

HCS300 series sand separator

Operation Manual

XI' an HL Petroleum Equipment Co.,Ltd.

Instruction on operation

- ★ All persons concerned must read through this manual and relevant instructions for operation and use carefully.
- ★ Designate the trained personnel as safety managers of the sand separator.
- ★ Make sure all operators are educated on relevant safety precautions.
- ★ Only the trained personnel designated are allowed for operation and maintenance.
- ★ Electrical and mechanical maintenance must be performed by professional engineers under the guide of relevant documentations or other means.
- ★ Adjustment of electrical system parameters must be authorized by the manufacturer and performed by electrical engineers.
- ★ It is recommended that guides of safe operation and equipment maintenance be hung on the site.
- ★ It is recommended that an equipment use record and a maintenance record be created.
- ★ Sufficient light should be provided for night work.
- ★ No access to the equipment is allowed for any person not concerned.

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1. Summary

The sand separator is suitable for drilling fluid solid control systems in oil and gas drilling and is used to separate solid particles in the drilling fluid after being treated by the mud shale shaker.

The HCS series sand separator combines a set of desander cyclones on a vibrating screen. The drilling fluid is first separated by the desander cyclones, and the overflow returning to the circulation system, the underflow is further screened by the vibrating screen.

2. Technical parameters

2.1. Technical parameters table

Sand separator model: HCS300 x 2S

Capacity: 240m³/h

Hydrocyclone Nos.: 2

Hydrocyclone size: 300mm

Working pressure: 0.28-0.35Mpa

Inlet diameter: 150mm

Outlet diameter: 200mm

Motor power: 0.5kw

Voltage/Frequency: 380V , 50Hz

Weight: 737KG Dimension:1464x1306x2312mm

2.2. Environmental conditions

Ambient temperature: -20°C ~ +40°C

Ambient relative humidity: no more than 95%

Degree of explosion-proof: ExdⅡBT4

Corrosive environment: No corrosive gas or vapor that may damage metal and insulation

Degree of electrical protection: IP55

3. Safety specifications

3.1. Installation

A Use proper crane and lifting devices;

B Lifting the equipment beyond the designated lifting point is not allowed;

C Be sure that the installation platform is strong enough to bear sufficient weight;

D The equipment should be placed stably and tightly fixed on the tank level.

3.2. Operation

A Make sure the screen box fixing block is already dismantled and put in place before start-up of the equipment;

B. Do not touch the screen box and spring during operation;

C Stop the machine, find out the cause and correct it in case of any abnormal sound or vibration arising after start-up.

D Cut off the main power source after shut-down.

4. Components and overall dimension

The HCS series sand separator consists of a single-motor vibrating screen, 1 to 3 pieces of desander cyclones, slurry collecting funnels and supports. The cyclone is made of wear-resistant special polyurethane, which is resistant to fluid erosion, corrosion resistance and long service life.

The overall dimensions of the equipment are shown in drawing 1.

The explosive view of the sand separator device is shown in drawing 2.

The explosive view of the assembly cyclone group is shown in drawing 3.

The explosive view of the cyclone is shown in drawing 4

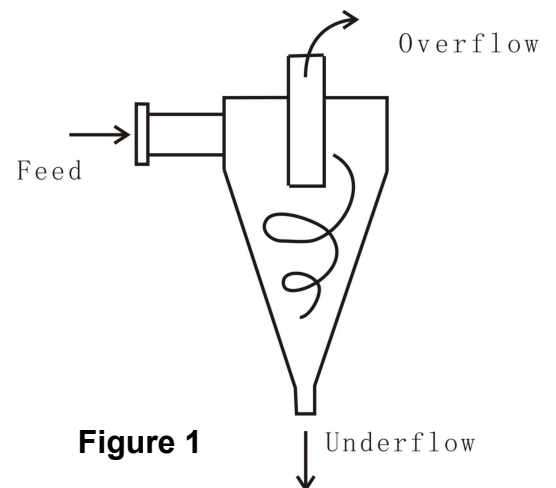
The explosive view of the vibrating screen box is shown in drawing 5.

5. Working Principle

5.1. Working principle of cyclone

The cyclone is also called hydrocyclone, the drilling fluid containing suspension solid particles enters the columnar spiral casing of the cyclone with a high speed under the action of the pressure, the drilling fluid which is rotating fast produces large centrifugal force, and moves to the bottom of the cone tube.

Because the solid density of drilling fluid is more than the fluid density of drilling fluid, separate the solid particles to approach the cone wall. the more close to the bottom of the cone tube, the smaller the semidiameter is, the palstance is faster, the centrifugal force is larger. The drilling fluid not only rotates around the center of the top of the cone fast, but it also produces a reversed swirl, it flows out of the cone tube through the bleeder tube upwards, the separated solid particles rotate downwards to be discharged through the base flow nozzle. Refer to figure 1.



