SP800 Full-hydraulic Pile Breakers

Operating Manual and Spare Parts Pictures

DRILLMASTER

Hunan Drillmaster Engineering Technology Co., Ltd.

Preface

You are welcome to use the SP800 Full-hydraulic Pile Breakers of Hunan Unimate Heavy Industry Co., Ltd. This device is independently developed and manufactured by the company after absorbing advantages of similar products abroad and considering the special conditions and requirements of bridge engineering.

It is currently the world's most advanced device of the like, which uses a plurality of hydraulic cylinders to simultaneously squeeze pile from different points on the same end face, and its working principle is simple, efficient and environmentally friendly.

Without prior notice, Unimate will continuously improve this device, update documents and technical specifications. Please be informed that the company will not assume the obligation to improve the device or spare parts sold before.

Your comments and suggestions will be appreciated if you find any deficiencies or inadequacies in the course of using this device.

Safety Precautions

• Please read this manual thoroughly before installing, debugging, using and repairing this device.

• The operator must have been trained strictly and obtained certificate before operating the device.

• All the provisions of this manual must be strictly followed in the course of use and maintenance.

• The auxiliary products of this device controlled and managed with safety signs must also have safety signs. So do the replacing parts during the usage.

• No person is allowed to stand in the working device in the course of the hydraulic Pile Breakers being installed, debugged, used or repaired.

• Safety warnings must be carried out before the start of the engineering machine.

says that if neglecting these instructions, improper operations may cause personal casualty or severe device damage.

says that if neglecting these instructions, improper operations may cause personal injury or device damage.

says that if neglecting these instructions, improper operations may cause mild personal injury or device trouble.

says that only qualified personnel are allowed to install and operate this device. In this manual, qualified personnel are people who are authorized to install, debug, use and repair the device according to the existing safety regulations and standard.

CONTENTS

Chapter 1: Overview of SP800 Full-hydraulic Pile Breakers

SP800 Full-hydraulic Pile Breakers is independently developed and manufactured by Hunan Unimate Heavy Industry Co., Ltd. after absorbing advantages of similar products abroad and considering the special conditions and requirements of bridge engineering.

It is currently the world's most advanced device of the like, which uses a plurality of hydraulic cylinders to simultaneously squeeze pile from different points on the same end face, and its working principle is simple, efficient and environmentally friendly.

The operation of the device needs power source which can employ fixed pumping stations or other mobile engineering machinery equipment. Under normal circumstances, pumping stations are more often used during the foundation construction of high-rise building as this combination of equipment needs lower investment overall but easier to be mobile and thus suitable for the group pile breaking. Mobile excavators are more often to be used as power source in bridge construction. Taking down the bucket of the excavator, hanging the hoisting chain of the pile breaker at the bucket and the big arm connecting shaft, combining these two machines, and then connecting any hydraulic oil line of excavator to the oil line of oil cylinder of pile breaker through the balance valve, to drive the cylinder group of pile breaker to work. This combination of pile breaker moves continently and has a wide working face, so it is suitable for projects with scattered piles and long work period.

This hydraulic pile breaker can apply to the pile breaking for high-speed rail bridge projects and civil engineering. There are some pile breaking equipment and manual pile breaking method at home and abroad, but they are inefficient and expensive and thus can not meet the requirements of large-scale pile breaking. The operation of this device has the following features:

1. High efficiency, for example, the length of pile is 1 meter, diameter is 1000mm, concrete grade is C30, as it can break 60 piles by working eight hours successively, while a worker can only break 2-3 piles by working eight hours;

2. Low noise, as it is full-hydraulic, so it can operate in suburbs with disturbing people;

3. Longer service life, as its main parts are all made of special materials and process. It is proven by practice to have 15 years of service life;

4. High modular design, and through changing the number of modules, it is easy to adjust the diameter of each pile on the site, and it is easy to be operated and maintained without requiring any special skills;

5. High safety, as the pile breaking is mainly done by manipulators, and there is no need for worker near the pile, so it is very safe;

Service environment of SP800 Pile Breaker:

1. The operation of the device needs power source which can employ fixed pumping stations or other mobile engineering machinery equipment.

