

Instruction manual



MEMBRANE PUMPS MODEL ZM - 10





You have just acquired the **MEMBRANE PUMP MODEL ZM-10**, an equipment that aims to provide you safety in the water supply. It was manufactured with high quality materials that guarantee durability and resistance with low cost of maintenance.

Watch-out

The data contained in this manual should not be considered as standards for all facilities and may suffer alterations without previous notification.

The ZM BOMBAS is available to their customers for more technical information of installation and maintenance of their products, by phone: +55(44)3028-0200 or by fax +55(44) 3028-3700, by e-mail: vendas@zmbombas.com or visit our site: www.zmbombas.com.br

Types of activation

The membrane pumps model ZM-6/10/15 can be used for various applications, being possible triggered by water wheels, by turbines or by electrical motor/stationary and by power outlets of 540 RPM tractors.

Can be used in both directions of rotation, to better serve the needs of the customers.

WHEEL DRIVING

Models

ZM 10 (wheel diameter = 1,0 m)

(wheel diameter = 1,4 m)



TRACTOR DRIVING

Model:

ZM 10



TURBINE DRIVING WITH 1 PUMP

Model

ZM 6/10



TURBINE DRIVING WITH 2 PUMP

Model

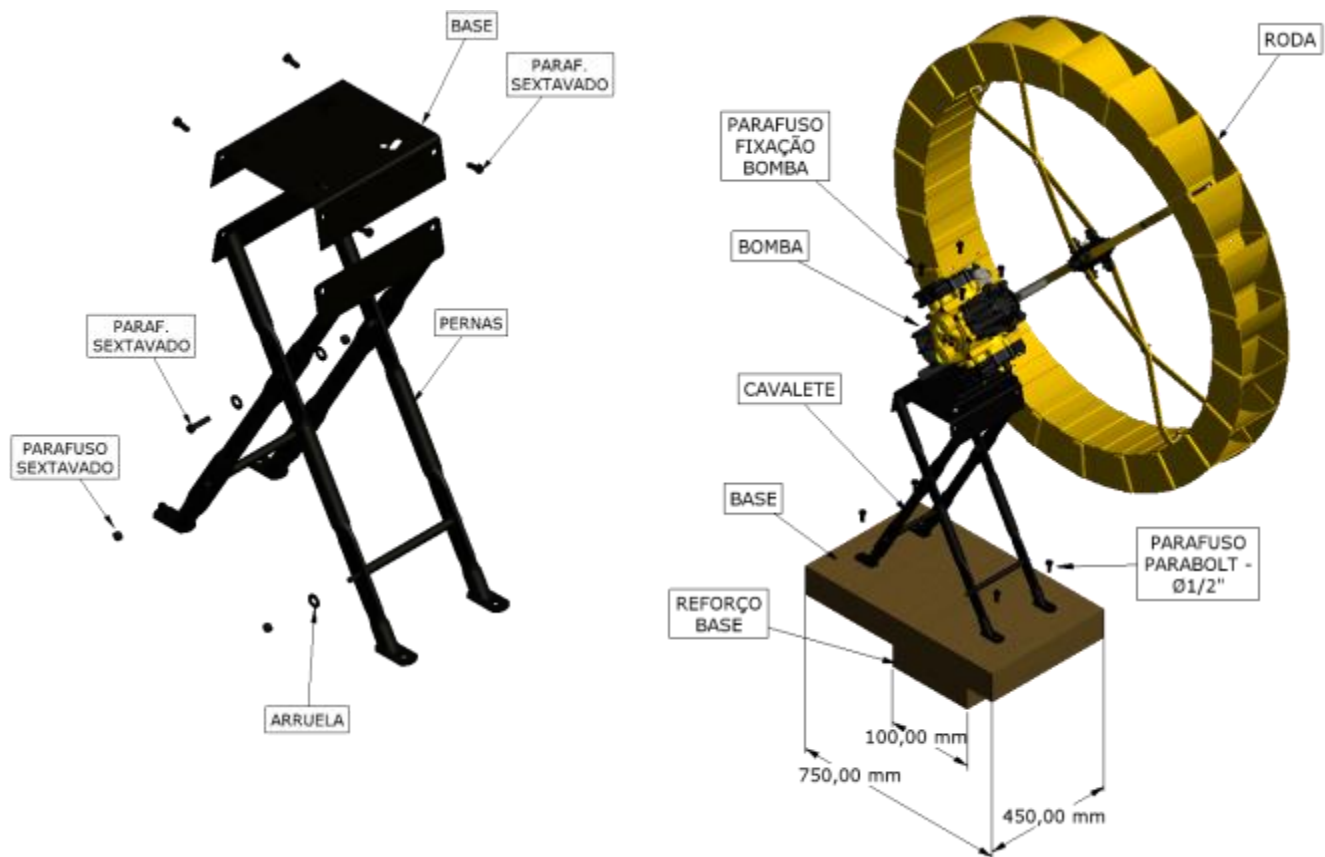
ZM 10



Care facility

ASSEMBLY OF PUMP AND WHEEL

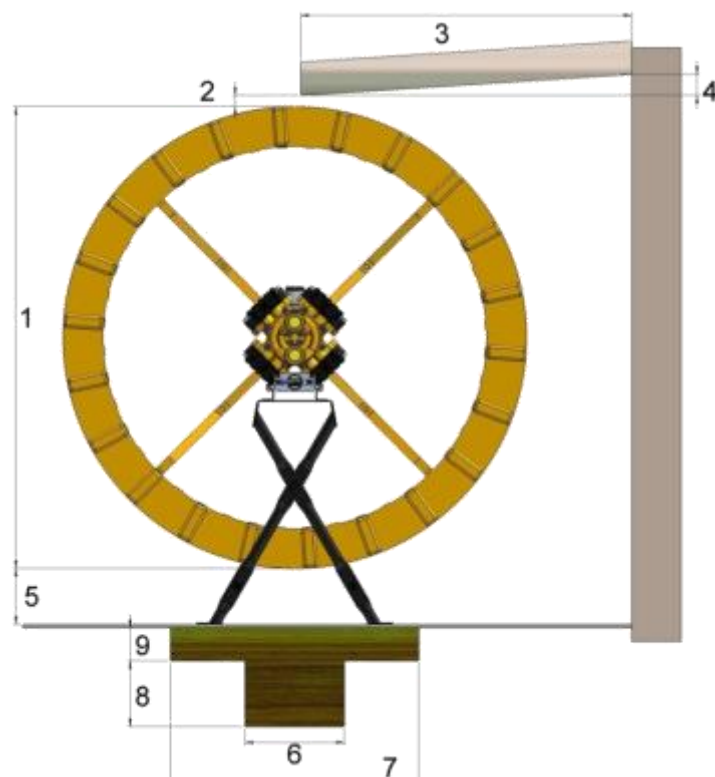
When stalling the pump select the most suitable location, that is easy to access, easy to capture water on the wheel and easy to suck the water to be pumped. Avoid installing the pump in places subject to flooding or difficult to access. The assemblies of the easel and the set are outlined below:



- Build masonry or similar base to fix the easel, when used the easel.
- It is recommended to fix the easel with screws para-bolt (or similar).
- Braze the Base as the illustration below:

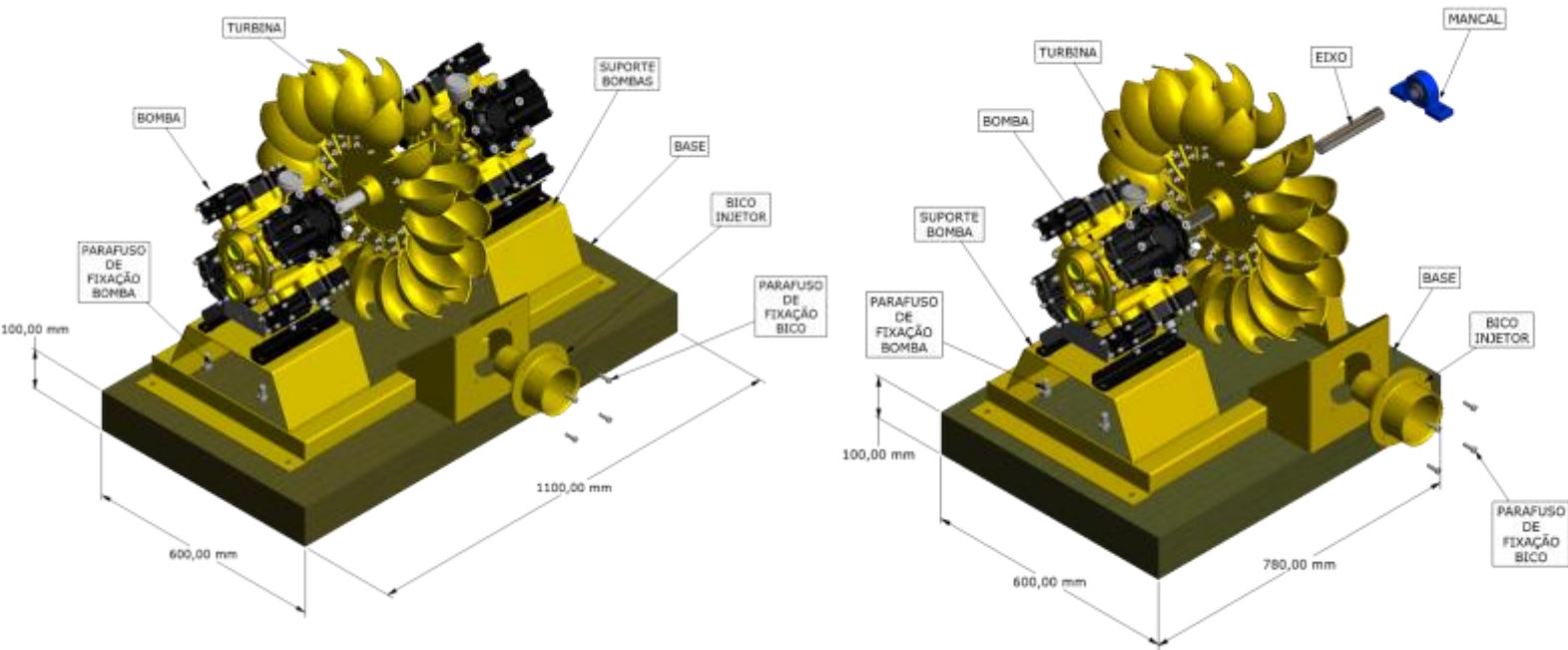
- Some indications:

- 1 – Wheel diameter
- 2 – Distance between the tube and the top of the wheel: $\pm 10\text{cm}$
- 3 – length of feeding tube, the proper positioning of the feeding tube will depend on the volume of the water. It should be positioned in order to provide greater spin on the wheel.
- 4 – Tube inclination: 3 to 5% of length
- 5 – Distance between the wheel and the masonry base: $\pm 7\text{cm}$
- 6 – Base reinforce - Length x Width: $\pm 10\text{cm}$
- 7 - Base – Length x Width: $75\text{cm} \times 45\text{cm}$
- 8 – Strengthening Base Depth: $\pm 60\text{cm}$
- 9 – Base Height: 10cm