5.2. Working principle of vibrating screen

The silt separator underflow screen is a single vibrating motor vibrating screen with a circular running motion. The slag discharge port is slightly lower than the rear end of the screen box. It mainly processes the liquid in the cyclone nozzle.

5.3. Working principle of sand separator refer to figure 2.

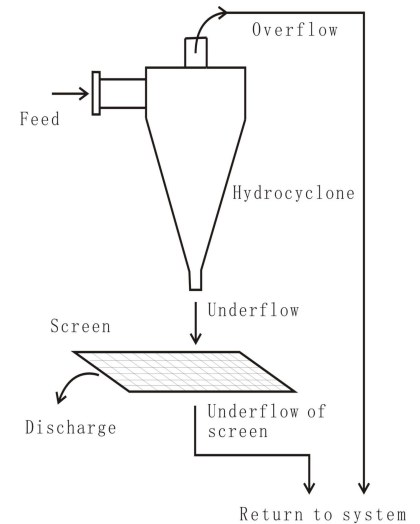


Figure 2

6. Installation and adjustment

6.1. Installation

6.1.1 Preparation

- A Check whether marks on the nameplate comply with requirements in the order or on operation;
- B Check the field power supply as required;
- C Check whether the tools and accessories are complete and keep them safely;
- D Clean and check the installation platform.

6.1.2 Lifting

It must be lifted at pointed place, and propping the lifting rope with spreader bar, so as to avoid destroying the equipment. Refer to figure 3.

The equipment can also be lifted after being dismantled into several main parts, the dismantling of large pieces of the equipment refers to drawing 2-explosive view of desander assembly.

6.1.3 Installation

Sufficient distance should be left around the installation location of the desander to facilitate operation and maintenance. Use bolts or pressure plates to fix the base. See attached drawing 1 for installation and dimensions.

6.1.4 Pipe connection

Position and standard of pipe connector refer to drawing 1, the standard of connector flange is as follows:

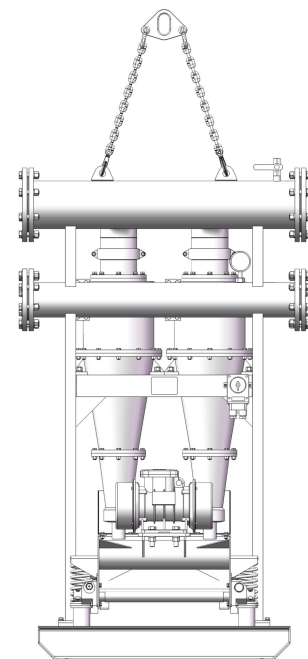


Figure 3

	Inside nominal diameter	Outside diameter of flange	Connecting screw	Distributed diameter of screw	Outside diameter of pipe
Overflow ports of desilter	DN200(8")	φ340	8-φ22	φ295	φ219
Feeding hole of desilter	DN150(6")	φ285	8-φ22	φ240	φ159

A gasket must be set at the connecting position of each flange to avoid leaking the slurry.

The above pipes can be connected from the left side or the right side of the equipment according to the site conditions. Refer Figure 4.

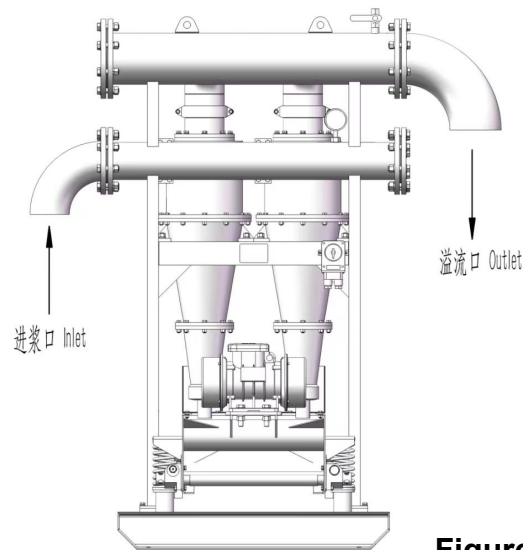


Figure 4

1.5 Slurry discharging

The bottom of the vibrating screen is open, and the recovered drilling fluid can be directly discharged into the mud tank below, and pumped into the centrifuge through the centrifuge feeding pump for next-level separation.

1.6 Slurry removal

The solid waste residue is discharged into the mud pool or collection tank outside the tank through the quicksand groove on the side of the tank.

1.7 Electrical installation

The external power cable is connected to the explosion-proof junction box on the base bracket.

When using AC380V power supply, the vibration motor is wired according to Y-shaped connection.

The motor and control box should be grounded according to specifications.