2. Hydraulic system pressure is 31.4MPa, the setting value of overflow valve is 34.4MPa, the diameter of main hydraulic pipe is 25mm and of the cylinder tubing is 20mm;

3. There are uncertain factors for the engineering machinery and the material composition of pile foundation, and the maximum depth of each pile breaking construction shall be 0.3m.

4. The number of modules, range of pile diameter, tonnage of engineering machinery needed and total weight of machine when the power source using engineering machinery are shown in the following table:

Number of modules	6	7	8	9	10	11	12	13
Range of pile diameter (mm)	500-600	650-800	850-1000	1050-1200	1250-1400	1450-1600	1650-1800	1850-2000
Tonnage of engineering machinery (t)	20	22	26	27	30	32	35	36
Total pile breaker weight (KG)	2335	2720	3100	3480	3860	4240	4620	5000

The oil pipe of pile breaker shall select corresponding hydraulic oil pipe and coupling before cutting pile. Before the operation, check whether the hydraulic pipe is well connected and whether the hydraulic oil pipe and oil cylinder have leakage by engineering machinery test pressure. Operation can be started only after ensuring the hydraulic pipe has no oil leakage.

Chapter 2: Structural Features and Working Principle

SP800 full- hydraulic pile breaker embodies the following structural features:

1. Module-based design with pin connection for easy assembling and maintenance;
2. Hydraulic cylinder piston and alloy head are connected with pin to prevent the piston from radial force and extend the service life of the cylinder;
3. SP800 full- hydraulic pile breaker is small for easy lifting and transportation.

Section 1: Working Unit

Working unit applies module-based design where modules are connected with each other by pins for easy assembling and maintenance. Cylinder and cylinder block are linked by high-strength bolts for easy assembling and maintenance. For the hydraulic pipeline, high-pressure connection and hydraulic tubing are employed to guarantee the appropriate pressure. Drill rod is made of alloy materials and given with special heat treatment to ensure the pile breaking can be realized and the drill rod has a longer service life.

Working unit of SP800 hydraulic pile breaker is arranged as shown Fig. 1:

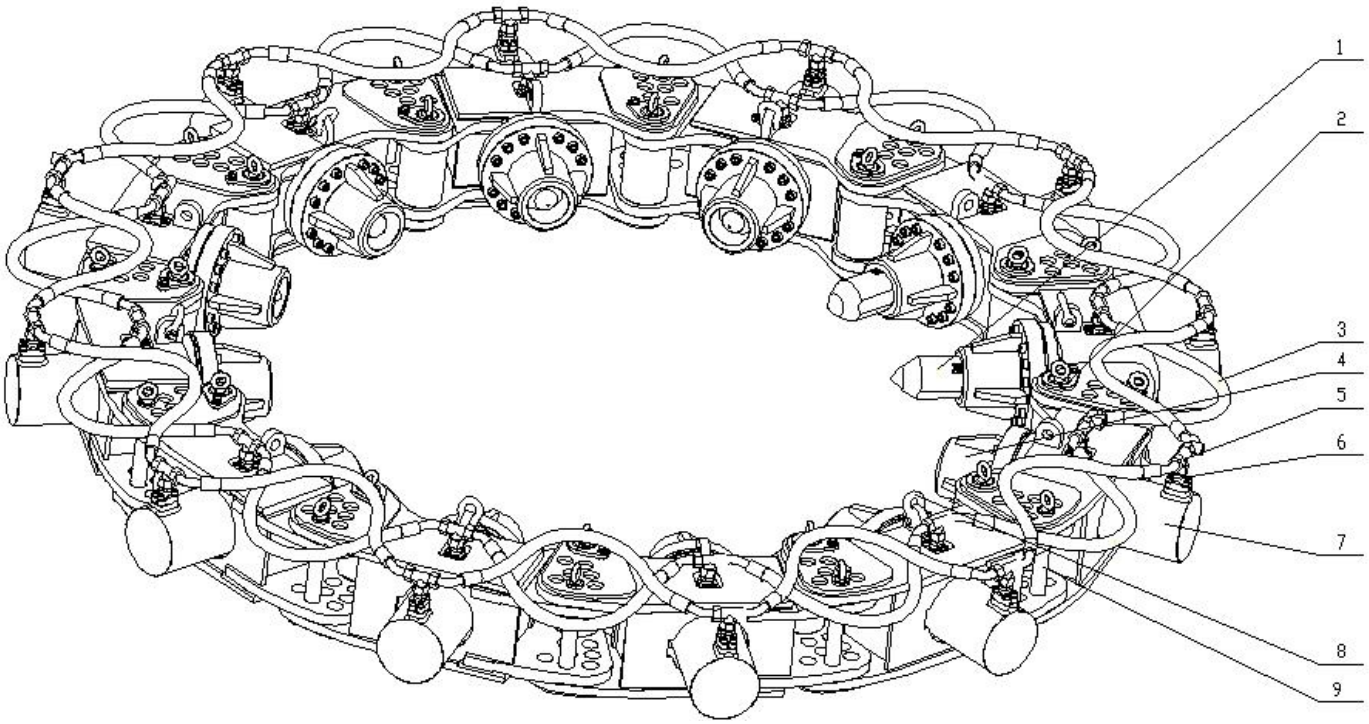


Fig. 1

1-drill rod; 2-hinge pin; 3-high-pressure rubber hose; 4-guide flange;

5-hydraulic tee; 6-hydraulic connector; 7-cylinder; 8-bow shackle;9-small hinge pin

Module assembling and disassembling unit:

High modularization design is made for easy adaption to individual pile diameter of each field. Modules are connected with the hinge pin for easy operation and maintenance without any special skill.

Module unit of SP800 pile breaker: as shown below, easy operation can be allowed by simply assembling and disassembling the hinge pins and small hinge pins when more/less modules are required due to the pipe diameter. Insert space may differ based on the number of modules (as shown in Fig.2). To assemble two modules, first align the hole to the hinge pin before inserting the hinge pin, give the gasket and bolt, align the corresponding small hinge pins hole and insert the small hinge pin to connect and fix the modules, as shown in Fig. 3:

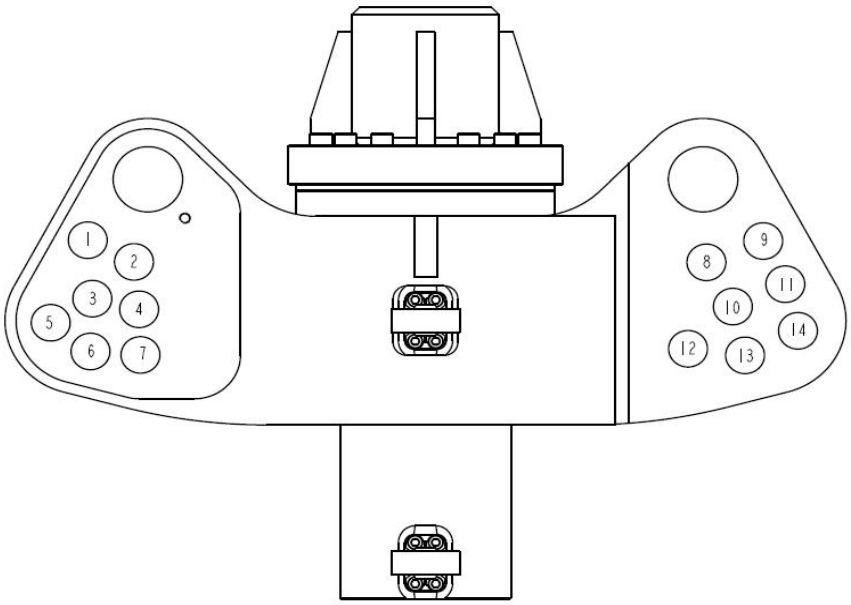


Fig. 2

Qty. of Module	6	7	8	9	10	11	12	13
No. of Corresponding Hole	3、11	2、9	1、8	4、11	3、10	7、14	6、13	5、12