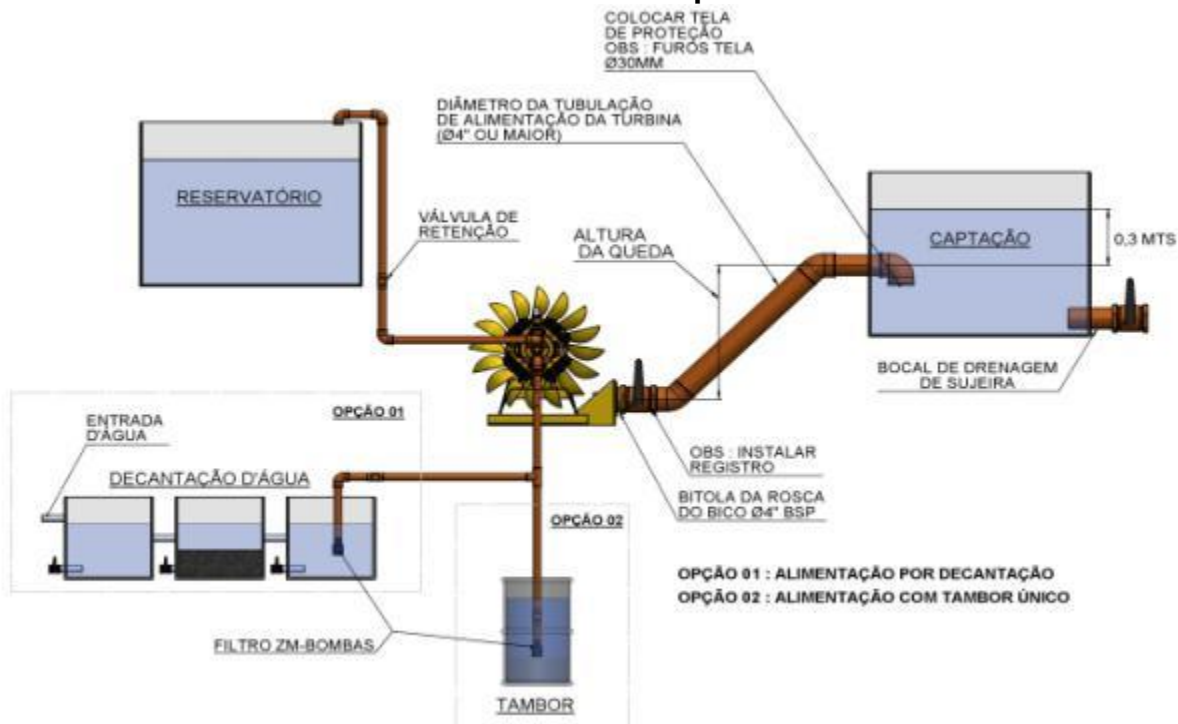


ASSEMBLING THE SET: PUMP AND TURBINE

The turbine driven pump must necessarily be brazed to a masonry base for purposes of fixation.



Recommendations to install the set: Pump and Turbine



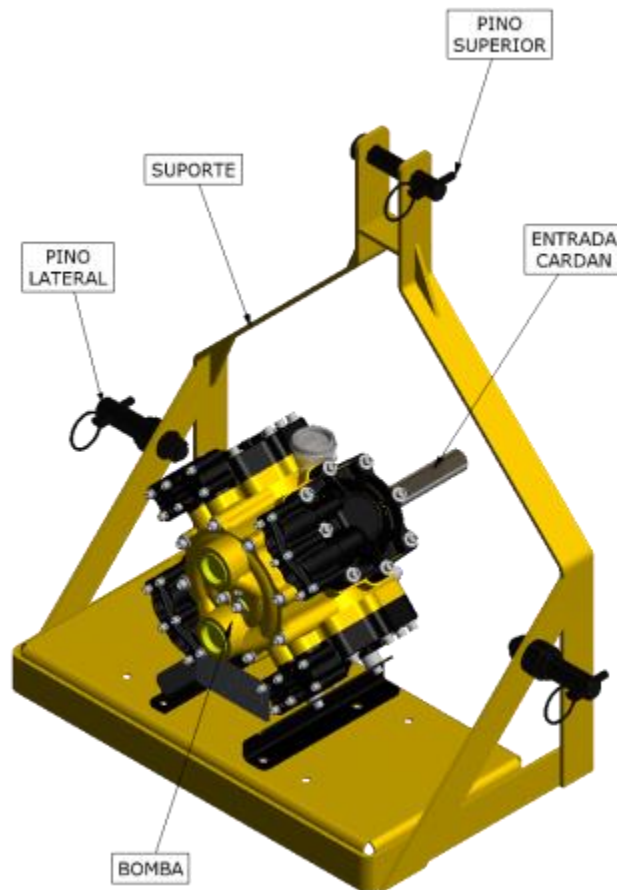
Important: install the Tube Water Catchment at least 0,3 meters below the level of the storage tank, with a curve 90° long and screen to prevent the entry of foreign bodies.

NOTES:

- When the distance of the feeding pipe of the turbine exceeds 20 meters, please consult the factory for technical guidance.
- Periodically check the accumulation of sand in the bottom of the catchment reservoir.

ASSEMBLY THE SET: PUMP AND TRACTOR

1. Fit the lateral and superior pins in the system three point hitch of the tractor;
2. Raise the assembly;
3. Install the CARDAN between the pump shaft and the axle tractor.



NOTE: RECOMMENDED MAXIMUM ROTATION: 540 RPM

SUCTION SYSTEM

- **Maximum suction depth (vertical): 7 meters;**
- **Maximum distance of suction in a straight line (horizontal): up to 60 meters;**
- **At each 10 meters in horizontal distance, we have a total loss of 1 meter deep (vertical) (see Table 1)**
- It is necessary to install the filter (ZM Pumps) to prevent the suction of solid materials. Lodge it in a deposit or plastic drum to catch water with capacity of at least 200 litres as shown in Figure 1.

- 1- **Storage of concrete or plastic drum – Minimum capacity of 200 litres.**
- 2- **Grit number 1/2", (half inch).**
- 3- **Suction Filter ZM.**
- 4- **Pipe water supply.**

- The system of water uptake can also be done by sedimentation as shown in Figure 2.

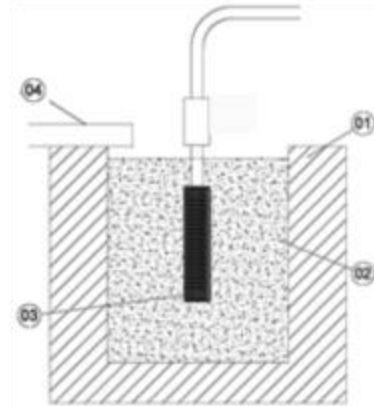


Figure 1

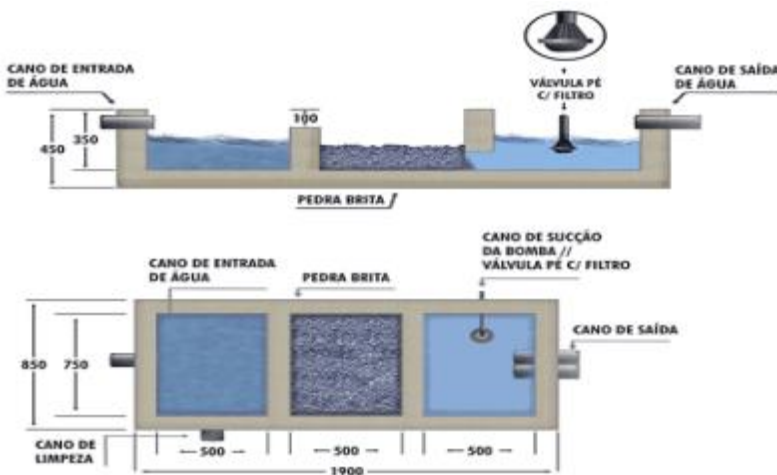


Figure 2

NOTE: measures in (mm)

