

# Mechanical diaphragm pump

## User manual



Please read this manual carefully before using.



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## I Introduction

The five series of mechanical diaphragm pumps HJ-W、HD、HJ-Z、HJ-D are reciprocating compound dosing pumps designed and developed by our company. The transport flow rate of HJ-W pump reaches 30L/H, pressure is 1.0Mpa, HD and HJ-L pump reaches 150L/H, and the pressure is 1.0Mpa. HJ-Z pump reaches 500L/h and the pressure is 1.2Mpa. and HJ-D pump transport flow up to 2000L / h, pressure is 1.0Mpa. These five series of pumps feature is mechanically driven diaphragm. The diaphragm eliminates the structural form of the PTFE thin membrane combined with the rubber and the iron core, and the corrugation increases the diaphragm stroke. The stroke adjustment mechanism replaces the effective stroke adjustment design of the conventional eccentric cam based on the working principle of the variable eccentric mechanism. This design significantly reduces the pulsation of pressure and flow, so that the flow rate is in the range of 10 to 100%, and the stability accuracy can be controlled at  $\pm 2\%$ .

## II Operating principle of the pump

The pump is composed of two parts: the transmission end part and the hydraulic end (pump head) part. The output flow of the pump depends on the stroke speed of the drive end, the diameter of the diaphragm (pump head) and the length of the diaphragm stroke. When the pump is running or stopped, the stroke length can be changed by adjusting the stroke adjustment hand wheel. According to the variable eccentric crankshaft rotation, the adjustable eccentric crankshaft transmits the reciprocating motion to the diaphragm through the connecting rod, causing the diaphragm to flex and deformation. The stroke length can be adjusted by changing the position of the variable eccentric crankshaft on the connecting rod. When the pump is in the suction stroke, the diaphragm starts to move backwards, and the pressure in the pump head immediately decreases; when the pump head pressure is lower than the suction line pressure, the valve ball of the suction port check valve is pushed up upward, the medium in the inlet line enters the pump head chamber. When the liquid suction stroke ends, the diaphragm movement stops instantaneously, the pressure in the pump head is equal to the pressure in the suction line, and the suction port check valve is reset.

When the pump is in the discharge stroke, the diaphragm begins to move forward and the pressure in the pump head rises immediately. When the pump head pressure is higher than the discharge line pressure, the discharge port check valve ball is "pushed open" upward, and the liquid in the pump head enters the discharge line. When the discharge port stroke ends, the diaphragm stops moving again. The pressure in the pump head is the same as the pressure in the discharge line, and the discharge port check valve is reset and then the next cycle is started. During the suction stroke, the pressure in the pump head must be higher than the material vapor pressure. If the liquid pressure is lower than its vaporization pressure, cavitation will occur and affect the performance of the pump.

### III Technical parameters

#### 1. Technical parameters sheet of HJ-W series mechanical diaphragm metering pump

Model	Rated flow(L/H)	Maximum pressure(Mpa)	Pump speed (Spm)	Diaphragm(mm)	Interface size(inch)	Motor power(w)	Note
HJ-W 0.5/1.0	0.5	1.0	28(50k)	Φ65	Import and export hose connection D:Φ9 D:Φ15 Netted tube (with 1/2.4 inch internal thread connection)	15	Flow can be manually adjusted during operation
HJ-W 1.5/1.0	1.5		35(40k)				
HJ-W 2.5/1.0	2.5		46(30k)				
HJ-W 5/0.6	5	0.6	56(25k)			25	
HJ-W 8/0.6	8		70(20k)				
HJ-W 12/0.6	12		93(15k)				
HJ-W 18/0.6	18		112(12.5k)				
HJ-W 22/0.6	22		140 (10k)				
HJ-W 30/0.5	30	0.5	155(9k)				

Features:

- 1, The structure is completely leak-free.
- 2, It can be used PVC, PTFE, 304, 316, etc. as the pump head material.
- 3, Suitable for all kinds of acid and alkali resistant liquid.
- 4, It can be installed on the medicine tank.
- 5, Easy to install, repair and maintain.
- 6, High operational safety performance.
- 7, Free to adjust the flow during operation.