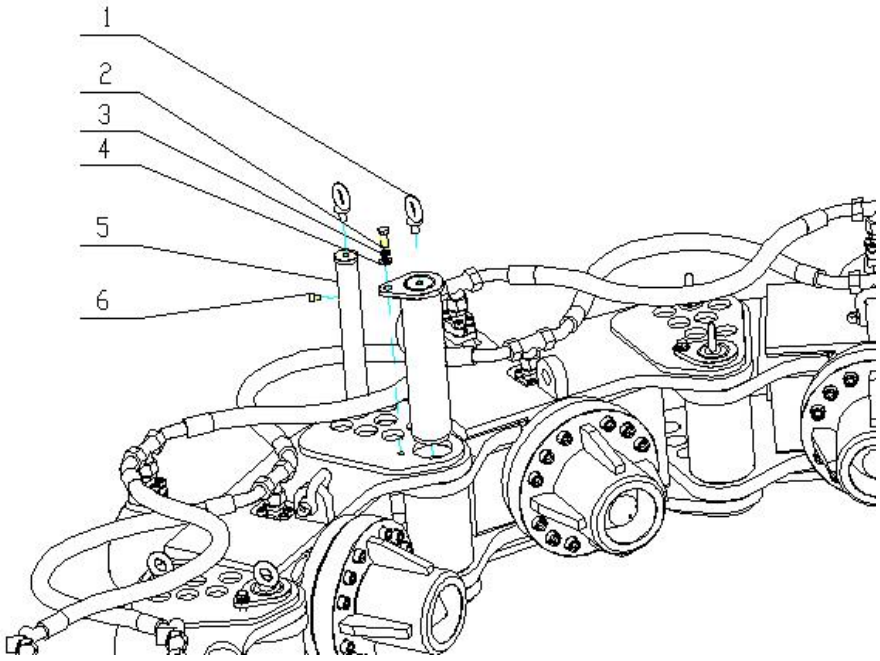


Fig. 3

1- sling bolt; 2-bolt; 3-washer; 4-gasket; 5-small hinge pin;6- screw; 7-hinge pin

Structure of single module of SP800 pile breaker:

Single module of the SP800 pile breaker integrates cylinder, guide flange, drill rod, elastic pin, tubing coupling, bow shackle, flange bolt, cylinder bolt, etc.

Taking SP800 for example, the cylinder is fixed on the cylinder block by the cylinder bolt; the cover flange is fixed on the cylinder block by flange bolt; the drill rod is jointed onto the cylinder piston by the special structure. The drill rod makes movement in the cover flange to realize the hydraulic pipe breaking. The bolts are assembled to the single module as shown in Fig. 8:

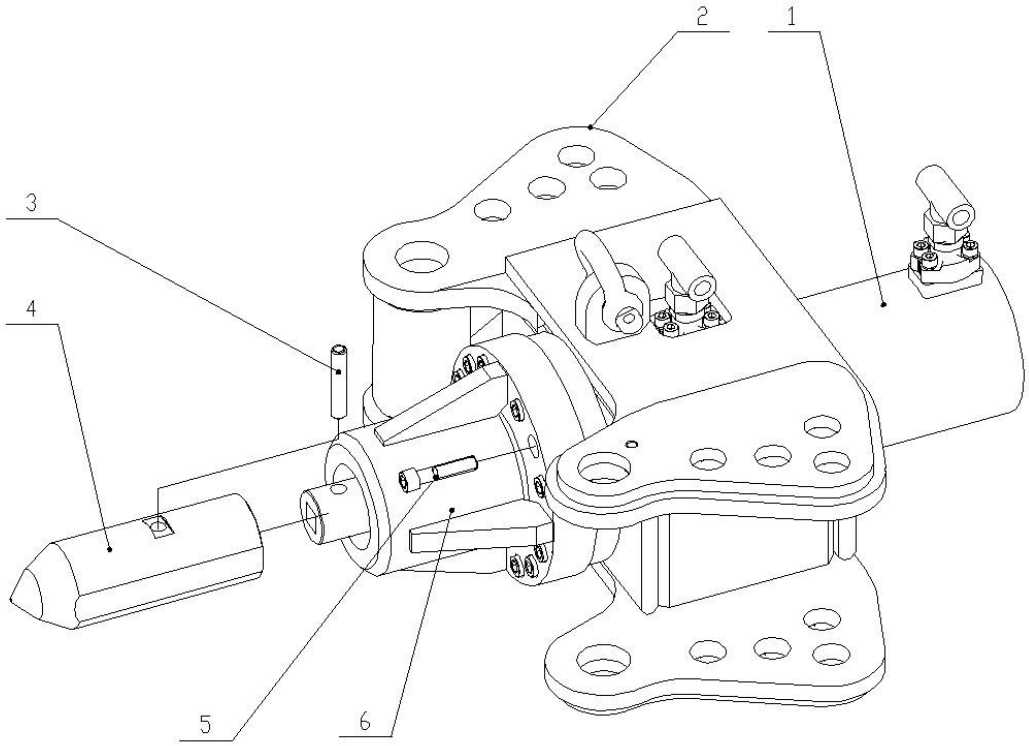
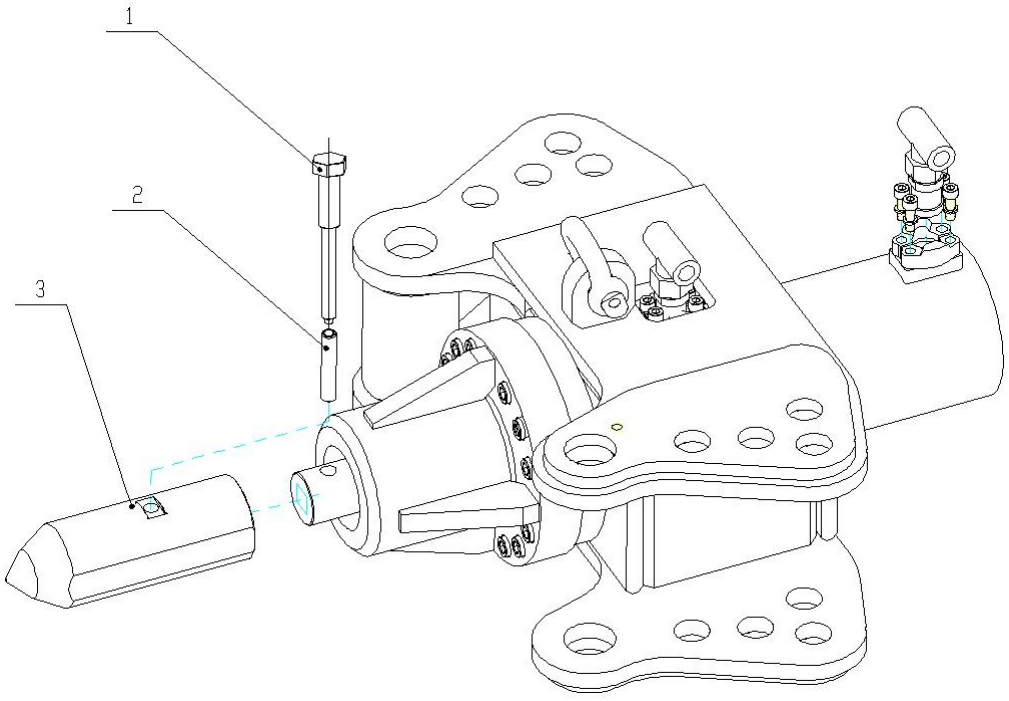


Fig. 8

1-high-pressure cylinder; 2-module; 3-elastic pin; 4-drill rod; 5-standing bolt; 6-guide flange

Method to change the drill rod:

Have the entire cylinder reached out until the mounting position of the elastic pin exposed, use the professional tool to knock the elastic pin out and change a new drill rod, knock the elastic pin into the pin hole to the level (chamfered end of elastic pin into the hole first), as shown in below:



1-professional tool; 2-elastic pin; 3-drill rod

Section 2: Lifting Unit

During the operation of the Pile breaker, the working unit is hung on the engineering machinery through the lifting unit which functions as a connector and lifter. The lifting unit has to bear the weight of the working unit on the pile breaker as well as tensile force generated during the working and lifting of pipe head and weight of the pile head, totally up to more than 17 tons.