IMPORTANT: Regardless the type of funding, it is recommended to make periodic inspection in the system of water catchment, it should be as clean as possible, with the purpose of pumping clean water and offer a better condition of pumping the system, “longer life useful and better hydraulic perform”.

Table 1 – Equivalence distance x Depth e¹

Suction Distance (m)	Up to 10	11 to 20	21 to 30	31 to 40	41 to 50
Maximum depth of suction	6m	5m	4m	3m	2m

Values for regions that are at most 305 meters of altitude above sea level.

- **Note:** For areas with elevations above 305 meters over the sea level, see Table 3, annexed to the manual.
- **IMPORTANT:** Suction pipe to be installed must be rigid and has a diameter equal or larger than the suction nozzle of the pump.

Table 2 – Diameter of pump pipe

Pump Model	ZM-6	ZM-10	ZM-15
Diameter of suction pipe (in.)	1.1/4"		
Diameter of the discharge piping (in.)	1.1/4"		
Type of trigger	Tractor/Turbine		

NOTE:- For driven pumps with tractor, use in suction hoses type EXPIRAFLEX. For discharge distances up to 1000 meters it is possible to use the cited gauges according to the model. For greater distances consult the factory.

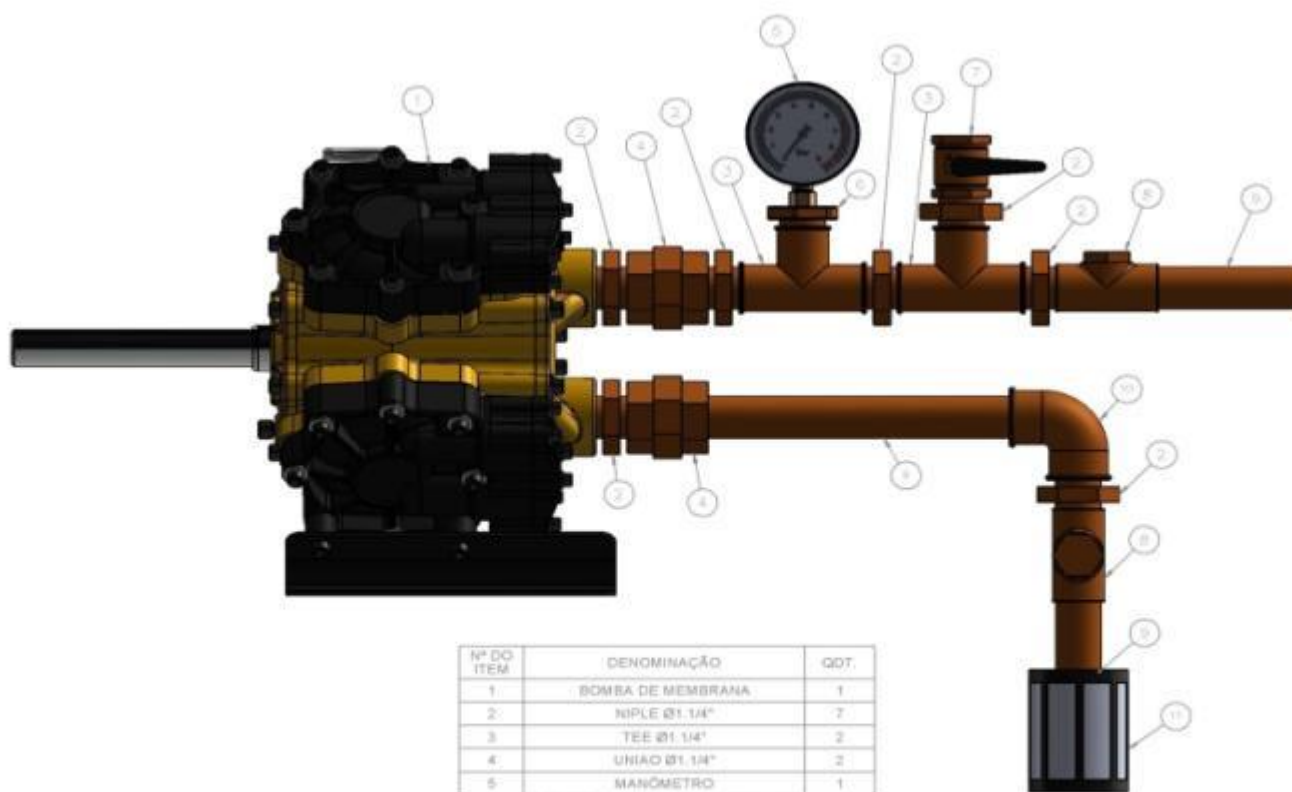
DISCHARGE SYSTEM

Make the discharge piping of the location where the pump will be installed up to the container, with plumbing gauge which is recommended to each model of the pump (Table 2), if you use hose, use a greater gauge due to the internal seams, because they reduce the gauge or the internal diameter of the pipe. Leave exposed (off the ground) the plumbing until the water reaches the reservoir, to make sure the seams were well sealed. After this verification bury pipeline.