6.2 Commissioning

6.2.1 Check the items listed below and settle timely in case of any abnormality.

A Check whether the equipment is complete and there is any parts neglected or mounted incorrectly.

B Check whether the equipment is grounded safely, and measure the ground resistance when necessary.

C Check whether the bolts are tightened.

D Check whether the dip adjustment structure can fluctuate normally. The cushion should be in contact with the shaft properly, or adjust the gap between the shaft and the cushion when necessary.

E Remove the fixing block for the screen box, rotate the block to a degree of 180 before fixing it on the base to avoid loss, as shown in Figure 5.

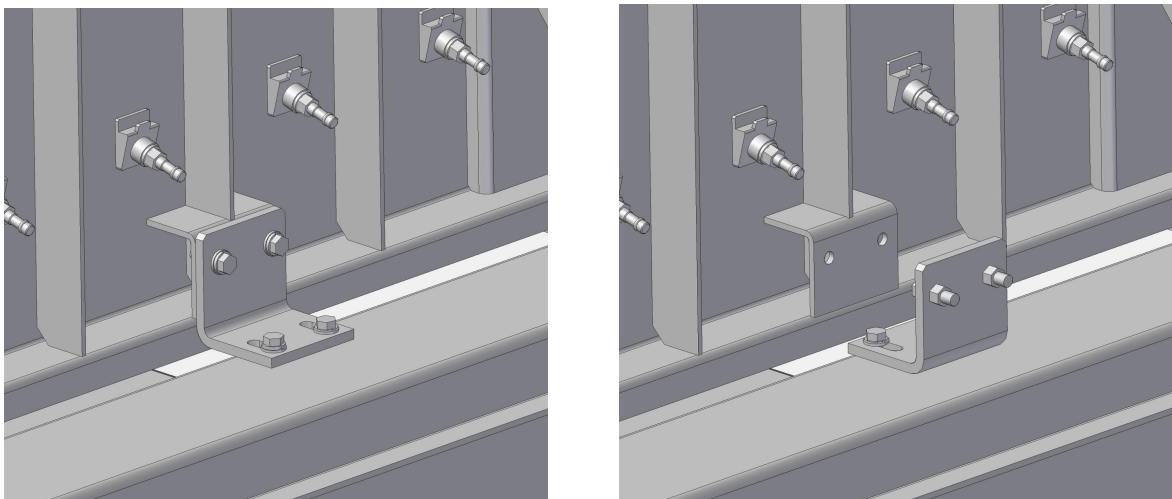


Figure 5

Mount the fixing block during transport Remove the fixing block before operation

6.2.2 Adjustment of vibrating screen

A. Starting the electromotor, observing if the moving track of straining box is on one line, if the objects (such as gloves, pasteboard) on the sifting bed can be

transported to the deslagging hole; if the vibration is abnormal, please change the phase line of any one of the electromotor.

B. Open circuit operation starts the shaker according to the operation steps, observing if there is abnormal sound or shaking, if the vibrating track is normal, and if the screen stencil is set and tightened.

6.2.3 Adjustment of desander

Open and close the corresponding valves according to the operating procedures, and start the feed pump.

Check whether the inlet pressure of the cyclone is appropriate. Too high or too low inlet pressure will affect the separation effect of the cyclone. The recommended pressure is 0.2~0.4MPa. Also observe whether the pipes and connections are well sealed.

If necessary, the size of the bottom flow nozzle can be adjusted.

If the underflow hole is reduced, it may cause blockage of the orifice, increase the solid content in the overflow, increase the overflow productivity, and reduce the sand settling rate; if the underflow hole is increased, the situation is opposite.

7. Operation steps and attentions

7.1. Preparation work before starting the machine

7.1.1 Install the equipment in accordance with the requirements in Chapter 6 "Installation and commissioning" and check carefully for commissioning before first operation and use after re-installation.

7.1.2 Preparation and check before daily start-up

A Clean the environment around the site, No parts or sundries is allowed;

B Check whether the fixing block on the screen box is removed;

C Check whether the screen is damaged or has large dry or sticking section;

D Check whether the screen is well installed and properly tensioned;

E Check whether the mesh number meet with operating requirements;

F The screen box dip should be proper without excessive inclination.

G Choosing or ensuring the base flow nozzle with suitable hole diameter size;

H Checking if the base flow nozzle of each cyclone is blocked.

7.2. Starting steps

A . Ensuring that the inlet valve of feed pump is opened, closing the outlet valve of feed pump (or the inlet valve of desander);

B . Connecting the external power supply;

- C . Starting the shaker
- D . Starting the feed pump
- E . Opening the outlet valves of feed pump (or inlet valves of desander), reaching the needed treating capacity.

7.3. Shutdown steps

- A . Closing the outlet valve of feed pump (or the inlet valves of desander);
- B . Stopping the shaker after delaying;
- C . Stopping the feed pump;
- D . Turning off the external power supply.

