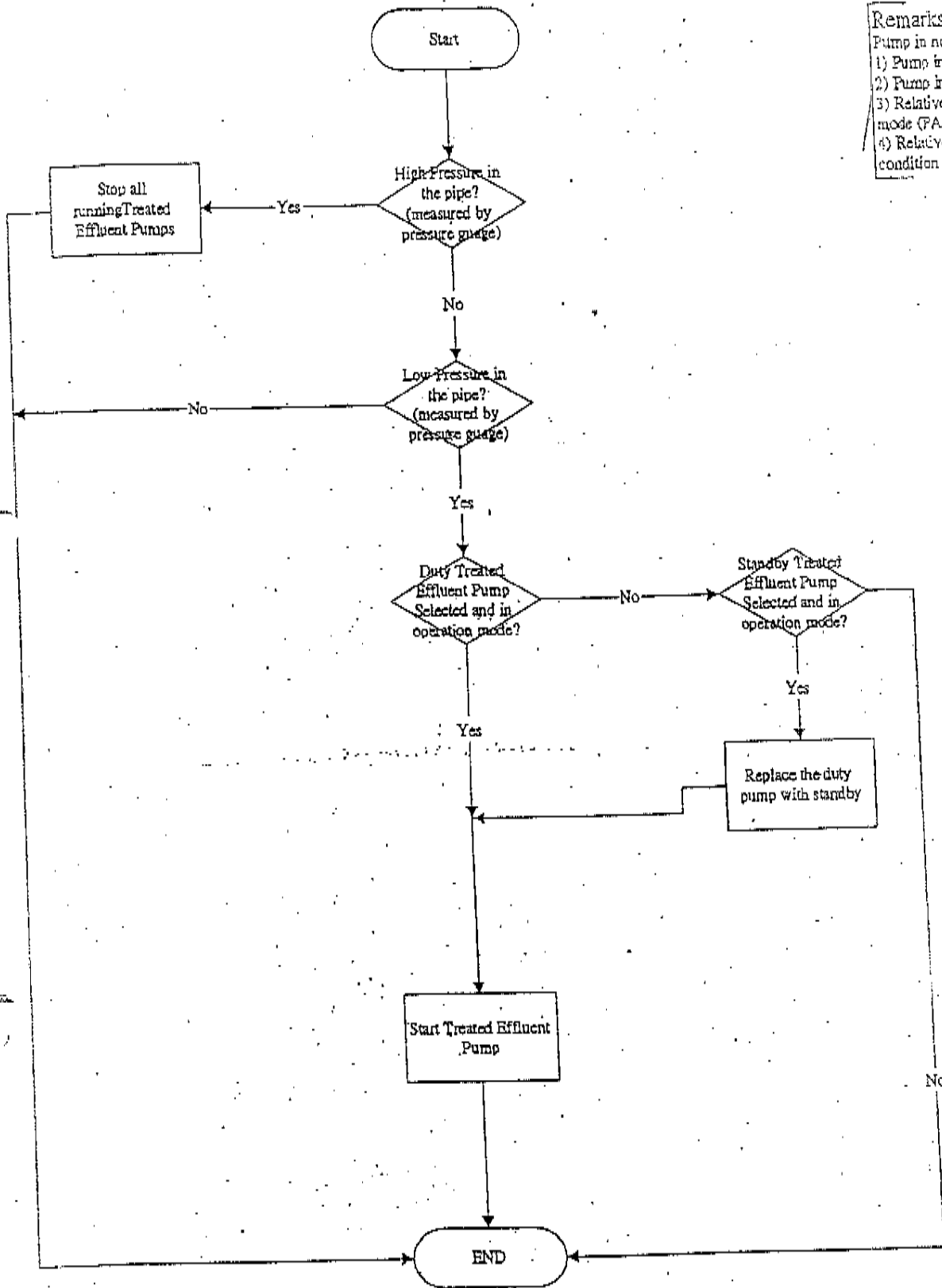


- Note:
- i) Dosing pump 1 interlock with EGV 1
 - ii) Dosing pump 2 interlock with EGV 2
 - iii) Dosing pump 3 and 4 are in manual operation only

Control Philosophy of Treated Effluent Pumps in Treated Effluent Storage Tank and Pumping Station

Rev. A

Remarks:
 Pump in normal operation if
 1) Pump in auto PLC mode (FA)
 2) Pump in non-fault condition
 3) Relative valve in auto PLC mode (FA)
 4) Relative valve in non-fault condition



Note:
 i) EGV 6 and EGV 7 normally are in open state

Contract No. : DC/2003/01
Ngong Ping Sewage Treatment Works

Operation Manual
Revision : Final
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3.1.3 Equipment General Arrangement Drawings