Contents

MAGDOS
Sizes 20-100

MAGDOS
Sizes 01-12

Thank you for purchasing the MAGDOS DE/DX diaphragm metering pump.

For optimum performance, please read all Operation and Maintenance Instructions before actual installation of this product.

Please check your shipment. If any of the equipment you received shows signs of damage, contact the shipping carrier immediately. Next, please unpack the pump slowly, taking care that no small parts are accidentally discarded. Compare the parts supplied with the enclosed packing list and your original purchase order.

If there are any discrepancies, contact your local Jesco America representative immediately.

CAUTION: Metering pumps and their accessories are often used with potentially dangerous chemicals. Please follow all safety precautions for any chemicals processed through your system.

If there is ever a question about appropriate installation or use of a product, contact the manufacturer before proceeding.

These pages contain guidelines for system design and general safety. It is essential to review all *Operation and Maintenance Instructions* before proceeding with installation of this equipment.

1. General Description

The MAGDOS DE/DX is an intelligent solenoid driven metering pump that combines digital technology and state-of-the-art microprocessors with high quality mechanics. The MAGDOS series is flexible and versatile in the area of external control. Its functionality incorporates the latest requirements in metering technology.

The MAGDOS is available in two versions, the DE and the DX. Both versions include microprocessor control. Two chassis sizes of the MAGDOS are available. The smaller chassis can be used for capacities ranging from 0 to 2.8 gph and the larger chassis for capacities ranging from 0 to 27.7 gph. Pressure ranges are available to 150 psi, depending on capacity.

2. System Design Guidelines

Before installing the MAGDOS DE/DX into a new or existing system, Lutz-JESCO America Corporation recommends careful review of your system's design and layout. It is essential that all local rules, codes and regulations are followed in the design and installation of chemical feed equipment. It is also important that the system meets the technical demands required, such as flow rates and pressures. Many factors must be taken into consideration, including process fluid specifications, material compatibilities, temperature, chemical handling, electrical wiring, line losses and many more.

Ambient temperatures exceeding 104^{O}F are not permitted. Radiant heat of surrounding equipment must be kept in acceptable limits to allow 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 the weather. With metering pump systems, particular attention must be paid to the piping system. Refer to the System Design Guide for more detailed information. (If in need of a System Design Guide, contact Jesco America Corporation).

Both the system designer and the operator are responsible for ensuring that the entire plant is constructed to prevent unreasonable damage to plant equipment or building resulting from leakage or technical failure.

It is especially important that chemical plants be designed to ensure the safety of maintenance people and operators. We recommend installing relief valves, splashguards, containment tanks, and leakage probes with alarm relays to aid this effort.

MAGDOS DE/DX pumps with integrated level control function are equipped with a short-circuit jack plug which must be removed before connecting a level control by means of a jack plug. A weather tight cable is available if using a level control to keep the NEMA 4x protection class.

Wiring of the MAGDOS metering pump must be carried out by a specialist according to the local regulations. Normally the MAGDOS is connected with a grounded plug. Please see the MAGDOS DE/DX Specification Sheet for all electrical data.

Mounting the metering pump directly on a water meter may result in noise level amplification. In this case, we recommend that you mount the pump on separate wall brackets which, for the same reason, should be fixed to outer walls instead of interior walls with adjacent occupied rooms. It is also possible to mount the pump directly on the supply tank.

Do not lay signal cables of water meters or 0(4)...20 mA controls parallel to high-voltage current or power supply lines. Supply and signal lines must be laid in separate channels. In the case of junctions, a 90Þ angle is required. If the water meter control cable is more than 6 feet long, it must be shielded. To avoid incorrect metering after the process is finished, provide an electric and hydraulic interlocking system.

NOTE: ***The MAGDOS metering pumps are not suited for use in explosive environments.***

3. Safety Precautions

The diaphragm metering pump is designed to pump various liquids into pressurized systems. By nature, the application of these pumps may present circumstances under which personal hazards can exist. All personnel who may have occasion to install, operate, or maintain these pumps should be provided with the opportunity to read this instruction manual and be familiar with its contents. Awareness of potential hazards can prevent accidents and injury.

Danger from Liquids Handled

All systems containing liquid and/or air under pressure present the potential for unexpected discharge of liquid in a violent manner. In operation and servicing of the pump, all parts of the pump and attached piping which contain liquid should be treated cautiously, until it is known with certainty that they have been depressurized and drained.

Danger from Electrical Hazard

Since these pumps include electric components, the hazard of electrical shock can exist. Installation and wiring of electrical components should be in accordance with the applicable codes.

Operational Hazards

To avoid personal injury, please adhere to the following guidelines:

1. Do not operate the pump if electrical compo-nent enclosures are not in place.
2. When venting cylinders or piping during startup, liquid will be discharged under pressure. The use of a pressure relief valve back to the supply tank is highly recommended. Suitable caution should be taken to avoid contact with the liquid and to avoid spillage or spraying of liquid.
3. Clean up any leaked or spilled liquid immedi-ately.

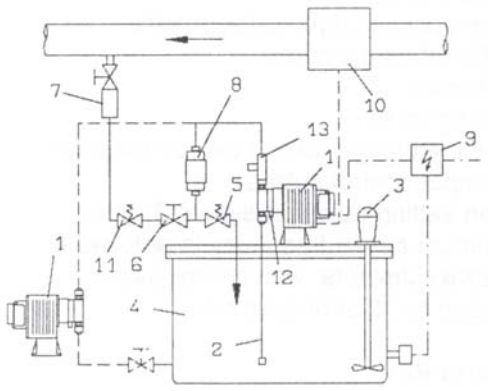
Safety

1. Before operating pump and accessories or attempting to service, become familiar with the contents of this instruction manual.
2. Observe all precautions established by plant safety procedures.

3. Observe all chemical handling instructions provided by the chemical supplier and/or plant regulations.
4. Do not operate pump with closed valves in suction and/or discharge lines.
5. Do not paint over or remove nameplates, labels, or tags.
6. In disassembly of pump, precautions should be taken for the possibility that a diaphragm rupture may have allowed pumped liquid to enter the drive system.
7. If a pump is to be used for other than original service, first ascertain that pump is suitable for new conditions (pressure and compatibility with liquid to be pumped).
8. Establishment of and adherence to a regular maintenance program can prevent problems by early detection of unusual conditions (e.g. unusual noise, overheating, and wetness indicating leakage).

4. Installation

Installation Example and Components



1. MAGDOS Pump
2. Suction Line
3. Electric Mixer
4. Tank
5. Relief Valve
6. Diaphragm Shutoff Valve
7. Injection Nozzle
8. Pulsation Dampener
9. Power Control Box
10. Water Meter
11. Back Pressure Valve
12. Leakage Tube
13. Flow Indicator

* In the case of effervescent media, we recommend providing the pump with a positive suction head and in the use of a degassing device.

The accuracy and reliability of a metering pump system depends on proper installation of each component. All considerations of sound hydraulic practice, including the elimination of air and foreign matter, accurate and reliable seating of check valves, proper size and length of piping, liquid vapor pressure, viscosity, and temperature may mean the difference between a successful or unsuccessful installation. The application of basic hydraulic principles during planning, installation and operation is essential. Good suction conditions will prevent a common cause of premature diaphragm failures. Each installation should be designed and built paying careful attention to all instructions regarding handling of corrosive, toxic or hazardous chemicals. It is of utmost importance that all safety procedures established by the owners and manufacturers be followed during installation, operation and maintenance phases.

Location

The preferred location of a metering pump system is indoors. Although systems can be installed outdoors, manufacturer's temperature ratings and recommendations must be followed. System fluids are subject to viscosity increase when temperatures fall. Drive units are subject to overheating when installed in direct sunlight or an area with high ambient temperatures. If a system must be installed outdoors, it should be sheltered from the elements with heating or cooling systems as needed. Proper installation indoors or out should allow sufficient room for operators and maintenance personnel to access each component for adjustments and servicing.

5. Start Up and Operation

ATTENTION: ***Adjust stroke length only while pump is running.***

1. For first startup, set pump to maximum stroke speed and stroke length and allow to prime. For this purpose, it is advisable to set both stroke adjustments to 100%. If the pump doesn't prime, remove discharge check valve and pour water or chemical (if harmless) into head. Mount the discharge check valve and allow to prime again.
2. If a venting aid is integrated in the metering head or 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 (approxi-

mately 1 drop for 1-3 strokes).

3. When proper operation is achieved, set stroke length to required output and lock adjusting knob. Refer to the calibration table on the side of pump to get the stroke length setting for a selected output (ml/stroke). The back pressure influences are taken into consideration in the table, and intermediate values must be interpolated. Depending on the installation and the chemicals used, these values may differ and must be checked under operating conditions. See Calibration Table below.
4. In the case of externally actuated pumps (e.g. by water meters), set pump to "external." Initiate the water flow by opening a water valve and check pump pulse rate. 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.