Lifting unit is arranged as shown in Fig. 9:

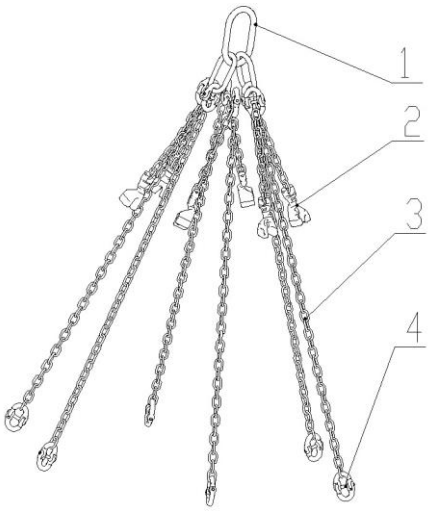


Fig. 9

1-sling; 2-chain regulator; 3-chain; 4-chain shackle

Chapter 3: Installation and Operating Instructions

Hunan Unimate Heavy Industry Co., Ltd. is able to manufacture and install corresponding modules and lifting devices based on customer's requirements for diameter of cut pile. The pile breaker can be used when delivered to the customer, which saves the time for pre-operation preparation by the customer.

In most cases, excavator which can be moved conveniently is used as power source during engineering construction. Remove bucket of the excavator and sling chain of the pile breaker at the connection shaft of the bucket and the large arm to mechanically combine these two kinds of equipment together; and then connect the large arm hydraulic circuit of the excavator to cylinder circuit of the pile breaker with balanced valve to drive cylinder group of the pile breaker to work.

Assembly of hydraulic joint and hydraulic oil pipe in the working unit is shown in the following Fig. 12 (working unit):

Precautions for piping layout:

1. Pipeline shall be kept away from moving parts of the excavator;
2. Pipeline shall be kept away from sharp edge and sharp corner;
3. Schematic diagram of pipe clamp and pipeline is shown in the following Fig. 11:

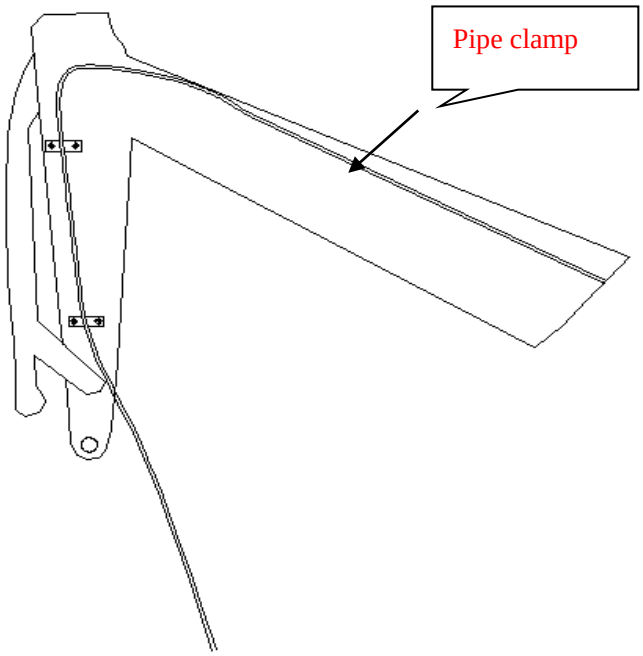


Fig. 11

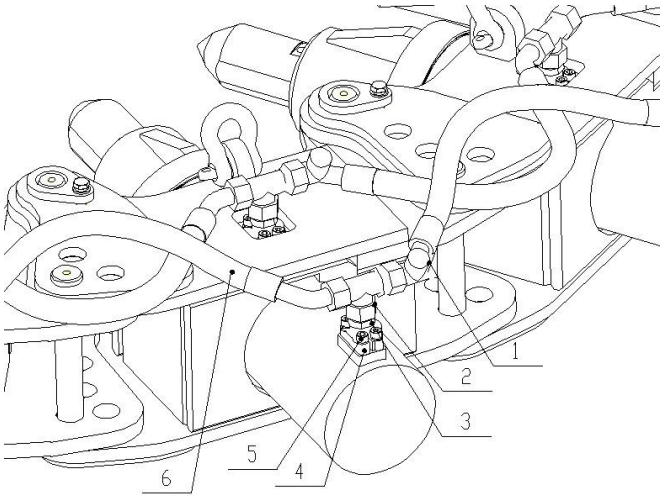


Fig. 12

1-Tee coupling A; 2-Tee coupling B; 3-Straight coupling; 4- Flange 5-Screw; 6-High-pressure rubber hose