- The pumps have the capacity to discharge the distance up to 12.000 meters in horizontal position or unevenness up to 200 vertical meters, according to the model;
- In specific cases, where the distance is long and the unevenness is steep, we recommend use greater plumbing than the recommended (table 2) for each pump model, to reduce the loss.
- The pipe must have resistance compatible with the manometric height that the pump will pump.
- It is recommended to install connection sleeve and the non-return valve in the beginning of the discharge piping, with the purpose to retain the water that is in the pipe when needed to perform maintenance.
- It is recommended to install the non-return valve in the discharge piping at each 40 meters height.
- It is recommended to install in the beginning of the discharge piping a (T) with registration. Purpose: when required maintenance, open up the register to make sure that the pump is pumping water.
- The non-return valve of Suction must be placed with the filter.

Note: To check pressure losses in the pipes and connections check table 4, attached to the manual.

ACESSORIES TO BE INSTALLED



Nº DO ITEM	DENOMINAÇÃO	QDT.
1	BOMBA DE MEMBRANA	1
2	NIPLE Ø1.1/4"	7
3	TEE Ø1.1/4"	2
4	UNIÃO Ø1.1/4"	2
5	MANÔMETRO	1
6	BUCHA DE REDUÇÃO Ø1.1/4" X 1/2"	1
7	REGISTRO	1
8	VALVULA DE RETENÇÃO Ø1.1/4"	2
9	TUBULAÇÃO Ø1.1/4"	1
10	COTOVELO 90º Ø1.1/4"	1
11	FILTRO 2M	1

After the installation of the pump and the suction and discharge systems, with the drive system (wheel, turbine or tractor) still stopped, proceed as follow:

- Check if the system is properly fixed: “base, pump, supporting and piping”;
- Release the water ingress in the suction piping, in case of driving turbine in "no circumstance the system can be triggered without being suctioning, instead the same can rotate at high speed, and cause injury or damage".
- Make sure that the discharge piping is not obstructed;
- If the registry is installed in the discharge piping, make sure that it is open. The installation of registry in the discharge piping is not recommended. It is recommended to install the non-return valve;
- Trigger the system only after performing these procedures.
NOTE: The drive turbine, if the discharge piping is not connected, the system may fire causing injury or damage.

NOTE: The ZM pumps have safety valve, and the maximum working pressure 200 m.c.a. (20 bars). In cases where the working pressure exceeds this pressure the safety system will enter in functioning.

Production Tables

Pump driven by wheel of diameter = 1,0 m (Model ZM 10):

Flow on the wheel (l/s)	Pot. Drive (W)	Unevenness Pumping (mca)	RPM	Production (l/day)
2	12	10	28	4720
		20	23	4070
		30	18	3000
4	24	10	36	6400
		20	33	5680
		30	29	5000
		40	25	4390
		50	21	3500
6	36	10	43	7800
		20	40	6970
		30	37	6550
		40	33	5900
		50	30	5350
		60	27	4790
		70	24	4220
		80	21	3500

Pump driven by wheel of diameter = 1,0 m (Model ZM 10):

Flow on the wheel (l/s)	Drive Power (W)	Unevenness of pumping (mca)	RPM	Production (l/day)
8	47	10	49	8800
		20	46	8010
		30	43	7490
		40	40	6960
		50	37	6500
		60	34	5880
		70	30	5330
		80	27	4770
		90	24	4210
		100	21	3640
10	58	10	52	9500
		20	49	8640
		30	47	8220
		40	44	7770
		50	42	7500
		60	39	6830
		70	36	6340
		80	33	5820
		90	30	5290
		100	27	4740
		110	24	4000

Maximum Head: 110 mca with wheel of 1,00 x 0,15

Pump driven by TRACTOR (Model ZM 10):

RPM	Height of pumping (mca)	Production (L/day)
540	5	132000
	45	120000
	85	112800
	110	110400
	150	108000
	200	72000

Pump driven by TURBINE (Model ZM 10):

NOZZLE 50 mm					
Height of Fall (m)	Flow on the Turbine (l/s)	Drive Potential. (W)	Height of Pumping (mca)	RPM	Delivery per Day (l/dia)
1,5	10,7	157	10	144	33370
			20	132	29140
			30	117	25050
			40	96	19720
			50	72	14880
			60	45	8810
			70	33	6070
2	12,3	241	10	168	40130
			20	156	35380
			30	147	32740
			40	135	30320
			50	120	26560
			60	102	21510
			70	72	15500
			80	57	11180
2,5	13,8	337	90	45	8120
			10	189	45570
			20	177	40040
			30	168	37150
			40	159	34860
			50	147	32140
			60	132	28420
			70	117	24620
			80	96	20130
			90	66	13730
3	15,1	443	100	57	10970
			110	42	8640
			10	216	52830
			20	209	48900
			30	198	44970
			40	188	42120
			50	182	39780
			60	175	38270
			70	165	35330
			80	153	32740
			90	140	29500
			100	120	22030
			110	99	20340
120	80	15850			
130	65	12780			

Pump driven by TURBINE (Model ZM 10):

Nozzle 50 mm					
Height of Fall (m)	Flow on the Turbine (l/s)	Drive Power (W)	Height of Pumping (mca)	RPM	Delivery per day (l/dia)
3,5	16,3	559	10	237	57670
			20	222	52270
			30	216	49500
			40	207	46480
			50	200	44450
			60	192	42590
			70	187	40608
			80	179	38880
			90	167	35250
			100	155	32610
			110	141	29540
			120	122	25090
			130	100	19260
			140	85	8610
4	17,4	683	10	252	61300
			20	241	56670
			30	230	53300
			40	225	51840
			50	215	47300
			60	205	45050
			70	200	43070
			80	195	42720
			90	188	40040
			100	179	37360
			110	167	34680
			120	155	31830
			130	135	26520
			140	112	15160
4,5	18,4	814	150	103	7940
			10	275	66810
			20	261	62150
			30	254	58690
			40	245	55640
			50	230	51720
			60	222	48840
			70	215	47750
80	209	45670			

	90	203	44350
	100	197	41990
	110	188	40320
	120	179	37380
	130	170	34840
	140	155	24530
	150	135	13700

Nozzle 50 mm					
Height of Fall (m)	Flow on the Turbine (l/s)	Drive Power (W)	Height of Pumping (mca)	RPM	Delivery per day (l/dia)
5	19,4	954	10	292	71300
			20	282	65890
			30	271	61110
			40	265	60190
			50	260	58230
			60	250	55350
			70	244	53160
			80	234	51200
			90	230	49990
			100	224	47630
			110	219	46820
			120	211	45440
			130	203	41180
			140	195	32310
150	183	23040			
160	175	18250			
170	154	9380			
5,5	20,4	1100	10	306	75340
			20	296	68710
			30	285	65770
			40	279	63870
			50	271	61450
			60	267	59960
			70	258	56270
			80	252	55520
			90	243	53850
			100	237	52010
			110	231	49700
			120	228	48610
			130	222	45610
			140	217	37200
150	210	28160			
160	202	23270			
170	193	17450			
180	180	10880			

Maximum Head of Pumping: 180mca

*Pipe drive turbine = 4" of diameter.