## 2. Technical parameters sheet of HD series mechanical diaphragm metering pump

Model	Rated flow(L /H)	Maximum pressure(Mpa)	Pump speed (Spm)	Diaphragm (mm)	Interface size(inch)	Motor power(w)	Note			
HD 0.5/1.2	0.5	1.2	28(50k)	Φ65	Import and export hose connection D:Φ9 D:Φ15 Netted tube (with 1/2.4 inch internal thread connection)	15	Flow can be manually adjusted during operation			
HD 1.5/1.2	1.5		35(40k)							
HD 2.5/1.2	2.5		46(30k)							
HD 5/1.0	5	1.0	56(25k)			Φ84		Import and export hose connection D:Φ9 D:Φ15 Netted tube (with DN15 plug)	25	
HD 8/1.0	8		70(20k)							
HD 12/1.0	12		93(15k)							
HD 18/1.0	18		112(12.5k)							
HD 22/1.0	22		140 (10k)							
HD 30/1.0	30		155(9k)							
HD 42/1.0	42	1.0	70(20k)			Φ84		Import and export hose connection D:Φ9 D:Φ15 Netted tube (with DN15 plug)	60	
HD 60/1.0	60		93(15k)							
HD 80/0.6	80	0.6	112(12.5k)	Φ84	Import and export hose connection D:Φ9 D:Φ15 Netted tube (with DN15 plug)		60			
HD 90/0.6	90		140(10k)							
HD 100/0.5	100	0.5	140(10k)				Φ84		Import and export hose connection D:Φ9 D:Φ15 Netted tube (with DN15 plug)	90
HD 120/0.3	120	0.3	155(9k)							
HD 150/0.3	150		200(7.5k)							

### Features:

- 1, The structure is completely leak-free.
- 2, It can be used PVC, PTFE, 304, 316, etc. as the pump head material.
- 3, Suitable for all kinds of acid and alkali resistant liquid.
- 4, It can be installed on the medicine tank.

- 5, Easy to install, repair and maintain.
- 6, High operational safety performance.
- 7, Free to adjust the flow during operation.

### 3.HJ-L series mechanical diaphragm metering pump

Features:

Model	Rated flow(L/H)	Maximum pressure(Mpa)	Pump speed (Spm)	Diaphragm(m m)	Interface size(inch)	Motor power(w)	Note
HJ-L-6.5/1.0	6.5	1.0	56(25k)	Φ65	Import and export hose connection D:Φ9 D:Φ15 Netted tube (with 1/2.4 inch internal thread connection)	60	Flow can be manually adjusted during operation
HJ-L-12/1.0	12		70(20k)				
HJ-L-24/1.0	24		112(12.5k)				
HJ-L-32/1.0	32		140(10k)				
HJ-L-42/1.0	42		70(20k)				
HJ-L-60/1.0	60	0.5	93(15k)	Φ84		90	
HJ-L-80/0.6	80		112(12.5k)				
HJ-L-90/0.6	90		140 (10k)				
HJ-L-100/0.5	100	0.3	140 (10k)				
HJ-L-120/0.3	120		155(9k)				
HJ-L-150/0.3	150		200(7.5k)				

- 1, The structure is completely leak-free.
- 2, It can be used PVC, PTFE, 304, 316, etc. as the pump head material.
- 3, Suitable for all kinds of acid and alkali resistant liquid.
- 4, It can be installed on the medicine tank.
- 5, Easy to install, repair and maintain.
- 6, High operational safety performance.
- 7, Free to adjust the flow during operation.