7.4. Operation attentions

- A. Check whether there is any abnormality after start-up, and feed after confirmation;
- B. It is a normal condition if there is obvious shake on the part of screen box and dip adjustment gantry when passing through the resonance section after shut-down.
- C. Clean the residual clay on the screen bed when replacement of screen after shut-down, and wash the bed with clean water when necessary.
- D. The vent hole on the top of the return tube is used for avoiding the siphonage produced by the return tube, there is a little drilling fluid flowing out from the vent hole while the cleaner is working, the vent hole should be avoided to be blocked, and the pipe can not be blocked artificially, or it would affect the normal working of desander.
- E. If the charging quantity is a little, and the charging pressure is not enough, 1 set of desanding cyclone can be shutdown (closing the inlet ball valve) to ensure the normal operation of the other cyclones.(Note: The cyclone with ball valve is customized and needs to be informed by the user before ordering!)

8. Lubricating and maintenance

8.1. Lubricating

The lubricating of cleaner is mainly the lubricating of corresponding parts of shaker, referring to the operation and maintenance manual of shaker.

8.2. Checking and maintenance

8.2.1. The checking and maintenance of shaker refers to the operation and maintenance manual of shaker.

8.2.2. Maintenance of desander.

- A. The deposited sand at the base flow nozzle should be removed after the desander stops, so as to avoid it being dry and hard in the cyclone to block the base flow nozzle so affect the effect.
- B. Each shift should check the wearing situation of base flow nozzle, the base flow nozzle if necessary;
- C. It should be checked and repaired after running for 500 hours, adjusting, screwing, cleaning, changing part of out of work or damaged parts, checking the sealing situation of connection position of pipes, checking the electric system, checking the wearing situation of cone tube of desander, spiral casing, changing it if necessary.

8.2.3 Maintenance of whole machine

The corrosion-resistant or rust protection treatment should be carried out on the surface of the whole machine during the off time after using for half year or one year, changing the iron stained fastening piece.

8.3. Electrical Maintenance

- A. Electrical maintenance must be performed by professional electrical technicians;
- B. Cut off external main power before opening the control cabinet;
- C. Pay special attention to the flameproof surface and add isolation grease on it before the cabinet cover is closed. No scoring and collision on the surface is allowed, and the sealing ring should be in good condition.
- D. The cable and rubber sealing ring at the inlet and outlet must be firmly clamped for flame-proof purpose.
- E. The thermal relay should be set around 5.4A. A too high or too low value is not suggested.

9. Principle of electrical control

Schematic diagram of electrical control see attached drawing 6.

10. Transport and storage

10.1. Transport

- A. Adjust the screen box dip to zero and use a special fixing block to fix the box before transport, as shown in Figure 5;
- B. Lifting on the specified point is required when the complete is loaded or unloaded, and attention should be paid to avoid collision during transport, refer Figure 3;

C. The equipment should be tightly fixed in the carriage or cabin and the latter should be sealed or covered with protective canvas during transport to avoid damage to the equipment caused by atrocious weather.

10.2. Storage

A. The equipment should be stored in a well ventilated warehouse with a relative humidity no more than 60%;

B. The warehousing environment should be cleaned of strongly corrosive gas harmful to metal and insulation;

C. For long-term storage, the parts or components vulnerable to corrosion should be coated with grease;

D. The electrical control cabinet should be powered semiannually to avoid electrical component failure caused by moisture.

11. Common fault and solutions

No.	Fault	Reason	Solutions
1	The motor cannot be started.	1 Power failure.	1 Designate a professional electrician to examine whether peripheral power supplies are in good condition.
		2 Certain element of the control cabinet was damaged.	2 Designate a profession electrician to check control cabinet elements.
		3 Motor damaged.	3 Designate a profession electrician to check whether motors are in good condition.
2	The motor automatically shut down shortly after being started.	1 Thermal relay current was set with a too low value.	1 Properly adjust the current value to 5.4A around.
		2 Motor wiring error.	2 Y connection is recommended for 380V power, but not Δ shaped connection.
3	The whole set vibrates obviously and sounds abnormally after start-up.	The fixing blocks were not dismantled.	Stop the machine immediately and dismount the four screen box fixing blocks thoroughly.
4	Vibrating path abnormal, failure in slag discharge or very slow discharging.	1 Only one of the two motors was started.	1 Start the other motor or ask a professional electrician to check the control cabinet or motor in case of failure in start-up.