Calibration Table

ml/PULSE	STROKE LENGTH SETTING +/-15% 8				
1.40	8.0	9.9	---	---	
1.20	6.5	8.0	9.0	---	
1.00	5.4	6.4	7.3	9.1	
0.80	4.3	5.0	5.5	7.0	
0.70	3.7	4.4	4.8	6.0	
0.60	3.2	3.8	4.3	5.2	
0.50	2.6	3.2	3.7	4.5	
0.40	2.2	2.7	3.2	4.0	
0.30	---	2.2	2.8	3.5	
PSI	30	60	90	150	

C. Analog signal 0/4-20mA (DX only)

To control the pump by analog signal, turn the selector switch to either 0...20 or 4...20 positions. The linearity of signal conversion into stroke frequency is +/- 3%. If the signal source is not isolated, it must be ensured that the signal line does not come into contact with ground.

Note: To avoid accidental metering after the process is finished, provide an electric or hydraulic interlocking system.

Supply Tank Level Control

To prevent the pump from being without chemical, due to low level supply tank , a suction line level switch with or without alarm signaling can beconnected to the 3.5 mm input jack. The pump is provided with a dummy plug that has to be removedto connect level switch.

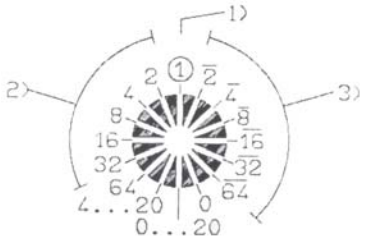
External Control

A. Contact (pulse)

In order to protect the pump against overheating, the maximum input frequency is limited to 100/70 pulses/minute; therefore, input frequency is higher, each third or fourth metering stroke is not carried out. Therefore, external pulse transmitters should be selected so that the pump is controlled with a maximum of 100/70 strokes/minute, depending on model selected, otherwise use the pulse division feature (DX only).

B. Contact (pulse) multiplication/ division (DX version only)

Input pulses can be multiplied or divided by setting the selector switch correspondingly.



Selector Switch

1. *Standard setting is a ratio of 1:1* (one contact, one stroke)
2. *Pulse Multiplication*
   e.g. Setting to 8
   - one incoming input pulse results in 8 metering strokes
3. *Pulse Division*
   e.g. Setting to 16
   - one metering stroke is carried out after 16 input control pulses

Note: When setting pulse division to 32, the maximum stroke frequency is reduced to 70 strokes/minute; with divisor 64, it is reduced to 36 strokes/minute.

Warning Alarm Relay

With the warning alarm relay (voltage-free output

contact), the following alarm states can be transmitted.

- "Tank Empty" if a simple level switch is connected. Pump stops.
- "Tank Almost Empty" if a level switch w/alarm signaling is connected. In this case, "Tank Empty" can not be indicated. Pump continues metering.
- Alarm activates when the analog signal is less than 4 mA. (e.g. cable breakage).

MAGDOS DX

1. Power supply cable, 115 VAC, 5.5 feet, with grounded plug.
2. Cable for warning alarm relay, 4 feet, optional.
3. 3.5 mm jack socket for level probe connection; can be used by 2-pin plug for simple low level indication or by 3-pin plug for low level indication with alarm signal.

4a. Cable or connector socket for pulse input.

4b. Cable or connector socket for pulse and analog signal input.

5. Stroke length knob for metering capacity.
6. Stroke length knob locking screw.
7. Speed frequency adjustment with changeover switch for internal/ external control.
8. LCD display. (DX only)

9a. Red LED
- Blinks slowly in the case of alarm signaling.
- Lights permanently if the tank is empty. Pump is then stopped automatically.

9b. Red LED on DX model
- Like 9a, plus fast blinking if, in the case of 4...20 mA analog signal control, the input signal is less than 4 mA (e.g. due to a cable breakage).
- Blinks slowly if selector switch (12) is set to "0" (pump is not metering).

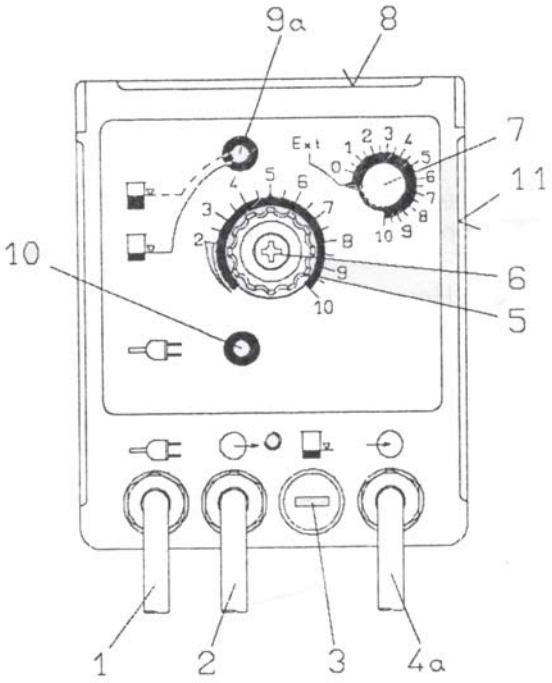
10. Green LED
- Lights when power supply voltage is applied and disrupted for a short time during the metering stroke. Blinks during the metering stroke.

11. Calibration table (on side of pump housing).

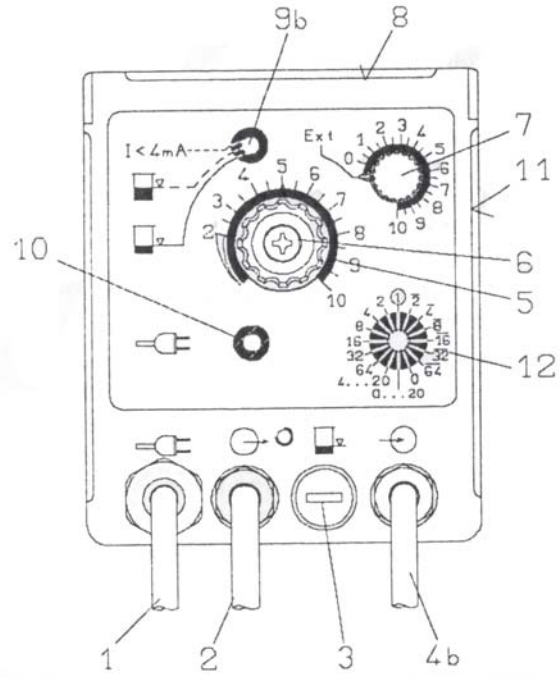
12. Selector switch for external control
- Pulse 1:1
- Pulse multiplication or division by factors of 2, 4, 8, 16, 32, or 64
- Current input 0...20 mA or 4...20 mA
- Pump stop "0"

Control Panel Features

MAGDOS DE



MAGDOS DX



Digital Display (DX Only)

The display indicates two types of information. First, it reflects the number of strokes per minute. Second, if an error occurs in the metering system, a specific error message will be displayed.

Normal Operation

Display	Meaning
80	Stroke frequency of 80 strokes per minute while operating in either internal or external signal control
1.1	Operating condition: External pulse control with contact ratio 1:1
1.16	Operating condition: External pulse control with pulse multiplication factor 16
8.1	Operating condition: External pulse control with pulse division divisor 8

Error Indication

Display	Meaning
E-L	"Tank Empty" message
I-E	Loss of analog signal (i.e. cable breakage)
OFL	Input signal greater than 20 mA with 0-20 or 4-20 mA control
OFF	Selector switch is set to "0", pump does not operate

6. Maintenance

General

1. After the first several hours of operation, turn off the pump and tighten all hardware and fittings. Retighten as needed to prevent leakage. Do not overtighten plastic fittings.
2. Clean exterior of pump as needed with mild soap liquid.
3. Clean and inspect check valves and diaphragms annually. Replace if needed.

After the First 80 Hours of Operation

1. Clean and inspect check valves and diaphragm. Replace if damaged. See **Replacing the Diaphragm** procedure and disassembly of check valves.
3. Check pump wetted end for leaks. Retighten connections and fasteners as necessary.