#### 4. Technical parameters sheet of HJ-Z series mechanical diaphragm metering pump

Model	Rated flow(L/H)	Pressure (Mpa)	Pump speed (min-1)	Diaphragm (mm)	Power(KW)	Import and export diameter(mm)	Weight(kg)
HJ-Z-25/1.2	25	1.2	72	Φ84	0.37	DN15	22
HJ-Z-50/1.0	50	1.0					
HJ-Z-80/0.8	80	0.8					
HJ-Z-120/0.7	120	0.7	140	Φ110/85	0.55		
HJ-Z-170/0.7	170	0.7					
HJ-Z-240/0.7	240	0.7					
HJ-Z-330/0.5	330	0.5	180	Φ110/95	0.55	DN25	
HJ-Z-420/0.5	410	0.5	140				
HJ-Z-500/0.5	500	0.5	180				

### 5. Technical parameters sheet of HJ-D series mechanical diaphragm metering pump

Model	Rated flow(L /H)	Pressure (Mpa)	Pump speed (min-1)	Diaphragm (mm)	Power(KW)	Import and export diameter(mm)	Weight(kg)		
HJ-D-350/1	350	1.0	140	Φ110/85	0.75	DN25	30		
HJ-D-410/1	410								
HJ-D-460/0.7	460	0.7		Φ110/95					
HJ-D-580/0.7	580								
HJ-D-650/0.35	650	0.35		Φ150	1.1			DN40	40
HJ-D-940/0.35	940			Φ160					
HJ-D-1200/0.35	1200								
HJ-D-1500/0.3	1500	0.3		180	Φ160	1.5	50		
HJ-D-1600/0.3	1600				Φ180				
HJ-D-1800/0.3	1800								
HJ-D2000/0.3	2000		Φ180		2.2				

## Attention

1. Before using the metering pump, please add 10w-40 oil or regular engine oil.
2. Metering pump motor wiring must be in accordance with the motor nameplate voltage wiring (380V or 220V).
3. Before the metering pump is turned on, make sure that the outlet pipe is unobstructed (the valve is fully open).
4. When welding stainless steel pipe joints, do not drop welding slag or debris into the pipeline or valve body (thereby causing the metering pump to not discharge water, the pressure becomes smaller or the flow rate becomes smaller).
5. When the metering pump stops working, first close the metering pump and then close the outlet valve.
6. The outlet line pressure must be higher than the inlet line pressure. If it is lower than the inlet pressure, a back pressure valve must be installed to prevent siphoning.
7. The diameter of the outlet pipe must be greater than or equal to the standard diameter of the corresponding metering pump.

## IV The use of pumps

- 4.1 Inspection and preparation of the pump before operation
  - 4.1.1 Check whether the bolts at each connection are tightened, the machine foot is adjusted and leveled, and the nut is not allowed to loosen.
  - 4.1.2 Before the first use of the new pump, the anti-rust grease on the processing surface of each moving part should be scrubbed. It is not allowed to scrape with a metal tool.
  - 4.1.3 Add 220# worm gear oil or 50# gear oil to the oil mark according to the ambient temperature and the temperature of the conveying medium in the rotating box.
  - 4.1.4 Rotate the coupling so that the diaphragm moves back and forth several times, without any jamming, and the hand feels smooth.
  - 4.1.5 Check if the handwheel is in the zero position or it should be as high as zero (if If the scale is to adjust zero. The adjustment scale will affect the range drift during transportation).
  - 4.1.6 Check whether the motor circuit is connected to the corresponding network power (wiring method, voltage should be calibrated according to the motor name plate) and make the pump rotate according to the specified rotation direction.
- 4.2 Start
  - 4.2.1 Before starting the motor, it is necessary to check whether the valve on the inlet and outlet pipeline is opened. It can only be started if the inlet and outlet pipeline is unimpeded.
  - 4.2.2 After starting, let it run for no more than a few minutes without any abnormality and then put it into use as needed.
  - 4.2.3 According to the needs of the process flow, check the flow calibration and curve provided in the qualification certificate and the flow calibration curve of the retest under actual working conditions, and obtain the corresponding stroke percentage value to turn



the adjustment handwheel to the specified scale; when rotating the adjustment handwheel, attention should be paid to not too fast and too hard. It should be adjusted according to the direction of small flow to large flow. If you need to adjust from large to small, turn the handle wheel through several grids and then rotate to the scale in the direction of large flow. The adjustment dial must be locked after adjustment to prevent loosening.