NOTE: The useful Power drive is determined by the height of fall and the diameter of the injector nozzle.

DADOS DE VAZÃO E PRESSÃO PARA PULVERIZAÇÃO:

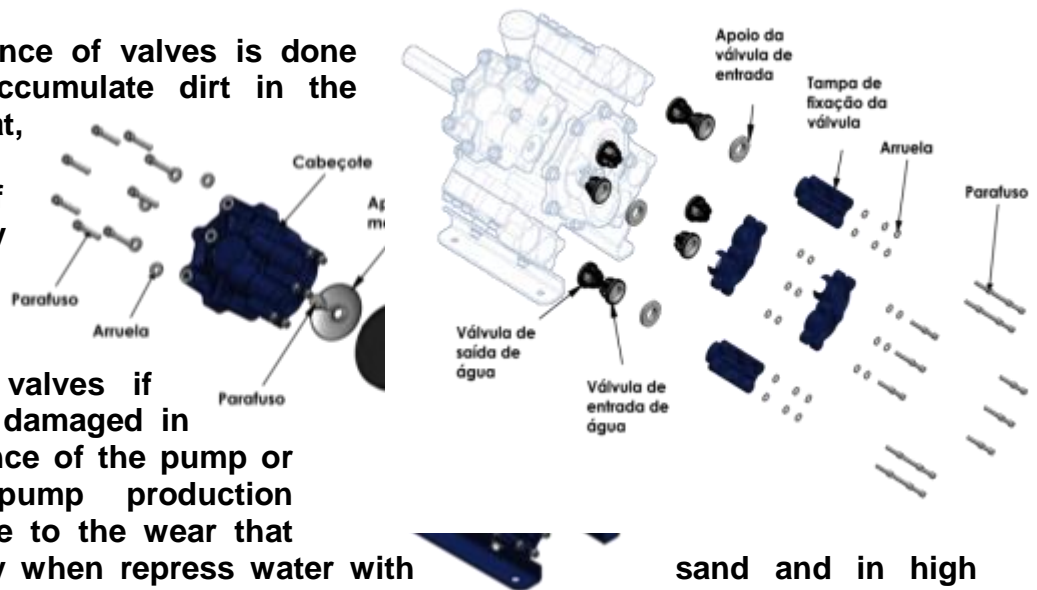
DIAM. NOZZLE (mm)	PRESSURE (BAR)						
	5	8	10	12	15	18	20
	FLOW (LTS/MIN.)						
1	0,8	1,0	1,2	1,3	1,5	1,7	1,8
1,1	1,0	1,2	1,3	1,6	1,7	2,0	2,1
1,2	1,1	1,3	1,6	1,8	2,1	2,4	2,5
1,3	1,3	1,6	1,8	2,1	2,4	2,7	2,8
1,4	1,5	1,8	2,1	2,4	2,8	3,2	3,3
1,5	1,8	2,3	2,6	3,0	3,4	3,8	3,9
1,6	2,1	2,7	3,1	3,5	4,0	4,3	4,4
1,7	2,6	3,2	3,6	4,0	4,4	4,8	4,9
1,8	3,0	3,6	4,0	4,4	5,0	5,5	5,5
1,9	3,3	4,0	4,4	4,9	5,5	6,0	6,2
2	3,7	4,4	5,0	5,5	6,1	6,7	6,8
2,1	4,1	4,9	5,5	6,0	6,8	7,4	7,6
2,2	4,5	5,4	6,1	6,6	7,4	7,8	8,5
2,3	5,2	5,9	6,6	7,3	8,1	8,8	9,1
2,4	5,6	6,4	7,2	7,9	8,8	9,7	9,9
2,5	6,1	7,0	7,8	8,5	9,6	10,5	10,8
2,8	7,0	8,8	9,8	10,7	12,1	13,2	13,5
3	7,8	10,0	11,2	12,3	13,8	15,1	15,5

Note: 1 Kg/cm²= 1 Bar = 14,22 PSI = Libras

Maintenance

VALVES

- The maintenance of valves is done when they accumulate dirt in the valve seat, preventing the sealing of the same, by simply make the cleaning when needed;
- Replace the valves if they become damaged in the maintenance of the pump or when the pump production decreases due to the wear that occurs mostly when repress water with unevenness.

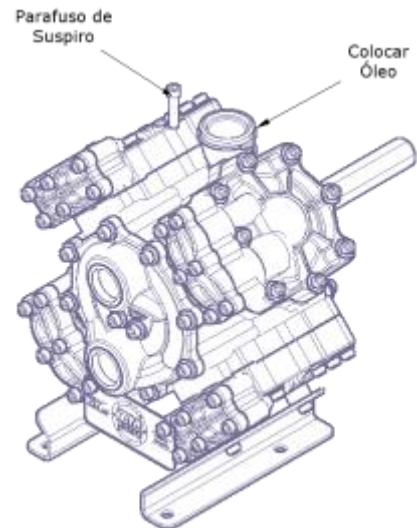
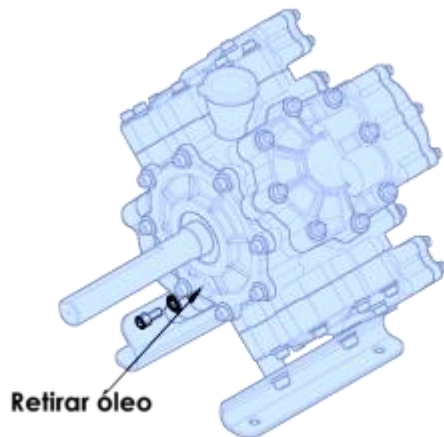


When replacing valves observe the positioning of them, as well as the placement of the o-rings.