Replacing the Diaphragm

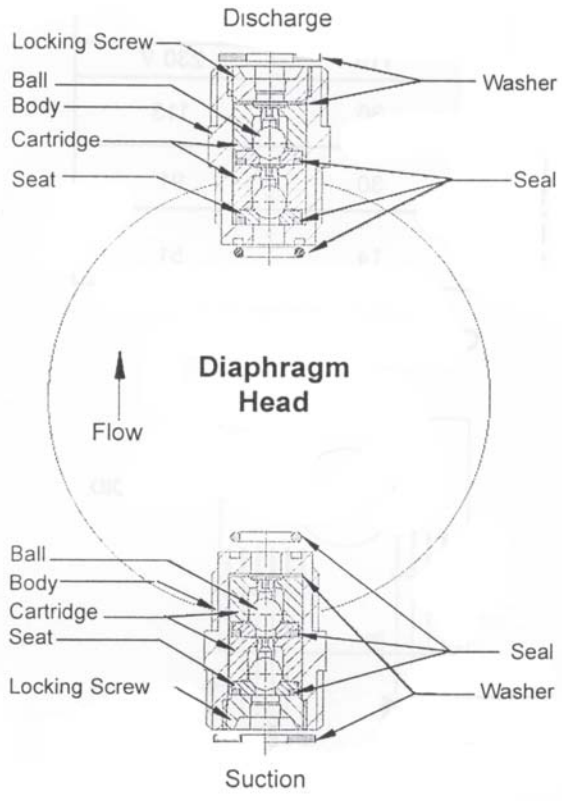
1. Adjust stroke length knob to 0%.
2. Shut off pump and close shutoff valves in the suction and discharge lines. Relieve pressure. Drain suction and discharge lines if possible. **Caution: Pressure must be relieved before proceeding. If pressure is not relieved, dangerous chemical spray may result.**
3. Disconnect union nuts from check valves.
4. Remove pump head mounting bolts and pull pump head/check valve assembly away from pump. Note orientation of check valves (flow arrows must point up). The head must not be reinstalled upside down.
5. Turn diaphragm counterclockwise to unscrew it from pump push rod. Note orientation of diaphragm support plate behind diaphragm.
6. Install the support plate onto diaphragm. Install new diaphragm by screwing it clock-wise into pump push rod.
7. Clean inside of pump head, using appropriate cleaning fluid compatible with materials of construction and metered chemical.
8. Reinstall pump head, noting orientation of check valves. Tighten head bolts evenly using an alternating crisscross pattern.
9. Reassemble suction and discharge lines, n shutoff valves and start pump according to the ***Start Up and Operation Instructions***, Section 5, page 1.4.
10. Check for leaks and tighten accordingly.

Disassembly & Cleaning of Check Valves

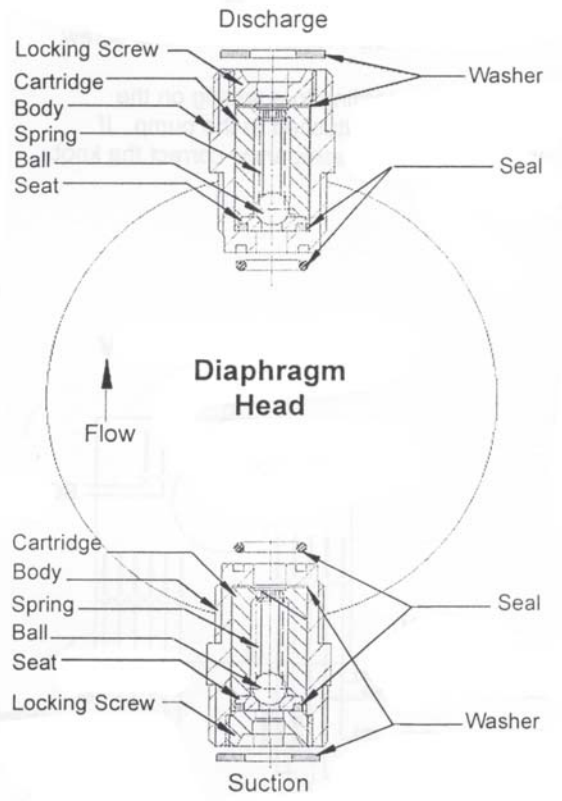
Please refer to drawings below.

1. Adjust stroke length knob to 0%.
2. Shut off pump and close shutoff valves in the suction and discharge lines. Relieve system pressure. Drain suction and discharge lines if possible.
   Caution: ***Pressure must be relieved before proceeding. If pressure is not relieved, dangerous chemical spray may result.***
3. Disconnect suction and discharge connections from pump head.
4. Refer to the appropriate check valve part drawing. Remove slotted locking screw by turning counterclockwise using a large flat bladed screwdriver. Using a tool such as a drift punch, carefully push all the internal components out of the check valve body.
5. Inspect balls, seats and ball guides for wear. If excessive wear is noted, replace parts. Clean all parts using an appropriate cleaning fluid.
6. Replace all seals.
7. Reassemble check valves, noting orientation of the internal parts. Replace locking screw.
8. Test check valves for leaks by placing on a flat surface with check valve seats down as shown in the parts list drawing. Pour a small amount of water into the top of each check valve. If water leaks out of the bottom of the check valve, disassemble the check valve and clean or replace the balls and seats.
9. Reassemble check valves to pump head after installing new seals between check valves and head. Ensure that check valves are oriented correctly in the pump head.
10. Reassemble suction and discharge lines, open shutoff valves and start pump according to Start Up and Operation Instructions. See page 1.4. Do not overtighten plastic fittings.

Double Ball Check Valves



Single Ball Spring - Loaded Check Valves



Calibration of Stroke Length Setting

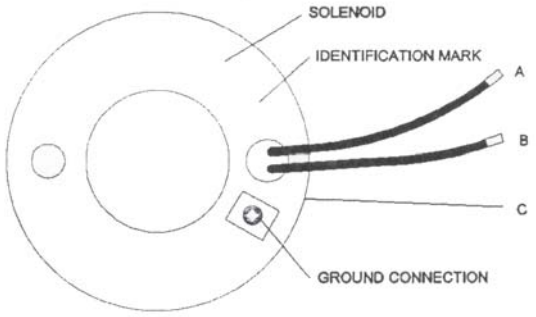
To avoid excessive metering, the discharge line must be returned to the supply tank during setting (if necessary). Refer to calibration tag on side of pump to calibrate pump to system pressure. Precise calibration will ensure proper chemical dosing as specifically related to variables of each pumping system.

1. With pump operating, loosen the fastening screw and turn the stroke length adjustment knob counterclockwise until the pump no longer delivers or, in the case of no pressure delivery, the flow rate has reached the minimum.
2. If zero delivery could not be attained because the knob reached the stop position:
   - Loosen and remove locking screw and knob.
   - Turn knob to right and place back on pump with loose locking screw.
   - Turn knob to left until pump no longer delivers fluid.
   - Turn pump off and by removing locking screw and knob, orient knob to zero of dial indicator; fasten with locking screw.
3. Run pump according to a setting on the calibration table attached to the pump. If there is a major discrepancy, correct the knob position.

Drive Solenoids

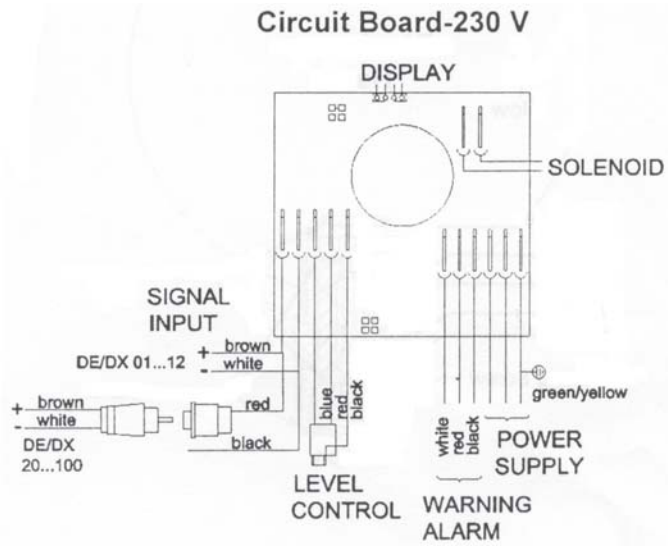
Depending on the pump version, the solenoid size differs. The following table shows the coil resistance at 68Þ F (20Þ C) room temperature. With perfect coils, the resistance tolerance should not exceed +/- 5%. If the resistance is substantially lower, there is a short in the coil. If the resistance is higher, the coil is fused or the wire is broken.

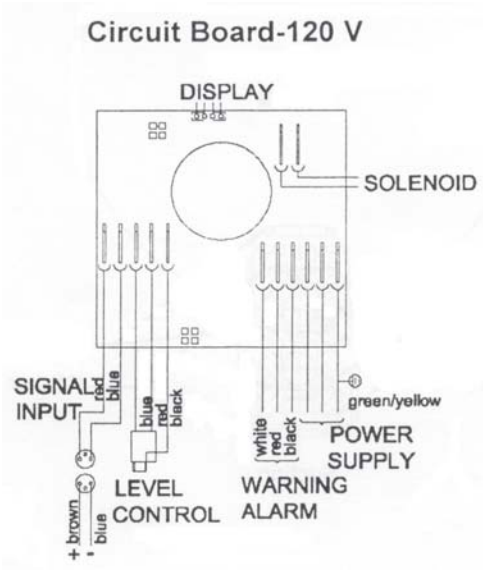
Test Check for Drive Solenoids
Resistance of Cold Coils (68˚ F/20˚ C)



The resistance between wires A-C and B-C is infinite.