4.2.4 The stroke adjustment of the pump can also be carried out in the stop or operation, after the stroke adjustment, the flow of the pump needs about 1-2 minutes to stabilize, the greater the change in the stroke length, the longer the time required for the flow to stabilize.

4.3.1.3 Check that the temperature of the regulator and other sports must not exceed 65 °C.

4.3.2 After starting the machine, the operation should be stable without abnormal noise. Otherwise, stop the machine to check the cause and eliminate the source of noise before putting it into operation.

4.4 Downtime

4.4.1 Cut off the power and stop the motor running.

4.4.2 Close inlet line valve. But it must be turned on before starting.

**V Pump maintenance**

5.1 Pump daily maintenance

5.1.1 The specified oil level in the rotating box should be checked frequently, not too much or too little. The lubricating oil should be clean and free of impurities, and pay attention to oil change in time. Please refer to the following table for oil replacement period:

Lubricating oil replacement time table (for reference)

Use cycle	Within the first month	Within two to six months	Over 6 months
Oil change time(h)	250-300/times	300-500/times	500-1000/times

5.1.2 After the pump is operated for 2000-3000 hours, the internal parts should be taken apart and the wear parts such as the connecting rod bushings should be inspected and repaired or replaced.

5.1.3 If the pump is out of service for a long time, the medium in the pump cylinder should be drained cleanly. For example, the corrosive liquid should be run with clean water for 5 minutes before shutdown to flush the residual liquid in the tank to prevent decay after shutdown.

5.2 Maintenance disassembly and assembly sequence

5.2.1 Disassembly of the cylinder components:

- 1、 First remove the piping and accessories connected to the check valve;
- 2、 Remove the pump head, screw out the diaphragm (it is best to communicate with the manufacturer) and then remove the cylinder head joint from the gearbox;
- 3、 Remove all parts of the tappet assembly in the following order:

A Remove the spring seat xiaozi; remove the spring seat, spring, tappet in turn; if the composite bearing grinding needs to be replaced, remove and replace it with the same model.

B Remove suction valve (flange); remove the valve sleeve, limit plate, valve seat and valve ball in sequence.

#### 5.2.2 Transmission case disassembly:

- 1、 Drain the lubricating oil in the tank;
- 2、 Remove the motor, motor seat, pull out the coupling, bearing press plate, etc., pull out the worm components;
- 3、 Remove the regulator assembly, and then remove the regulating handwheel and regulating pin from the assembly;
- 4、 Remove the two ends of the spindle, you can take out the worm gear, eccentric wheel and spindle from the box.

5.2.3 The assembly is performed in reverse order when it is removed. However, it should be noted that the assembly clearance should be checked after the components are assembled, and the assembly should be free to rotate without jamming.

1、 The adjusting pin must be screwed to the dead point when assembling the sliding sleeve regulator seat. At the same time, rotate the regulating handwheel to the scale of 20, and fine-tuning the handwheel to match the adjustment rod cylinder to the chute

2、 Adjust the tightness of the packing nut properly, turn the coupling to test the rotation, and rotate freely without jamming

## VI Installation

### 6.1 Pump installation

6.1.1 The pump shall be installed on the mixed soil with a height of 300-500 mm above the ground, or on the corresponding solid base, and the pump shall be corrected in a horizontal state; In the installation of multi-pump, it shall be noted that the inter-phase coupling of the pump shall be used as the calibration reference. Concentricity deviation shall not exceed 0.15 mm (elastic coupling), and the steel coupling shall be within 0.05 mm;

6.1.2 There should be no sharp bends (not more than 90°) on the suction and discharge lines, and components in the pipeline that are bent to increase the resistance should be minimized.