		2 The two motors rotate to a same direction.	2 Reverse the rotation direction of one of the motors after changing the phase line.
5	Abnormal vibration.	1 The eccentric block of the vibrating motor was not set as stipulated.	1 Reset or secure the eccentric block as stipulated. It is recommended that the two motors should be set with the same size and both ends of a motor be set in a same direction.
		2 The eccentric block of the vibrating motor was loosened.	
		3 The whole set was not stable or well fixed.	2 Stabilize and fasten the whole set.
6	The sound is mixed with abnormal noise	The screwed connection was loose.	Thoroughly check each screwed connection according to judgment of the abnormal position.
7	The gantry shakes and gives much noise.	The dip adjustment handle was not clamped.	Clamp the dip adjustment handle.
8	Dip adjustment difficulty.	1 The dip adjustment handle was not released.	1 Release the dip adjustment handle.
		2 The plastic friction-reducing pad was too tightly placed against the column.	2 Release the locking nut, properly loosen the screw on the pad before tightening the nut, as shown in Diagram 6.
9	Short service time of screen.	1 Screen tension was too loose, too tight or uneven.	1 Tension the screen as required.
		2 The rubber strip was damaged or aged.	2 Replace all the rubber strips.
		3 The drilling fluid was too high in solid content.	3 Short service time of screen caused by drilling fluid high in solid content is just normal.

10	The feeding pressure is not stable	1. The pump charging is not enough caused by lowering of fluid level of pump groove and air entrainment	Increasing the fluid level
		2. There are sundries in the pump and block the pump or the pump is abraded	Checking and repairing the pump
11	The flow of base flow is reduced or cut off	The base flow nozzle is blocked	Dismounting the base flow nozzle, removing the blocking object
12	The flow of overflow, base flow is reduced	The inlet of cyclone is blocked	Closing the inlet valve of cyclone, dismounting it, removing the blocking object
13	The base flow is discharged in columnar form or discontinuous block form, the viscosity is high	1. The viscosity of charging drilling fluid is high	1. Reducing the viscosity of charging drilling fluid
		2. The hole of the base flow nozzle is too small	2. Changing the base flow nozzle with bigger hole size
14	The base flow is thin	1. The charging pressure is not enough	1. Increasing the charging pressure
		2. The hole of the base flow nozzle is too big	2. Changing the base flow nozzle with smaller hole

If any failure mentioned above cannot be eliminated through the suggested means, consult the manufacturer for settlement.

12. List of tools, spare parts and documents

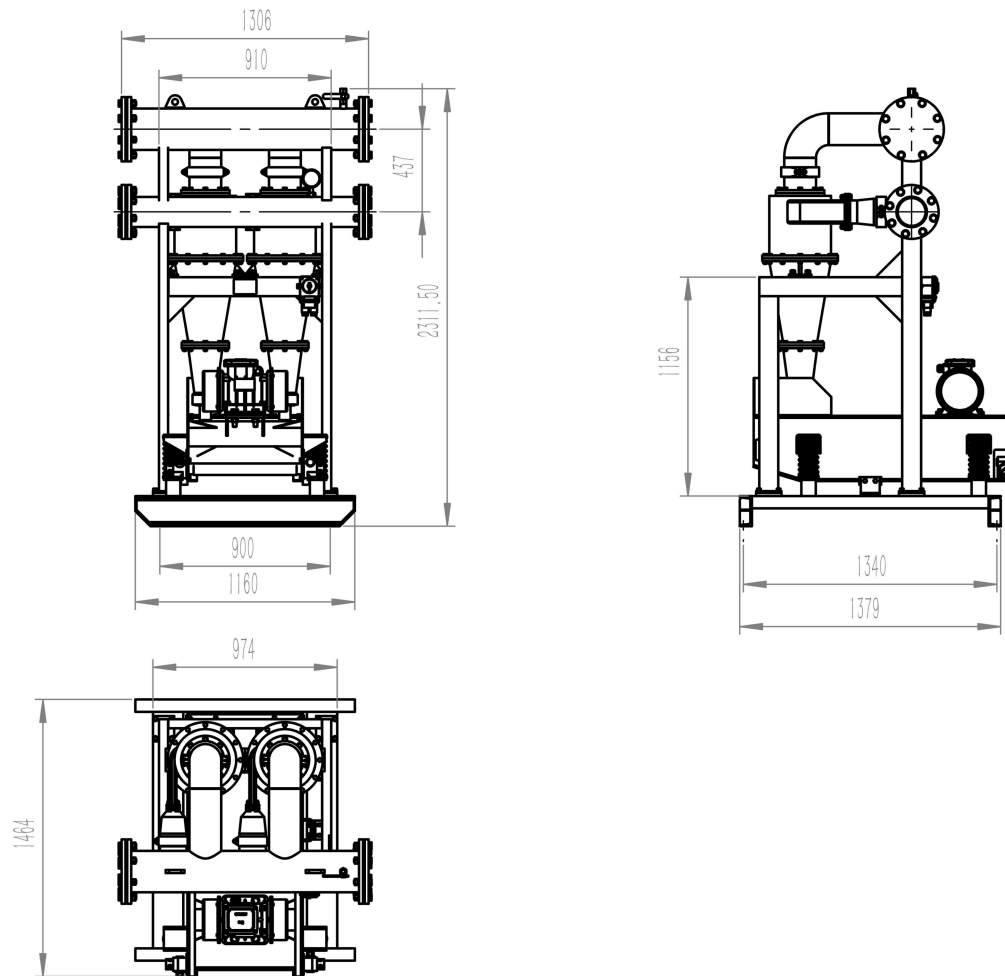
No.	Category	Name	Code or specification	Quantity	Remarks
1	Tool	Tension wrench		2	
2		Support strip	600*35	7	
3					