Solenoid in Pump Version	Resistance [Ω] +/- 5% between A-B at	
	115V	230V
DE/DX 01-2	30	113
DE/DX 4-12	30	91
DE/DX 20-100	14	51

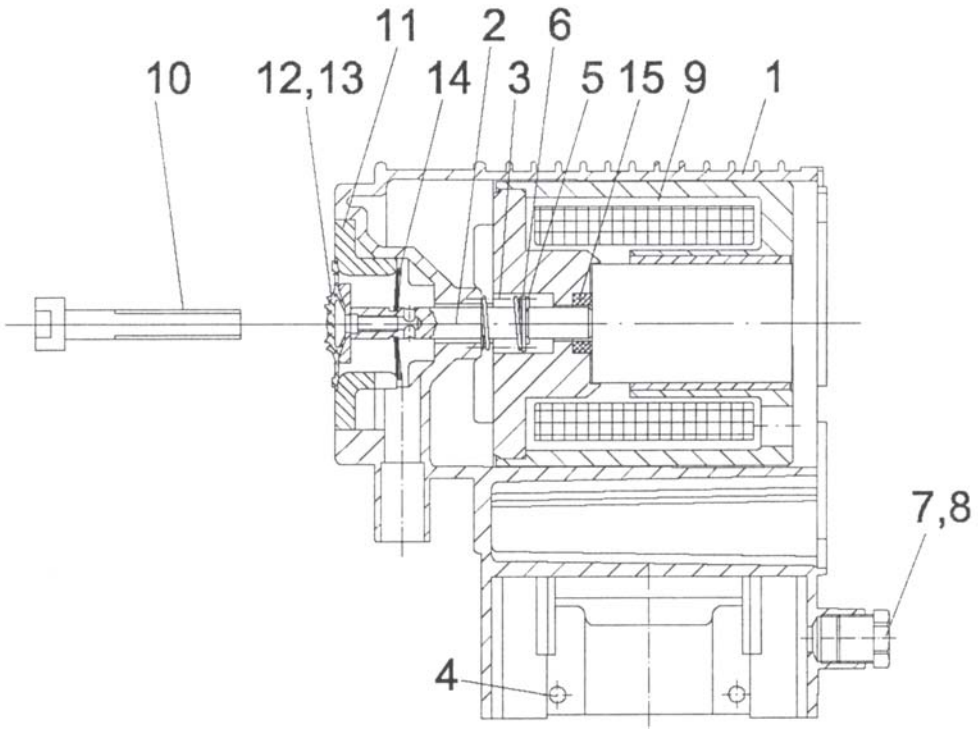




7. Troubleshooting

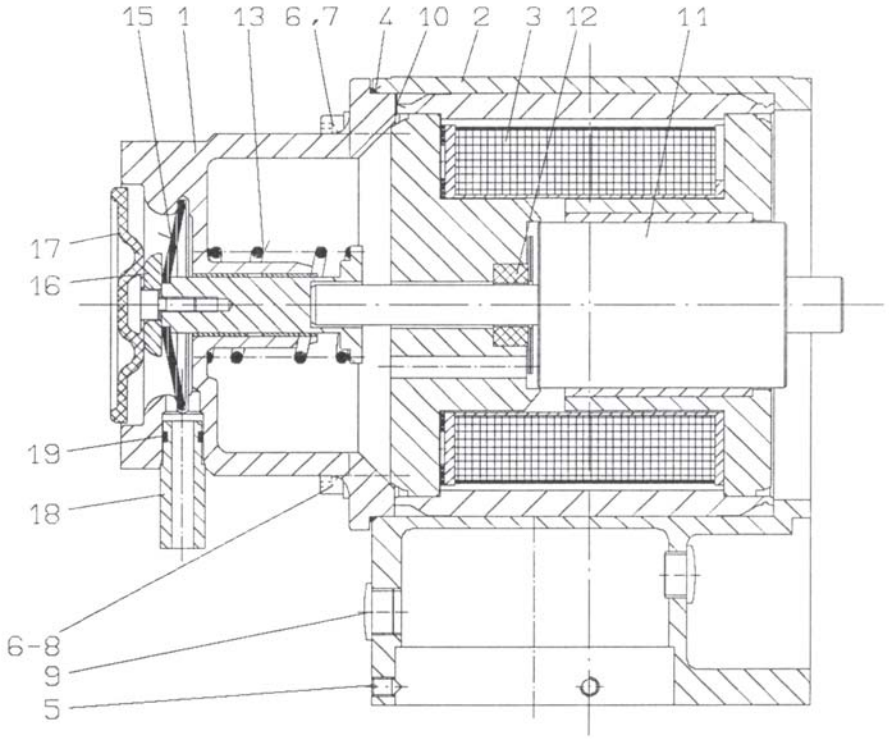
Problem	Possible Cause	Recommended Action
Pump fails to inject chemical.	System shut off valves are closed	Open valves, prime pump.
	Check valves are leaking.	Inspect connections. Clean valves and reinstall or replace. (See Start Up, page 1.4.)
	Suction filter, foot valve or suction line is leaking or blocked.	Clean and seal suction line.
	Check valves are incorrectly installed.	Reassemble check valves. Ensure that the balls for the suction and discharge valves are correctly positioned above the check valve seat (See Maintenance Section, page 1.7).
	Suction lift is too high.	Install pump at lower position or install a priming aid.
	Viscosity is too high.	If viscosity reading is between 100 and 400 cps, install spring-loaded valves. Enlarge suction line inner diameter. Use special wetted head. (Consult factory)
Pump is not stroking.	LEDs are off.	Check power supply line.
	Pump is set to zero stroke.	Correctly adjust pump stroke length.
	Low level jack is open.	Insert level probe plug or replace dummy plug.
	Diaphragm return spring is broken.	Replace spring.
	Solenoid is defective.	Check coil resistance and isolation, replace solenoid if required.
Red low level liquid indication LED is blinking.	Supply tank level is low.	Refill supply tank.
Red low level liquid indication LED is on.	Supply tank empty; level control or dummy plug incorrectly inserted.	Fill supply tank or check suction line float. Check dummy plug or cable connection.
Pump is experiencing frequent diaphragm failures.	Back pressure at discharge connection is too high.	Check system pressure. Possible blocked injection nozzle. Install pulsation dampener to even out flow.
	There is sediment in metering head.	Flush metering head. Install screen on foot valve.
	Diaphragm was not properly tightened into diaphragm rod.	Tighten diaphragm. Support plate must then be positioned between diaphragm and diaphragm rod.
	No diaphragm support plate.	Replace diaphragm with support plate.When replacing diaphragm, check if deflector plate or diaphragm rod have been corroded by process fluid.
Pump is delivering too much chemical.	Stroke knob shifted.	Recalibrate knob (See Maintenance Section, page 1.7).
	Stroke frequency is too high.	Reduce frequency.
	Suction pressure too high (pump siphoning).	Install back pressure valve in discharge line.

Drive Unit for MAGDOS DE/DX 01-12



Item No.	Description	Qty.	Part No.						
			01	03	07	2	4	8	12
1	Housing	1	27078						
2	Diaphragm Rod	1	32713						
3	Pressure Spring	1	29382						
4	Locking Screw	4	83613						
5	Snap Ring	1	84154						
6	Washer	1	84144						
7	Cable Gland Nut	1	78786						
8	Grommet	1	78787						
9	Solenoid Assembly 115 VAC	1	32746		32748				
	Solenoid Assembly 230 VAC	1	32730		32714		32715		
10	Solenoid Retaining Screw	2	83514						
11	Diaphragm Insert	1	32958	28849		28850		28851	28852
12	Diaphragm	1	81683	81424				81463	81464
13	Support Plate	1	---			29313		23892	33897
14	Deflector Plate	1	22066						
15	Dampening Ring	1	81680		78509				