MEMBRANE

- Replace the membrane when will be disruption of it. This can be check if the pump performance is not appropriate and is noted the presence of oil in the pumped water.

- **IMPORTANT:** The membranes should be



replaced every 12 MONTHS of usage, regardless whether they are apparently good.

NOTE: When performing maintenance of membranes observe the positioning of the heads (left and right).

LUBRICATION

- Make the oil change following the steps in the figure (this should be done when the pump is stopped);
- Remove the oil by removing the screw shown in the figure;
- You should use oil SAE 20W40 in the pump sump;
- Observe that the level is determined by the display. Where do you put the oil (ideal level: half display Full when operating)
- Oil sump capacity:1,6 litres;
- Used to change every 12 MONTHS;
- DO NOT THROW USED OIL IN NATURE.

NOTE: When removing the oil is necessary to remove the screw from the vent

Possible Defects, Causes and Solutions

PROBLEMAS	CAUSAS	SOLUÇÕES
The wheel spins and stops	<ul style="list-style-type: none"> • Low water flow to move the wheel. 	<ul style="list-style-type: none"> • Increase the volume of water to move the Wheel.
The pump runs, but does not pump water	<ul style="list-style-type: none"> • Dirt in the valves; • Air intake. 	<ul style="list-style-type: none"> • Clean filter; • Clean valves; • Change mebranes; • Remove air intake suction, checking the connections and whether there are no ups and downs in the suction pipe;
The pump does not suck water	<ul style="list-style-type: none"> • Level difference between the Pump and the water to be suctioned more than 7 meters; • Problems with valves; 	<ul style="list-style-type: none"> • Place vertical non-return valve and fill the barrel with water before driving it; • Clean the valves or replace them. • Bringing water in a reservoir near to the pump and make the suction of it.
The pump sends water gushing	<ul style="list-style-type: none"> • Valve problems. 	<ul style="list-style-type: none"> • Clean the valves or replace them.
Production (flow) of pump insufficient	<ul style="list-style-type: none"> • Low water flow in the wheel; • Valves worn; • Production of spring water (mine) insufficient. 	<ul style="list-style-type: none"> • Check whether the production of water in the reservoir is compatible with the rotation of the wheel/turbine. If so, the production Will only increase with the increase of the water flow on the Wheel; • Replace valves;
Oil leaks with water	<ul style="list-style-type: none"> • One or more membranes are ruptured. 	<ul style="list-style-type: none"> • Replace membrane.

Precautions

1. Observe the installation location, preventing that with the rains, the flood damage any component of the pumping system;
2. Install the filter ZM Pumps in the suction system preventing that the pump draw in sand or other type of solid;

3. When replacing the oil make sure that the amount (volume) is according to the instruction manual;
4. When performing pump maintenance, never do with it when running;
5. Under no circumstances stop the wheel or turbine with pieces of wood, iron or other objects;
6. The pump can not work above the maximum pressure indicated in the tables of production;
7. Change the oil of the pump after its useful life;
8. if you installed register in the piping of discharge instead of non-return valve, when performing maintenance, make sure that it is open before starting the pump;

NOTE: IT IS NOT RECOMMENDED THE USAGE OF REGISTER IN THE DISCHARGE PIPING.

Warranty terms

The ZM BOMBAS guarantees the equipment identified herein, pledging to repair or replace parts and components that, in normal use and service, following the technical recommendations, have **MANUFACTURING DEFECTOR OR OF RAW MATERIAL**, according to the following criteria:

WARRANTY PERIOD: 24 (twenty four) months, starting from the date of issuance of bill of sale to the first owner.

ITEMS EXCLUDED FROM WARRANTY: The items listed below are not covered by warranty:

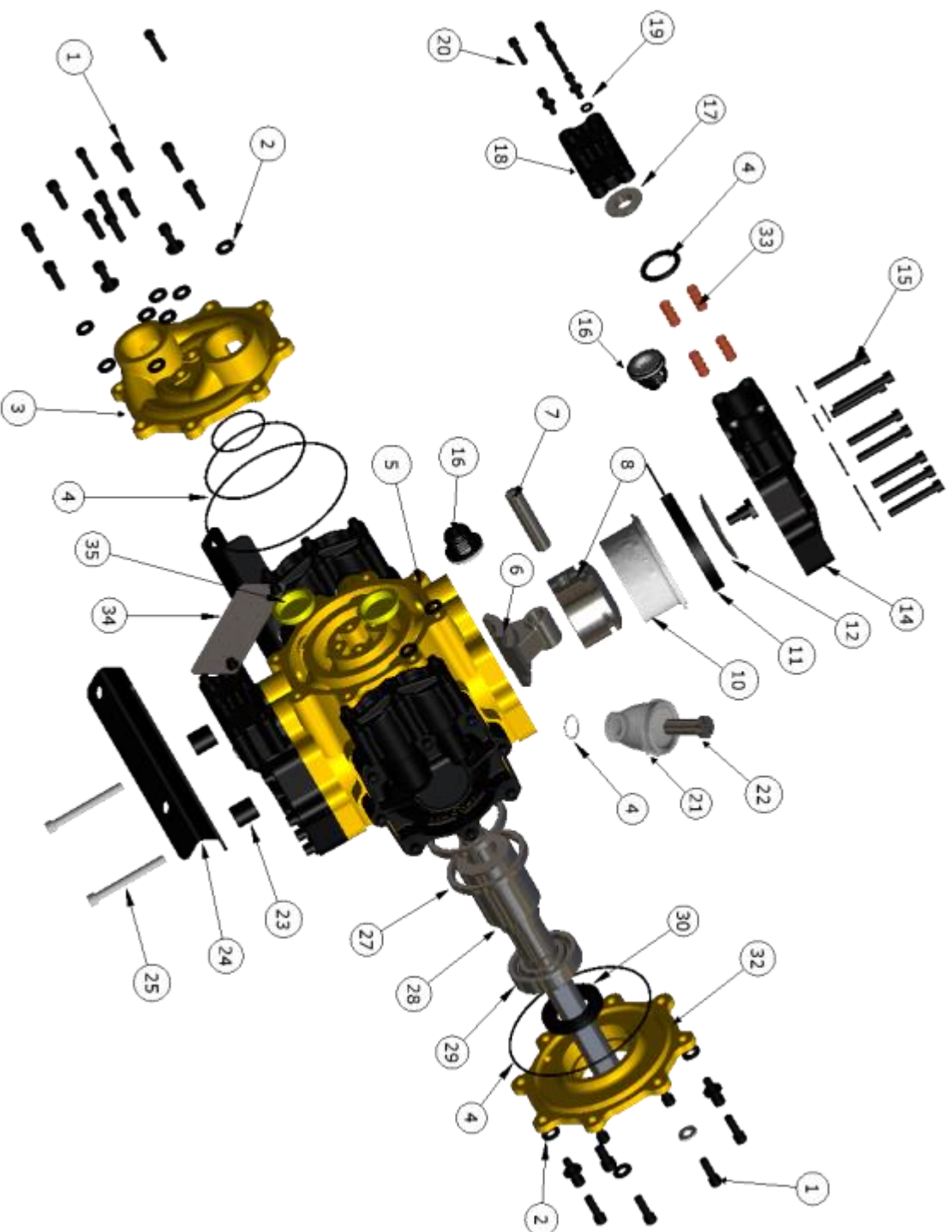
- Parts to be replaced by prevented maintenance – filter elements, membranes, O-rings, valves, cylinders, bearings, etc.
- Parts that show wear or natural fatigue due to usage, **UNLESS THEY HAVE MANUFACTURING DEFECTS, ASSEMBLY OR RAW MATERIAL;**
- Defects resulting from accidents;
- hydraulic oils, lubricants, greases and similar;