3	Spare parts	Nozzle	20	2	Installed
4		Nozzle	25	2	
6	Documents	Sand separator operation manual		1	
7		Motor operation manual		1	
8		Quality certificate		1	

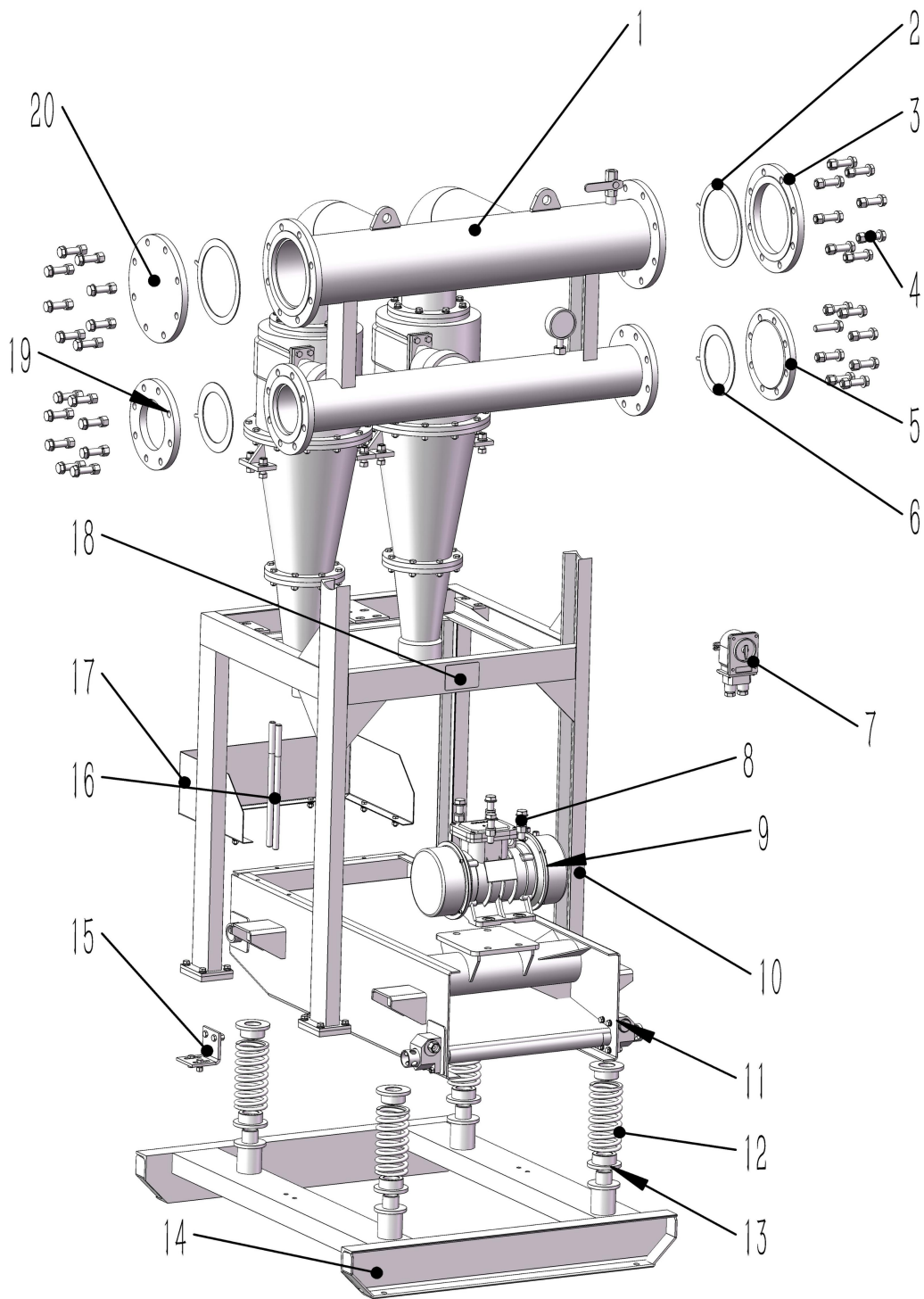
Wearing parts and fittings are available in our company.