6.1.3 Do not install the pump and tank in direct sunlight.

6.1.4 It is required to be mounted on the cartridge barrel but not higher than 1.5m. If the value is greater than that will affect the suction of metering pump. For equipment maintenance and inspection, please put it in a spacious place.

6.1.5 Do not install in places where it is easy to touch moisture or corrosive gases.

6.1.6 The ambient temperature of the pump installation is  $-20\text{ }^{\circ}\text{C} + 40\text{ }^{\circ}\text{C}$ , and the height is below 1000M above sea level.

6.2.1 The suction pipe can not be less than the suction valve diameter of the pump,

and the length of the suction pipe should be shortened as much as possible, generally 2-3 meters; if the length must be increased, but the length does not exceed 5 meters (However, the starting time of inhalation of liquid is relatively prolonged) .

6.2.2 Pipes connected to the suction and discharge valves (flanges) cannot be forced to combine to increase the load on the pump valve. The weight of pipes and valves must not be borne by the pump and suction and discharge valves. After the pipeline is installed, the pipe fittings should be supported.

6.3 Increased flux of special liquids through the pipe

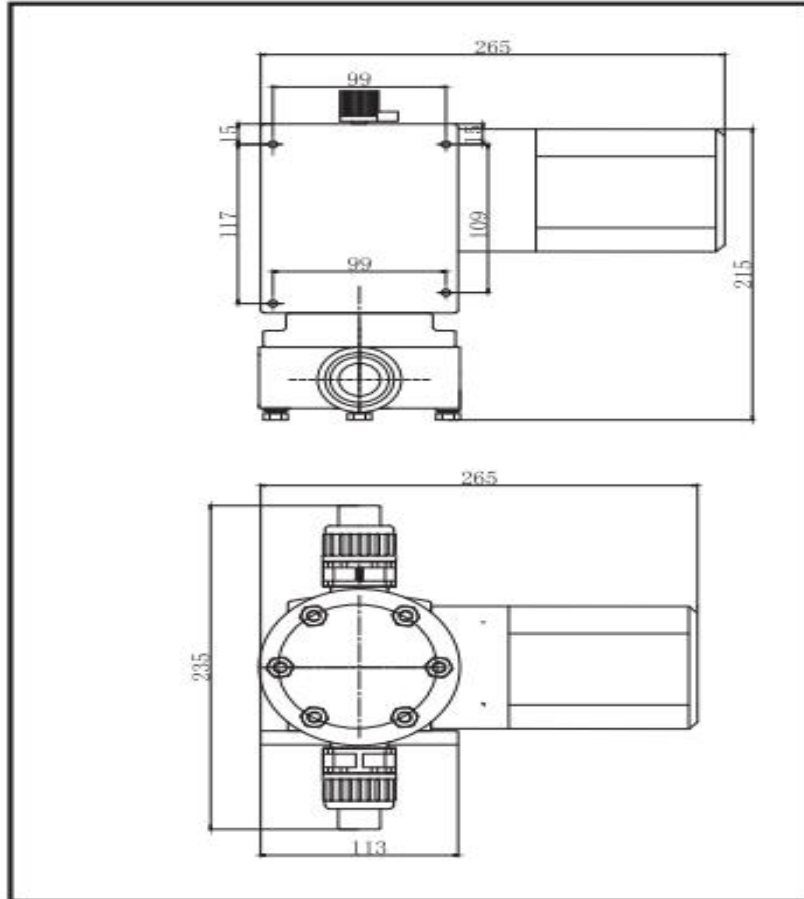
6.3.1 For the conveying suspension and the medium which is easy to produce sediment, the valve and the tee should be added to the suction and discharge accessories of the pump so that the cylinder can be flushed without disassembling the pipeline when the pump operation is stopped.

6.3.2 In order to ensure the safe operation of the pump and the safety of the piping system, a safety valve should be provided on the discharge pipe. If it is necessary to reduce the pulse of the liquid to be conveyed, a buffer can be installed close to the pump discharge line.