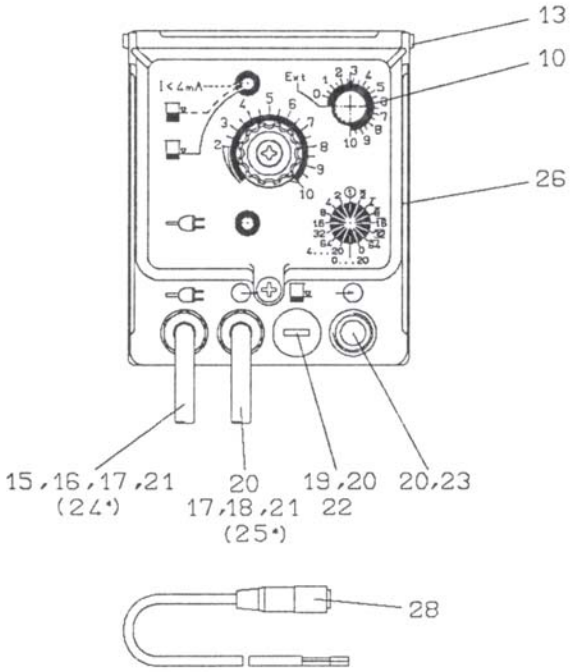
Drive Unit for MAGDOS DE/DX 20-100

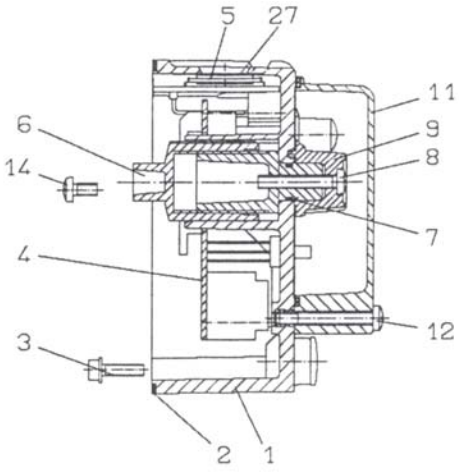


Item No.	Description	Qty.	Part No.		
			20	40	100
1	Diaphragm Flange	1	23913	24024	24041
2	Housing	1	21593		
3	Solenoid Assembly 115 V	1	79021		
	Solenoid Assembly 230 V	1	79020		
4	Sponge Rubber Cord	1	97593		
5	Screw	4	83105		
6	Socket-Head Cap Screw	4	83668		
7	Washer	3	84160		
8	Toothed Washer	1	84145		
9	Dummy Plug	2	78788		
10	Foam Rubber	3	81727		
11	Armature	1	21738		
12	Buffer Ring	1	78511		
13	Pressure Spring	1	19617		
14	Diaphragm Rod	1	19780	21599	21600
15	Deflector Plate	1	22056	22057	22058
16	Support Plate	1	28977	---	----
17	Diaphragm	1	81465	81466	81467
18	Leakage Pipe	1	25174	25190	
19	O-Ring	1	80005	80058	

Control Unit for MAGDOS DE/DX 01-12

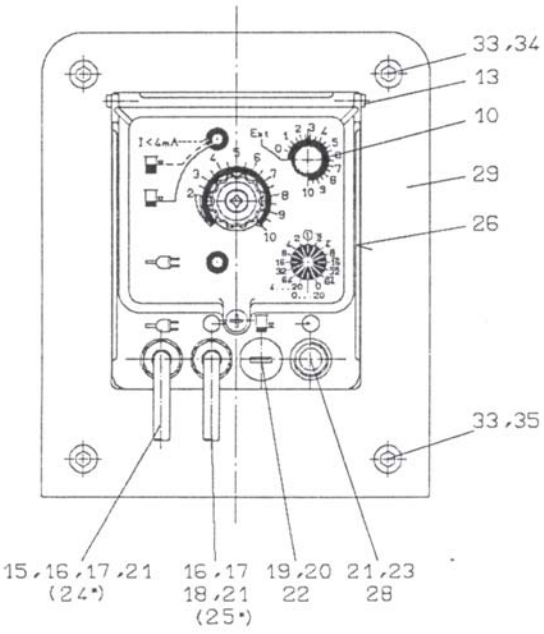
(refer to page _____)

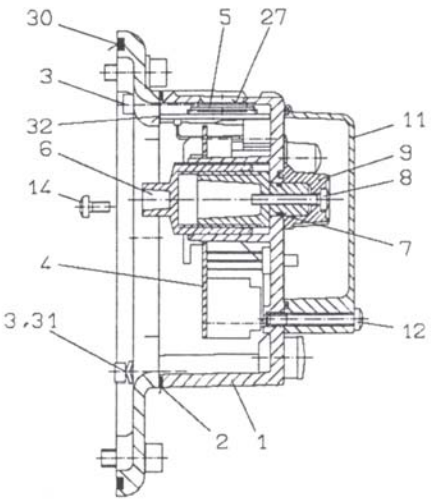


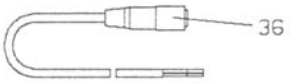


Control Unit for MAGDOS DE/DX 20-1000

(refer to page _____)







* Only with 115 VAC models.

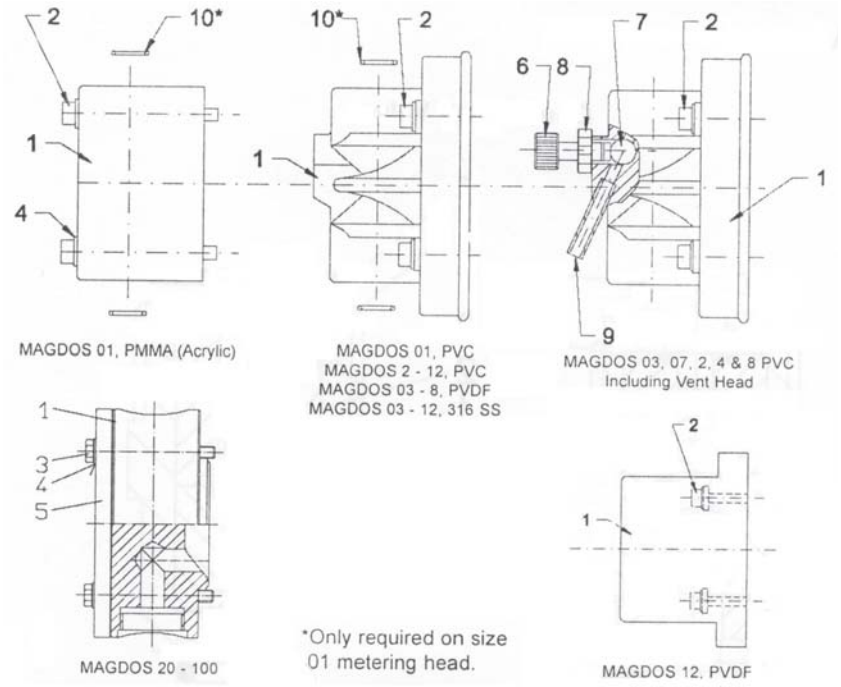
Control Units for MAGDOS DE/DX 01-12

Item No.	Description	Voltage/ Model	Quantity Required	Part No.			
				DE	DE...S	DX...D	DX...SD
1	Housing	115 VAC	1	34130		34133	
		230 VAC	1	33873		33876	
2	Housing Seal		1	81710			
3	Screw		4	83409			
4	Electronics	115 VAC	1	78663		78664	
		230 VAC	1	78682	78683	78684	
5	Digital Display		1	----		78782	
6	Stroke Adjustment	01, 03	1	34045			
		07, 2	1	34046			
		4	1	34047			
		8, 12	1	34048			
7	O-ring		1	80072			
8	Screw		1	83746			
9	Stroke Adjustment Knob		1	32661			
10	Speed Adjustment Knob		1	33877			
11	Control Cover		1	22247			
12	Locking Screw		1	21587			
13	Screw		2	83543			
14	Screw		2	83653			
15	Power Supply Cable	115 VAC	1	79013			
		230 VAC	1	78997			
16	Cable Gland Nut		1	78786			
17	Grommet		2	78787			
18	Warning Relay Cable	115 VAC	1	----	78980	----	78980
		230 VAC	1	----	78800	----	78800
19	Jack Socket		1	33878			
20	Cover Plug		3	78788			
21	Insulation Adapter Plug		2	78916			
22	Dummy Plug		1	29115			
23	External Control Socket	115 VAC	1	33317			
		230 VAC	1	78947			
24	Gland Nut	Pg 9	1	78904			
25	Gland Nut	Pg 7	1	----	78615	----	78615
26	Calibration Table	01	1	261001			
		03	1	261002			
		07	1	261003			
		2	1	261004			
		4	1	261005			
		8	1	261006			
		12	1	261007			
27	Digital Display (decal)		1	----		78665	
28	Cable w/plug for External Control		1	32916			