13. Attached Drawing

Attached drawing 1 Outline Dimensional Drawing HCS300×2S



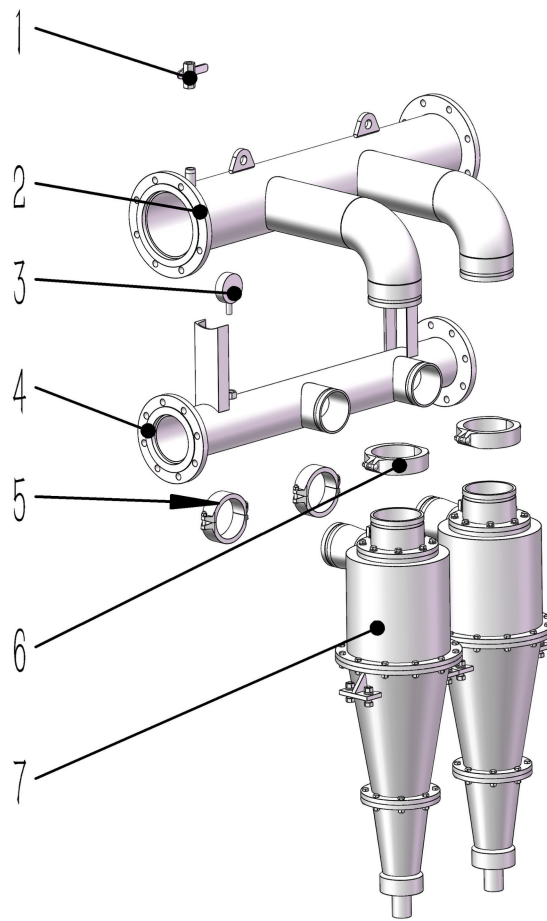
Attached drawing 2 Explosive view of desander assembly



Desander explosive view parts list:

No.	Code/ Specification	Name	Qty	No.	Code/ Specification	Name	Qty
1	HCS300-01	Cyclones assembly	1	11	HCS300-05	Screen box assembly	1
2	DN200	Flange gasket	2	12	HCS300-06	Shock absorbing spring	4
3	DN200-PN10	Flange	1	13	HCS300-07	Spring shock absorber sleeve	4
4	M20×80	Bolts	32	14	HCS300-08	Base	1
5	DN150	Flange blind plate	1	15	HCS300-9	Fixing block	2
6	DN150	Flange gasket	2	16	HCS300-10	Screen tension wrench	2
7	HCS300-02	Explosion- proof switch	1	17	HCS300-11	Collection funnel	1
8	M20×80	Bolts	4	18	HCS300-12	Nameplate	1
9	HCS300-03	Vibrating motor	1	19	DN150- PN10	Flange	1
10	HCS300-04	Bracket	1	20	DN200	Flange blind plate	1

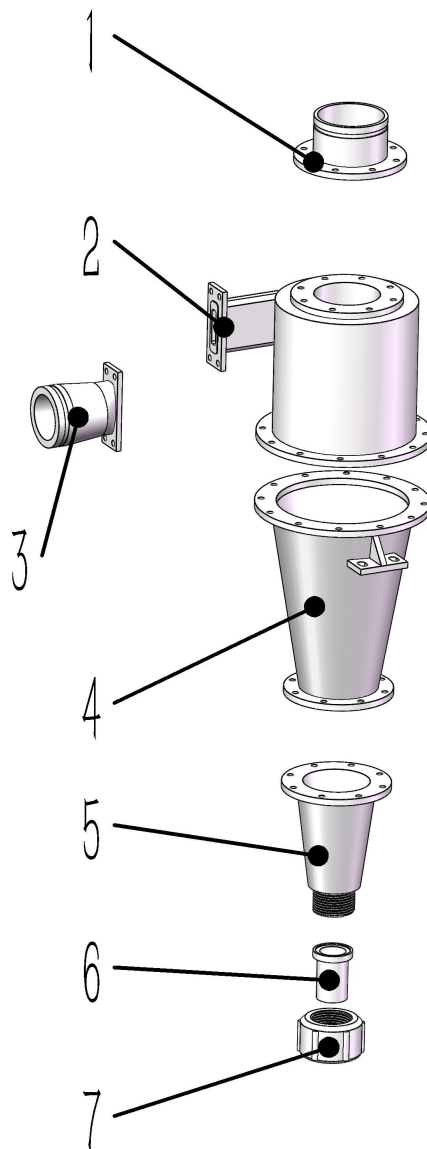
Attached drawing 3 Explosive view of assembly cyclone group