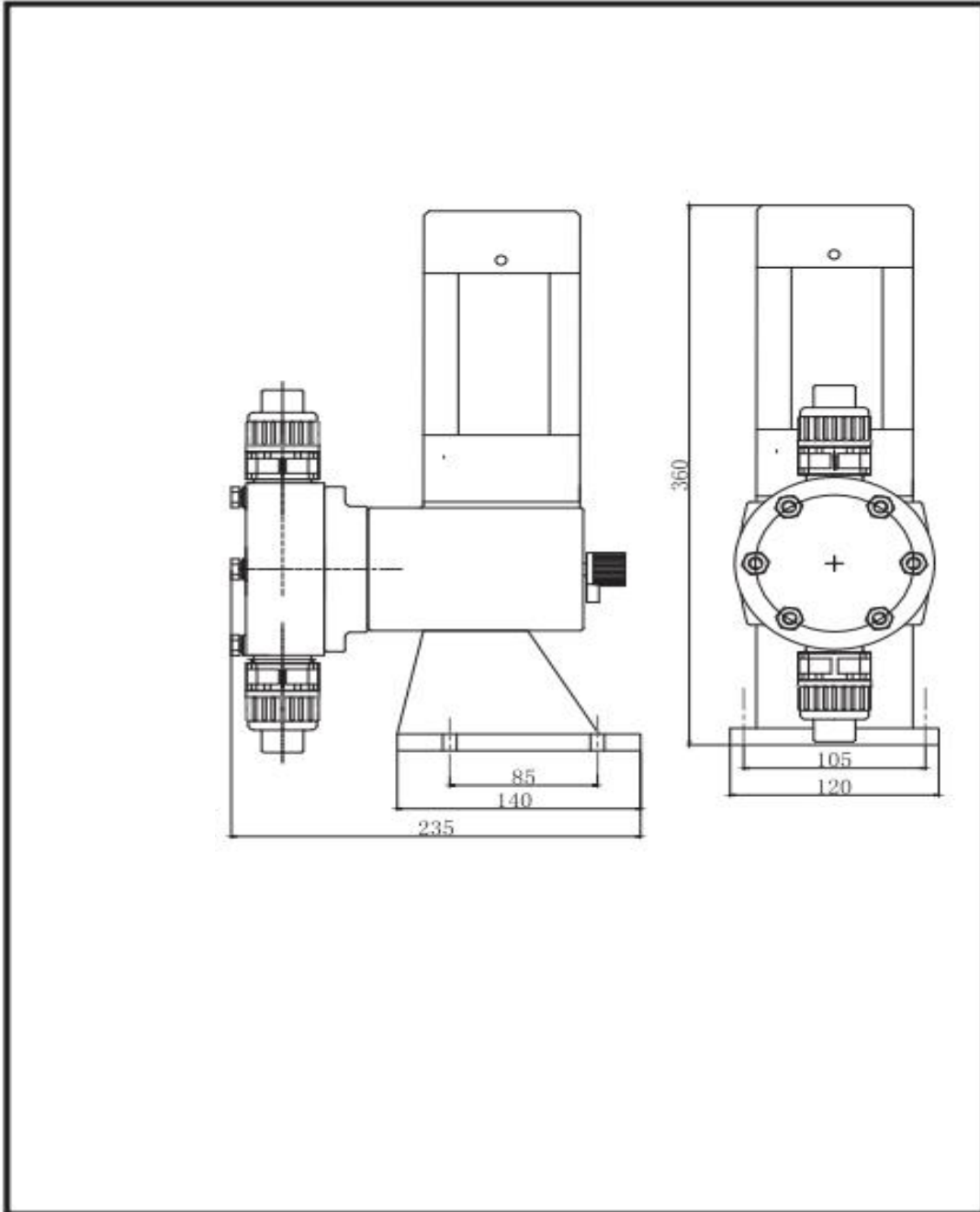
6.4 Installation specification (installation drawing)

6.4.1 Other technical requirements for pump installation shall comply with the relevant provisions of TJ231(5)-78 pump installation in the "Construction and Acceptance Specifications for Mechanical Equipment Installation Work".