Control Unit for MAGDOS DE/DX 20-100

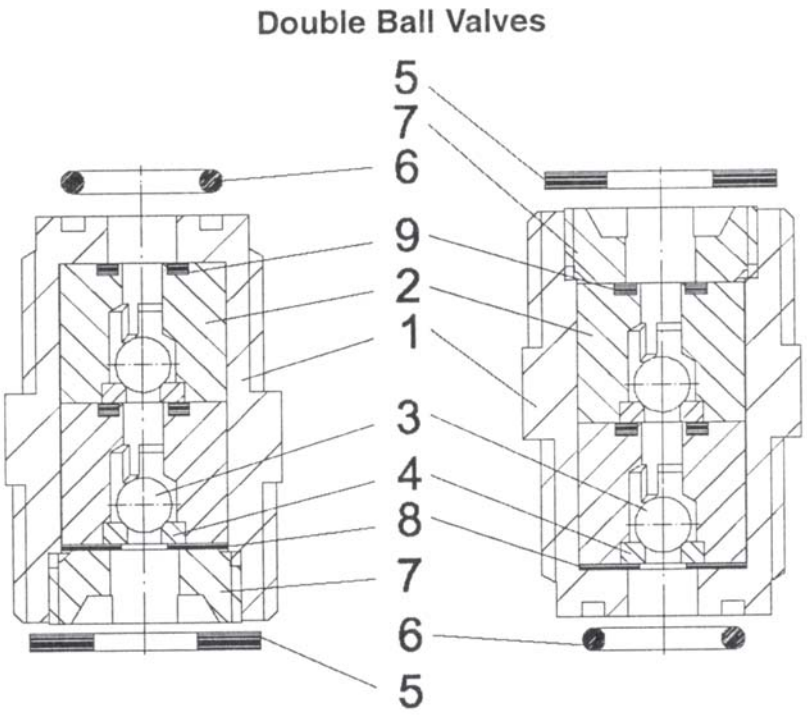
Item No.	Description	Voltage/ Model	Quantity Required	Part No.			
				DE	DE...S	DX...D	DX...SD
1	Housing	115 VAC	1	34130		34133	
		230 VAC	1	33873		33876	
2	Housing Seal		1	81710			
3	Screw		4	83187			
4	Electronics	115 VAC	1	79018		79019	
		230 VAC	1	79016		79017	
5	Digital Display		1	---		78782	
6	Stroke Adjustment		1	34351			
7	O-ring		1	80072			
8	Screw		1	83746			
9	Stroke Adjustment Knob		1	32661			
10	Speed Adjustment Knob		1	33877			
11	Control Cover		1	22247			
12	Locking Screw		1	21587			
13	Screw		2	83543			
14	Screw		2	83653			
15	Power Supply Cable	115 VAC	1	79013			
		230 VAC	1	78997			
16	Cable Gland Nut	Pg 7	1	78786			
17	Grommet	Pg 7	1	78787			
18	Warning Relay Cable	115 VAC	1	---	78980	---	78980
		230 VAC	1	---	78800	---	78800
19	Jack Socket		1	33878			
20	Cover Plug	230 VAC	3	78788			
21	Insulation Adapter Plug		2	78916			
22	Dummy Plug		1	29115			
23	3-Pole Connection Socket	115 VAC	1	33317			
	Cinch Plug	230 VAC	1	33879			
24	Gland Nut	115 VAC	1	78904			
25	Gland Nut	Pg 7	1	---	78615	---	78615
26	Calibration Table	20	1	261416			
		40	1	261417			
		100	1	261418			
27	Digital Display (decal)		1	---		78665	
28	Dummy Plug		1	25084			
29	Spacer		1	21594			
30	Sponge Rubber Cord		1	97113			
31	Cable Clamping Ring		1	84188			
32	Foam Rubber		1	---		81727	
33	Socket Head Cap Screw		4	83292			
34	Washer		3	84160			
35	Toothed Washer		1	84145			
36	Cable w/plug for External Control	115 VAC	1	32916			
		230 VAC	1	25096			

Metering Heads



Item No.	Description		Quantity	Head Material					
				Acylic	PVC	PVC w/Vent	PVDF	216 SS	PP
1	Diaphragm Housing	01	1	32960	32919	----	----	----	---
		03, 07	1	---	----	25960	28114	22527	---
		2, 4	1	---	21603	25961	28116	21611	---
		8	1	---	21222	25962	28118	21612	---
		12	1	---	22399	----	28689	21613	---
		20	1	---	18113	----	----	23912	---
		40	1	---	----	----	99160	22329	22044
		100	1	---	----	----	----	22394	22046
2	Socket Head Cap Screw	01-12	4		83409	83409	83409	83622	---
3	Hex Head Screw	20	4	---	83110	----	----	83110	---
		40, 100	4	---	----	----	83495	83685	83495
4	Washer	01	4		----	29778	----	84143	---
		20	4	---	84160	84160	----	84160	---
		40, 100	4	---	----	----	84174	84174	84174
5	Pressure Plate	40, 100	1	---	----	----	32903	---	18453
6	Venting Screw	03, 07	1	---	----	32142	----	---	---
7	Check Valve Ball	03, 07	1	---	----	29778	----	---	---
8	Nut	03, 07	1	---	----	32143	----	---	---
9	Vent Nipple	03, 07	1	---	----	32845	----	---	---
10	O-ring	01	2		----	----	----	---	---
11	Complete Diaphragm Head Kit	01	1		33321	----	----	---	---
		03, 07	1	---	----	25188	28115	25189	---
		2, 4	1	---	23809	13328609	28117	23812	---
		8	1	---	23810	13328610	28119	23813	---
		12	1	---	23811	---	29178	23814	---
		20	1	---	23909	---	---	23911	---
		40	1	---	---	---	261530	23727	23721
		100	1	---	---	---	---	23728	23722

Valves for MAGDOS DE/DX 01 & 03

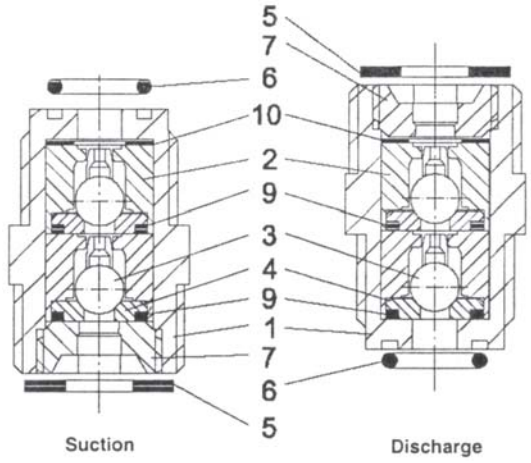


Item No.	Description	Material	Part No.	PVC	PVDF	316 SS
1	Check Valve Body	PVC	20845	1	----	----
		PVDF	28108	----	1	----
		316 SS	19289	----	----	1
2	Ball Guide	PVC	29446	2	----	----
		PVDF	29901	----	2	----
		316 SS	28460	----	----	2
3	Valve Ball	Ceramic	81550	2	2	2
4	Valve Seat	Ceramic	81549	2	2	2
5	Gasket	Viton	81371	1	----	1
		PTFE	81580	----	1	----
6	O-ring	Viton	81384	1	1	1
7	Locking Screw	PVC	19299	1	----	----
		PVDF	28110	----	1	----
		316 SS	24031	----	----	1
8	Gasket	Viton	81551	1	1	1
9	O-ring	Viton	80618	2	2	2
Suction Valve Assembly				29434	33700	28459
Discharge Valve Assembly				29435	33701	28461

Note: Spring-loaded check valves not available for these pump sizes.