Explosive view parts list of cyclone assembly

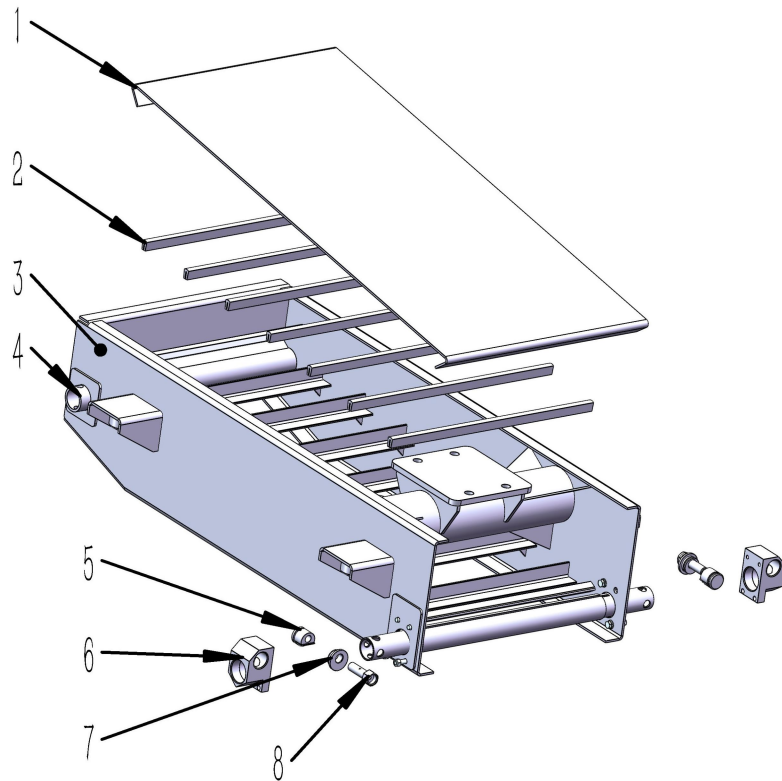
No.	Code/ Specification	Name	Qty	No.	Code/ Specification	Name	Qty
1	DN20	Ball valve	1	5	140	Clamp assembly	1
2	HCS300-01-01	Overflow manifold	1	6	168	Clamp assembly	8
3	Y-100-1.0MPa	Pressure gauge	8	7	HCS300-01-03	Cyclone	8
4	HCS300-01-02	Inlet manifold	1				

Attached Figure 4 Explosive view of cyclone



No.	Code/ Specification	Name	Qty	No.	Code/ Specification	Name	Qty
1	HCS300-01-03-01	Overflow pipe	1	5	HCS300-01-03-05	Lower part	1
2	HCS300-01-03-02	Cyclone body	1	6	HCS300-01-03-06	Nozzle	1
3	HCS300-01-03-03	overflow short pipe	1	7	HCS300-01-03-07	Compression nut	1
4	HCS300-01-03-04	Middle part	1				

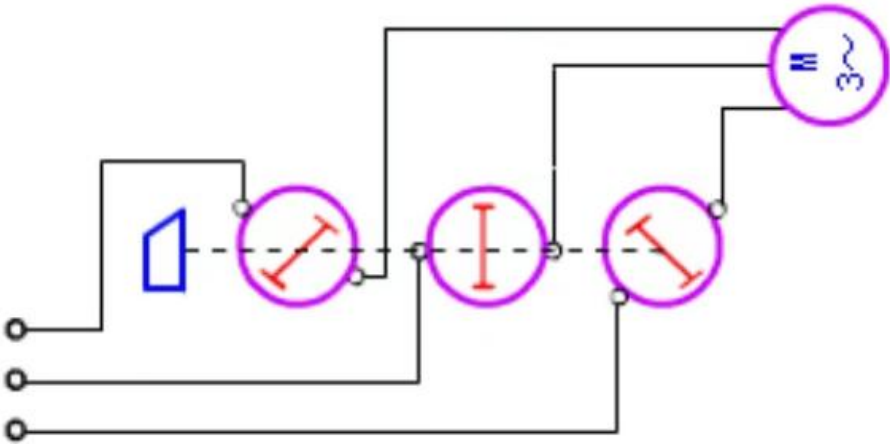
Attached drawing 5 Explosive view of screen box assembly



Explosive view of screen box assembly parts list:

No.	Code/ Specification	Name	Qty	No.	Code/ Specification	Name	Qty
1	HCN100-06-01	Screen	1	5	HCN100-06-05	Clasp slip	2
2	HCN100-06-02	Support strip	7	6	HCN100-06-06	Fixed seat	2
3	HCN100-06-03	Screen box	1	7	HCN100-06-07	Slip cover	2
4	HCN100-06-04	Fixed shaft	1	8	HCN100-06-08	Locked bolt	2

Attached drawing 6 Electrical schematic



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