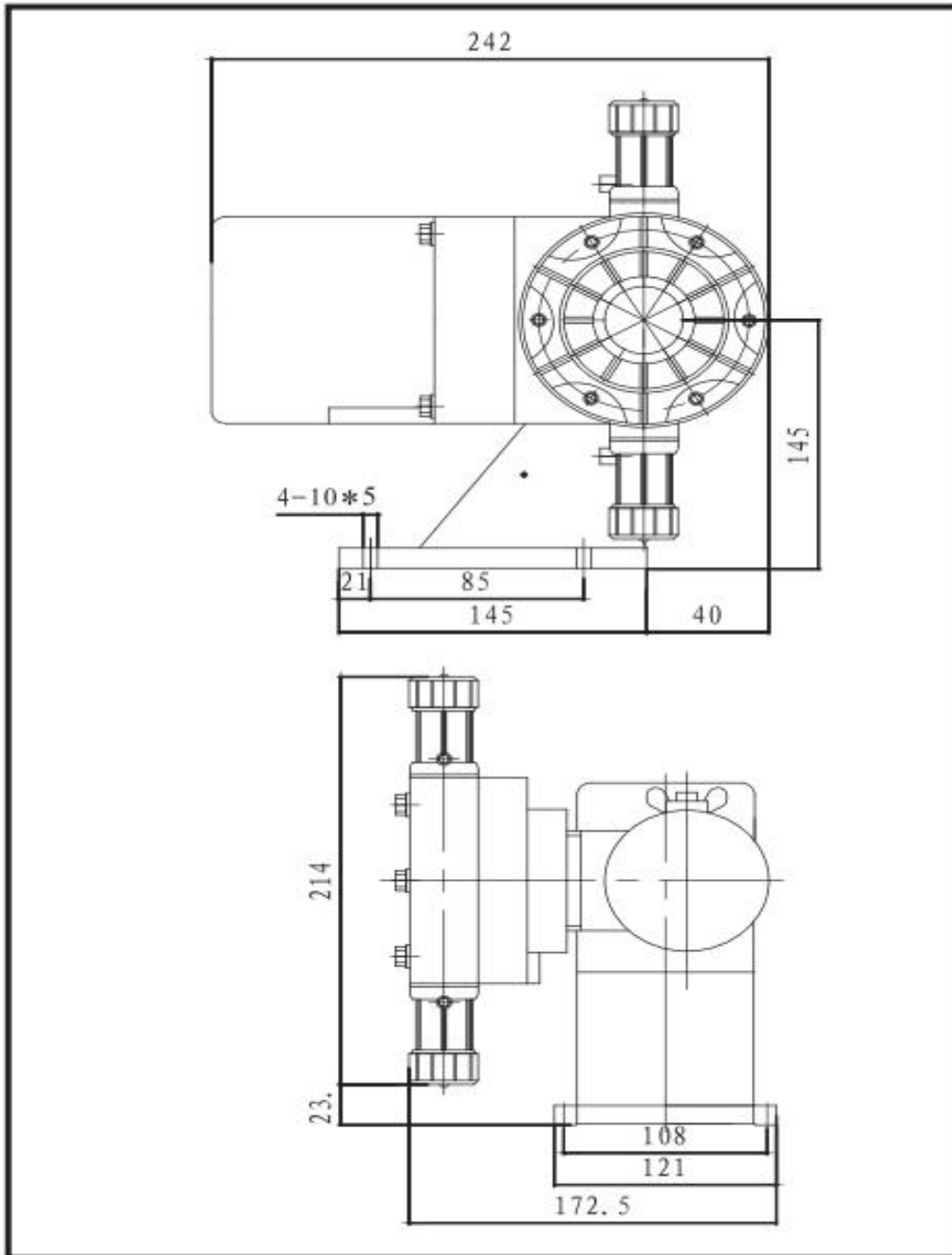
**Shape installation and reference size---HJ-W**