Valves for MAGDOS DE/DX 07-12

Double Ball Valves

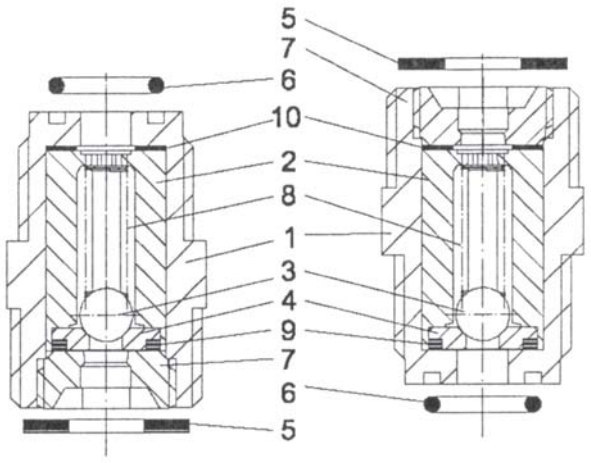


Item No.	Description	Material	Part No.	Suction									Discharge								
				PVC			316 SS			PVDF			PVC			316 SS			PVDF		
				Seal Material: H=Hypalon, P=PTFE, V=Viton																	
				H	P	V	H	P	V	H	P	V	H	P	V	H	P	V	H	P	V
1	Valve Body	PVC	20845	1	1	1	–	–	–	–	–	–	1	1	1	–	–	–	–	–	–
		PVDF	28108	–	–	–	–	–	–	1	1	1	–	–	–	–	–	–	1	1	1
		316SS	19289	–	–	–	1	1	1	–	–	–	–	–	–	1	1	1	–	–	–
2	Ball Guide	PVC	19294	2	2	2	–	–	–	–	–	–	2	2	2	–	–	–	–	–	–
		PVDF	28109	–	–	–	–	–	–	2	2	2	–	–	–	–	–	–	2	2	2
		316SS	19293	–	–	–	2	2	2	–	–	–	–	–	–	2	2	2	–	–	–
3	Valve Ball	Glass	29778	2	2	2	–	–	–	–	–	–	2	2	2	–	–	–	–	–	–
		316SS	18044	–	–	–	2	2	2	–	–	–	–	–	–	2	2	2	–	–	–
		PTFE	25247	–	–	–	–	–	–	2	2	2	–	–	–	–	–	–	2	2	2
4	Valve Seat	PVDF	81460	2	2	2	–	–	–	2	2	2	2	2	2	–	–	–	2	2	2
		316SS	81461	–	–	–	2	2	2	–	–	–	–	–	–	2	2	2	–	–	–
5	Gasket	Viton	81138	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1
		PTFE	81580	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	1	–
		PTFE	81677	–	1	–	–	1	–	–	–	–	–	1	–	–	1	–	–	–	–
		EPDM	81453	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–
6	O-ring	EPDM	80754	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–
		Viton	81384	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1
		PTFE	80617	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–
7	Locking Screw	PVC	19299	1	1	1	–	–	–	–	–	–	1	1	1	–	–	–	–	–	–
		PVDF	28110	–	–	–	–	–	–	1	1	1	–	–	–	–	–	–	1	1	1
		316SS	24031	–	–	–	1	1	1	–	–	–	–	–	–	1	1	1	–	–	–
9	O-ring	Viton	80013	–	–	2	–	–	2	–	–	2	–	–	2	–	–	2	–	–	2
		PTFE	80627	–	2	–	–	2	–	–	2	–	–	2	–	–	2	–	–	2	–
		EPDM	80755	2	–	–	2	–	–	2	–	–	2	–	–	2	–	–	2	–	–
10	Gasket	Viton	81526	–		1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1
		PTFE	81585	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–
		EPDM	81525	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–
Complete Valve Assembly				33497	24027	20890	34395	24029	25667	34391	28111	33703*	33498	24028	20891	34396	24030	25668	34392	28112	33704*

*Hydrolfluosilicic Acid Service (H_2SiF_6)

Valves for MAGDOS DE/DX 07-12

Spring-Loaded Single Ball Valves

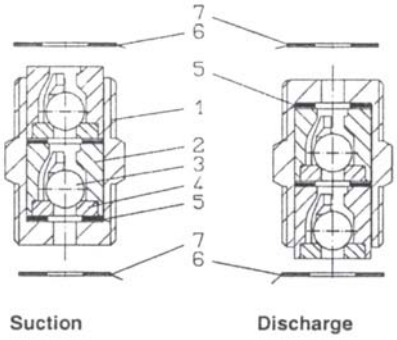


Item No.	Description	Material	Part No.	Suction									Discharge								
				PVC			316 SS			PVDF			PVC			316 SS			PVDF		
				Seal Material: H=Hypalon, P=PTFE, V=Viton																	
				H	P	V	H	P	V	H	P	V	H	P	V	H	P	V	H	P	V
1	Valve Body	PVC	20845	1	1	1	–	–	–	–	–	–	1	1	1	–	–	–	–	–	–
		PVDF	28108	–	–	–	–	–	–	1	1	1	–	–	–	–	–	–	1	1	1
		316SS	19289	–	–	–	1	1	1	–	–	–	–	–	–	1	1	1	–	–	–
2	Ball Guide	PVC	24066	1	1	1	–	–	–	–	–	–	1	1	1	–	–	–	–	–	–
		PVDF	24067	–	–	–	1	1	1	–	–	–	–	–	–	1	1	1	–	–	–
		316SS	29386	–	–	–	–	–	–	1	1	1	–	–	–	–	–	–	1	1	1
3	Valve Ball	Glass	29778	1	1	1	–	–	–	–	–	–	1	1	1	–	–	–	–	–	–
		316SS	18044	–	–	–	1	1	1	–	–	–	–	–	–	1	1	1	–	–	–
		PTFE	25247	–	–	–	–	–	–	1	1	1	–	–	–	–	–	–	1	1	1
4	Valve Seat	PVDF	81460	1	1	1	–	–	–	1	1	1	1	1	1	–	–	–	1	1	1
		316SS	81461	–	–	–	1	1	1	–	–	–	–	–	–	1	1	1	–	–	–
5	Gasket	Viton	81138	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1
		PTFE	81677	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–
		EPDM	81453	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–
6	O-ring	EPDM	81384	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1
		Viton	80617	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–
		PTFE	80754	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–
7	Locking Screw	PVC	19299	1	1	1	–	–	–	–	–	–	1	1	1	–	–	–	–	–	–
		PVDF	28110	–	–	–	–	–	–	1	1	1	–	–	–	–	–	–	1	1	1
		316SS	24031	–	–	–	1	1	1	–	–	–	–	–	–	1	1	1	–	–	–
8	Valve Spring	Hastelloy	25081	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	O-ring	Viton	80013	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1
		PTFE	80627	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–
		EPDM	80755	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–
10	Gasket	Viton	81526	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1
		PTFE	81585	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–
		EPDM	81525	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–	1	–	–
Complete Valve Assembly				33499	25085	25087	34397	25089	25669	34393	29348	34370*	33500	25086	25088	34398	25090	25670	34394	29385	34371*

*Hydrolfluosilicic Acid Service (H_2SiF_6)

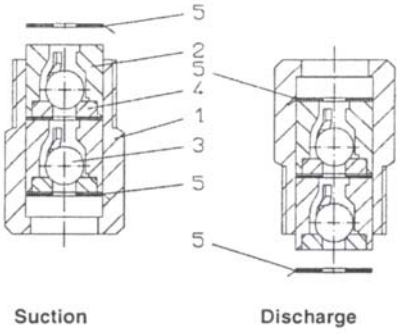
Valves for MAGDOS DE/DX 20

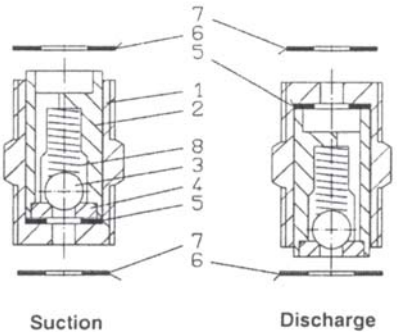
Plastic



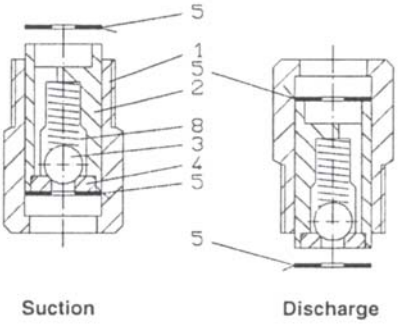
Double Ball Valves

Stainless Steel





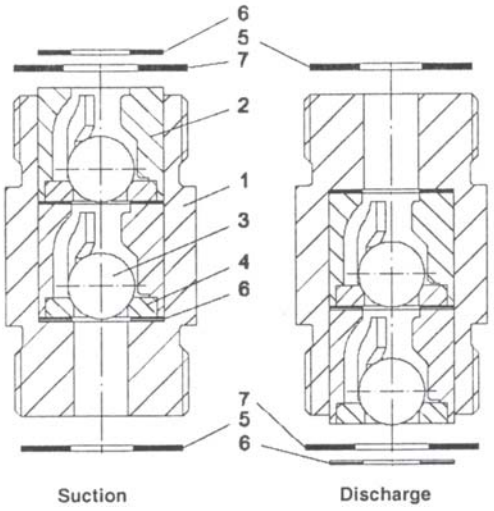
Spring-Loaded Valves



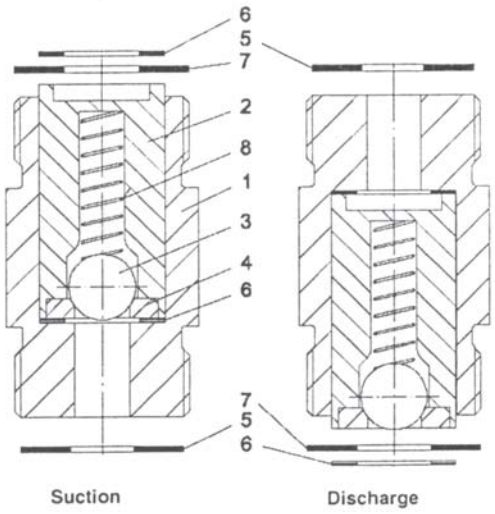
Item No.	Description	Material	Part No.	Double Ball								Spring-Loaded			
				Suction				Discharge				Suction		Discharge	
				PVC		316SS		PVC		316SS		PVC		PVC	
				Seal Material: H=Hypalon, H-Hypalon, V=Viton											
				H	V	H	V	H	V	H	V	H	V	H	V
1	Valve Housing	PVC	18189	1	1	–	–	1	1	–	–	1	1	1	1
		316SS	19601	–	–	1	1	–	–	1	1	–	–	–	–
2	Ball Guide	PVC	82405	2	2	–	–	2	2	–	–	–	–	–	–
		316SS	82102	–	–	2	2	–	–	2	2	–	–	–	–
		PVC	23412	–	–	–	–	–	–	–	–	1	1	1	1
3	Valve Ball	Ceramic	10017	2	2			2	2			1	1	1	1
		316SS	10136			2	2			2	2				
4	Valve Seat	PVC	82406	2	2			2	2			1	1	1	1
		316SS	82103			2	2			2	2				
5	Gasket	Hypalon	81037	2		2		2		2		1		1	
		Viton	81138		2		2		2		2		1		1
6	Gasket	Hypalon	81033	1		1		1		1		1		1	
		Viton	81285		1		1		1		1		1		1
7	Gasket	Hypalon	81041	1		1		1		1		1		1	
		Viton	81141		1		1		1		1		1		1
8	Valve Spring	Hastelloy	25082									1	1	1	1
Complete Valve Assembly				18187	18185	260470	19176	18188	18186	260481	19177	25161	25162	27516	27517