- Damage of personal or material nature of the user, owner or third caused by recklessness;
- Displacement and freight of equipments, parts and components, to warranties not granted;
- Displacement and immobilization of people and vehicles.

NOTE: The warranty does not cover transportation costs in case of technical assistance.



Exploded View



N	PEÇA	QD
1	SCREW SET	20
2	WASHERS SET	53
3	FRONT COVER	1
4	RINGS O-RINGS	3
5	CÁRTER	1
6	CONNECTING ROD	4
7	PIN CON. ROD	4
8	PISTON	4
9	PISTON RING	4
10	SHIRT	4
11	MEMBRANE	4
12	WASHER MEMBR.	4
13	SCREW SET	4
14	HEAD	4
15	SCREW SET	24
16	VALVES	8
17	VALVE SUPPORT	4
18	VALVE COVER FIX.	4
19	WASHERS SET	24
20	SCREW SET	16
21	OIL DISPLAY	1
22	SCREW SET	1
23	FOOT WEDGE	4
24	FOOT PUMP	2
25	SCREW SET	4
26	BEARING	1
27	RING CON. ROD	2
28	SHAFT	1
29	BEARING 6207	1
30	SEAL	1
31	RING O-RING	1
32	BACK COVER	1
33	NUT BRASS	16
34	LOGO PLATE	1

Note: The atmospheric pressure is always an absolute pressure, greater is the altitude lower will be the atmospheric pressure; therefore, the suction capacity of the pump will be lower.

TABLE 3

Altitude (m)	Theoretic elevation (m)	Relative elevation (m)
At sea level	10,3	8,2
305	10,0	8,0
457	9,8	7,84
610	9,6	7,68
1220	8,9	7,12
1830	8,3	6,64
2440	7,7	6,16
3050	7,1	5,68
4570	5,9	4,72

TABLE 4 Loss of loads in meters/100m for PVC pipes

FLOW (m ³ /h)	GAUGE (INCHES)						
	3/4	1	1.1/4	2	2.1/2	3	4
1,0	4,4	1,3	0,4	0,1			
1,2	6,0	1,7	0,6	0,2			
1,4	7,9	2,3	0,7	0,3	0,1		
1,6	10	2,9	0,9	0,3	0,1		
1,8	12	3,5	1,1	0,4	0,2		
2,0	15	4,2	1,4	0,5	0,2		
2,5	22	6,3	2,0	0,7	0,3	0,1	
3,0	30	8,6	2,8	1,0	0,4	0,1	
3,5	39	11	3,7	1,3	0,5	0,2	0,1
4,0	50	14	4,7	1,6	0,7	0,2	0,1
4,5		18	5,7	2,0	0,8	0,3	0,2
5,0		21	6,9	2,4	1,0	0,3	0,2
6,0		29	9,5	3,3	1,4	0,5	0,3
7,0		38	12	4,3	1,8	0,6	0,3
8,0		48	16	5,4	2,2	0,8	0,4

TABLE 4 Loss of localized loads, equivalent length in meters of PVC pipes

ACCESSORY	GAUGE (INCHES)							
	3/4"	1"	1.1/4"	1.1/2"	2"	2.1/2"	3"	4"
Knee 90°	1,2	1,5	2,0	3,2	3,4	3,7	3,9	4,3
Knee 45°	0,5	0,7	1,0	1,0	1,3	1,7	1,8	1,9
Curve 90°	0,5	0,6	0,7	1,2	1,3	1,4	1,5	1,6
Curve 45°	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1,0
Tê 90° pass. Direct	0,8	0,9	1,5	2,2	2,3	2,4	2,5	2,6
Tê 90° lateral output	2,4	3,1	4,6	7,3	7,6	7,8	8,0	8,3
Reg. Drawer open	0,2	0,3	0,4	0,7	0,8	0,9	0,9	1,0
Valve globe open	11	15	22	36	38	38	40	42
Channel output	0,9	1,3	1,4	3,2	3,3	3,5	3,7	3,9
Normal input	0,4	0,5	0,6	1,0	1,5	1,6	2,0	2,2
Input border	1,0	1,2	1,8	2,3	2,8	3,3	3,7	4,0
Valve foot and sieve	9,5	13	16	18	24	25	27	29
Valve ret. horiz.	2,7	3,8	4,9	6,8	7,1	8,2	9,3	10
Valve ret. vertical	4,1	5,8	7,4	9,1	11	13	14	16



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