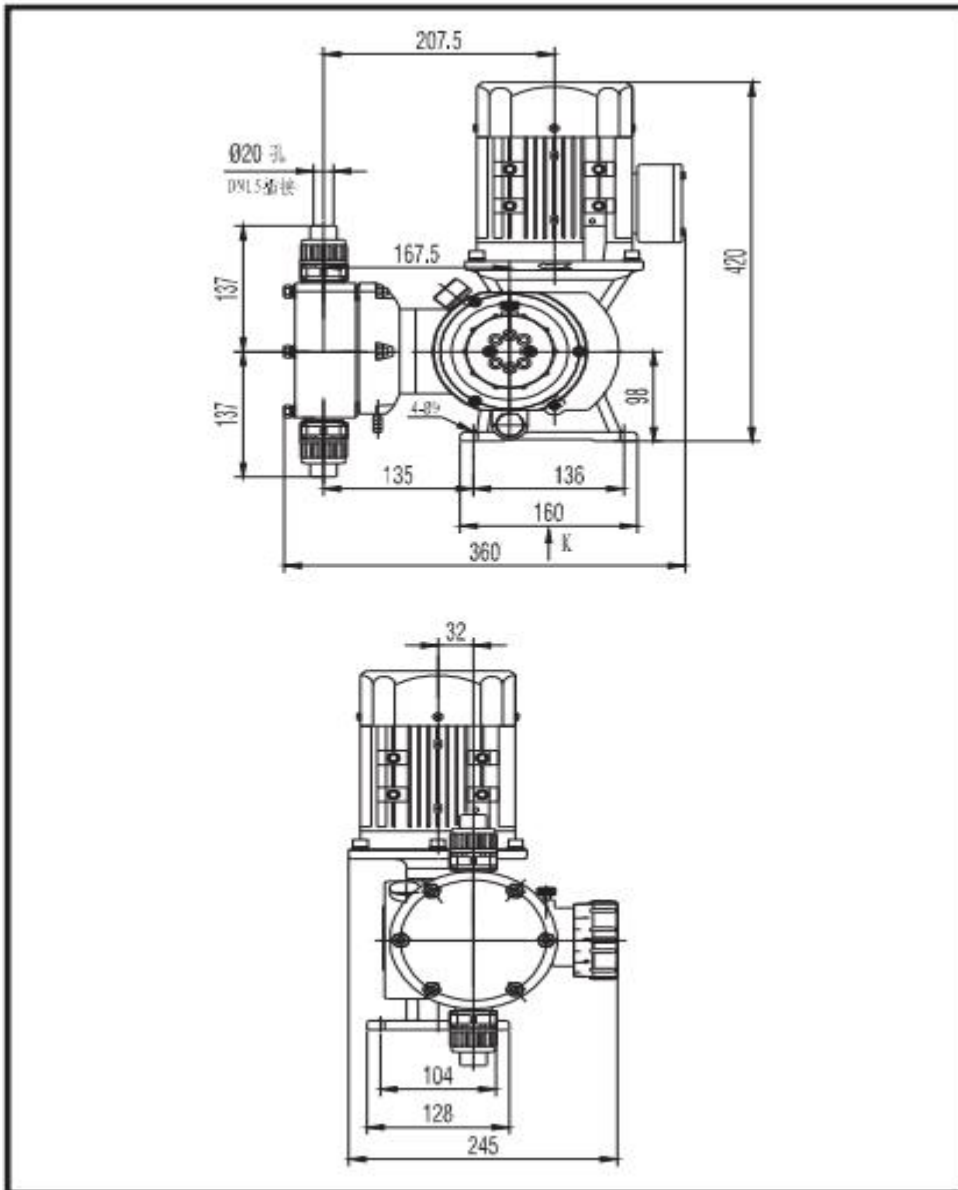
Shape installation and reference size--- HD



Shape installation and reference size---HJ-L



Shape installation and reference size--- HJ-Z



Shape installation and reference size--- HJ-D