Valves for MAGDOS DE/DX 40 & 100

Double Ball Valves



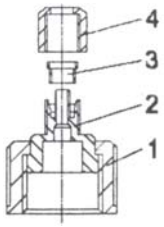
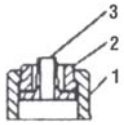
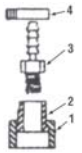
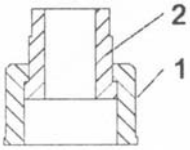
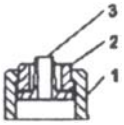
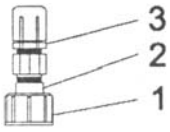
Spring - Loaded Valves



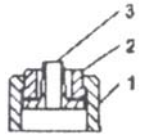
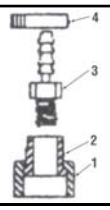
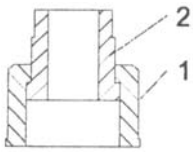
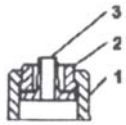
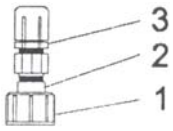
Item No.	Description	Material	Part No.	Double Ball												Spring-Loaded			
				Suction						Discharge						Suction		Discharge	
				PP		316SS		PVDF		PP		316SS		PVDF		PP		PP	
				Seal Material: H=Hypalon, V=Viton															
				H	V	H	V	H	V	H	V	H	V	H	V	H	V	H	V
1	Valve Body	PP	34665	1	1	--	--	--	–	1	1	–	–	--	--	1	1	1	1
		316SS	32449	--	–	1	1	--	–	–	–	1	1	–	--	--	–	--	--
		PVDF	34082	--	–	--	--	1	1	–	–	–	–	1	1	--	--	--	--
2	Ball Guide	PP	34142	2	2	--	--	--	–	2	2	–	–	--	--	--	--	--	--
		316SS	82112	--	–	2	2	--	–	–	–	2	2	–	--	--	–	--	--
		PP	22882	--	–	--	--	--	–	–	–	–	–	--	--	1	1	1	1
		PVDF	34084	--	–	--	--	2	2	–	–	–	–	2	2	--	--	--	--
3	Valve Ball	Glass	82457	2	2	--	--	--	–	2	2	–	–	--	--	1	1	1	1
		316SS	82114	--	–	2	2	--	–	–	–	2	2	–	--	--	–	--	--
		PTFE	261504	--	–	--	--	2	2	–	–	–	–	2	2	--	--	--	--
4	Valve Seat	PP	82456	2	2	--	--	--	–	2	2	–	–	--	--	1	1	1	1
		316SS	82113	--	–	2	2	--	–	–	–	2	2	–	--	--	–	--	--
		PVDF	34083	--	–	--	--	2	2	–	–	–	–	2	2	--	--	--	--
5	Gasket	Hypalon	81035	1	–	1	--	1	–	1	–	1	–	1	--	1	–	1	--
		Viton	81198	--	1	--	1	--	1	–	1	–	1	--	1	--	1	--	1
6	Gasket	Hypalon	81238	2	–	3	--	2	–	2	–	3	–	2	--	1	–	1	--
		Viton	81276	--	2	--	3	--	2	–	2	–	3	–	2	--	1	--	1
7	Gasket	Hypalon	81239	2	–	--	--	1	–	1	–	–	–	1	--	1	–	1	--
		Viton	81277	--	2	--	--	--	1	–	2	–	–	–	1	--	1	--	1
8	Valve Spring	Hastelloy	32577	--	–	--	--	--	–	–	–	–	–	--	--	1	1	1	1
Complete Valve Assembly				26841	26842	260471	27652	261529	261527	27356	27357	260482	27655	261528	261526	26845	25707	27353	27354

* Quantity 3 required on 316SS Double Ball valves

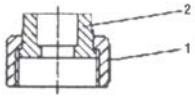
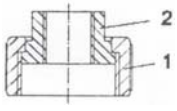
Connections for MAGDOS DE/DX 01-12

Connection Type		Material	Size/ Tube Material	Conn. Assy. Part No.	Item No.	Spare Parts	
						Description	Part No.
	A	PVC	4mm x 6mm PE	20975	1	Union Nut	88116
					2	Connection	88012
					3	Cutting Ring	88003
					4	Union Nut	88004
		PVDF	4mm x 6mm PE	29387	1	Union Nut	28120
					2	Connection	88028
					3	Cutting Ring	88003
					4	Union Nut	88004
	B	PVC	1/4" x 7/16" PVC	261317	1	Union Nut	88116
					2	Tube Nipple	261267
					3	Cutting Ring	261265
	C	PVC/ PP	1/4" x 7/16" PVC	261059	1	Union Nut	82087
					2	Threaded Conn.	30100
					3	Tube Adapter	260548
					4	Hose Clamp	260549
	D	PVC	1/4" FNPT	30101	1	Threaded Conn.	30100
					2	Tube Nut	82087
		PVDF	1/4" FNPT	30115	1	Threaded Conn.	30114
					2	Tube Nut	28120
		PTFE	1/4" FNPT	261405	1	Threaded Conn.	30100-2
					2	Tube Nut	91165
		SS	1/4" FNPT	30103	1	Threaded Conn.	30102
					2	Tube Nut	19303
	E	PVC	1/4" x 3/8" PE	261307	1	Union Nut	88116
					2	Cutting Ring	261266
					3	Tube Nipple	261267
	F	PVC/PP	3/8" x 1/2" PE	261398	1	Union Nut	82087
					2	Threaded Conn.	30100
					3	Tube Adapter	261397

Connections for MAGDOS DE/DX 20

Connection Type		Material	Size/ Tube Material	Conn. Assy. Part No.	Item No.	Spare Parts	
						Description	Part No.
	**B**	PVC	1/4" x 7/16" PVC	261459	1	Union Nut	82156
					2	Tube Nipple	261267
					3	Cutting Ring	261265
	**C**	PVC/PP	1/4" x 7/16" PVC	261466	1	Union Nut	82156
					2	Threaded Conn.	30100
					3	Tube Adapter	260548
					4	Hose Clamp	260549
	**D**	PVC	1/4" FNPT	30104	1	Union Nut	82156
					2	Threaded Conn.	30100
		SS	1/4" FNPT	30103	1	Union Nut	19303
					2	Threaded Conn.	30102
		PVDF	1/4" FNPT	261583	1	Union Nut	82156
					2	Threaded Conn.	30114
	**E**	PVC	1/4" x 3/8" PE	261335	1	Union Nut	82156
					2	Tube Nipple	261267
					3	Cutting Ring	261266
	**F**	PVC/PP	3/8" x 1/2" PE	261460	1	Union Nut	82156
					2	Threaded Conn.	30100
					3	Tube Adapter	261397

Connections for MAGDOS DE/DX 40 & 100

Connection Type		Material	Size/ Tube Material	Conn. Assy. Part No.	Item No.	Spare Parts	
						Description	Part No.
	**T**	PVC	1/2" Slip	30109	1	Union Nut	82213
					2	Cemented Conn.	30108
	**S**	PVC	NPT 1/2"	30111	1	Union Nut	82213
					2	Threaded Conn.	30110
		SS	NPT 1/2"	30113	1	Union Nut	29518
					2	Threaded Conn.	30112
		PP	NPT 1/2"	261378	1	Union Nut	82213
					2	Threaded Conn.	30110-1
		PVDF	NPT 1/2"	261531	1	Union Nut	82213
					2	Threaded Conn.	30110-3