The straight coupling is fixed to corresponding female thread in the cylinder with flange and screw for connection. Torque spanner of inner hexagon spanner is tightened at a moment of 45N.M. Tee coupling B is connected to the straight coupling and tightened with 32mm torque spanner at a moment of 180N.M. The hydraulic oil pipe is connected to one side of tee coupling A and tightened with 32mm torque spanner at a moment of 105N.M. Connect hydraulic cylinder of each module with tee couplings and straight coupling and then connect with the hydraulic cylinder of engineering machinery to form a closed loop.

During pile head cutting, after internal diameter of combined cylinder of the pile breaker is adjusted to corresponding diameter range for the type of pile, the combined cylinder will be directly installed on the pile surface to be cut with the assistance of excavator; and then position and tightness of cylinder piston shall be adjusted slightly until the pile surface to be cut is closely clamped by the combined cylinder. Then system pressure of the excavator shall be adjusted according to the strength of cast pile concrete and the cylinder shall be pressurized until the concrete pile breaks under strong pressure. After the pile is cut, broken wasted concrete block shall be directly moved to the spoil yard by using the pile breaker and then the cylinder shall be released to stack the waste slag tidily.

Precautions for installation:

1: Do not wear gloves while replacing hydraulic pipes and hydraulic joints so as to keep interface of the hydraulic parts clean! In case the hydraulic pipes can not be replaced in a timely manner after being removed, standby nuts shall be screwed on temporarily to prevent foreign matters from entering the pipe coupling!

2: When position of bow shackle of the working unit is changed, hinge pin of the bow shackle shall be tightened into the threaded hole for the shackle, so as to prevent inclination of the working unit during lifting due to uneven stress!

3: In case of increase or decrease in quantity of modules as well as removal of hinge pin, copper rod shall be used for stroking!

4: Empty module shall not be used in case the pile diameter is no larger than 500mm!

Chapter 4: Safe Operation and Precautions

Before operating the pile breaker, engineering machinery operator shall be able to operate corresponding engineering machinery skillfully and shall get familiar with operating rules and safety knowledge on engineering machinery. Detailed precautions are listed as below:

Precautions for operation:

1. **Do not get close to the operating pile breaker. Concrete may fall during pile cutting and the power source operator shall be informed to stop operation before getting close to the pile breaker!**
2. **Check whether all hydraulic oil pipes and hydraulic joints are tightened before pile cutting. Oil pipes and joints with oil leakage observed when hydraulic pipe fittings are tightened shall be replaced!**
3. **The working unit shall be free of tapping force and damage; otherwise, its service life as well as lifetime of the whole machine will be affected. The working unit shall be cleaned regularly after pile cutting!**
4. **Any person shall not stay in the operating area of engineering machinery during pile cutting; otherwise, it will result in severe personal injury!**
5. **During transportation, transshipment and operation, the cylinder shall be free from tapping force and great pressure! Soil, sand etc. on the accessories of the cylinder shall be cleaned regularly when construction is terminated, so as to keep the periphery of the cylinder clean!**
6. **Hydraulic pipes and pipe couplings shall be free from tapping force and great pressure during transportation, transshipment and operation! Especially for operation, if there is any concrete block falling onto the hydraulic part during operation, concrete on the hydraulic part shall be removed after operation, so as to protect the hydraulic part from deformation due to external force and keep the periphery of the hydraulic part clean!**

Pre-operation preparation:

1. The SP800 hydraulic pile breaker shall have a power source before operation and excavator shall be selected preferentially according to current situation of popularization and operation of engineering machinery!
2. The SP800 hydraulic pile breaker is equipped with quick-change coupler for hydraulic pipe. The manufacturer can be informed in advance to manufacture corresponding quick-change coupler according to model of excavator used by the customer!
3. Customer can also use crane in combination with hydraulic pump station to suspend the pile breaker at the front end of the crane and connect the hydraulic pump station with the pile breaker through quick-change coupler!

Chapter 5: Repair and Maintenance Instructions

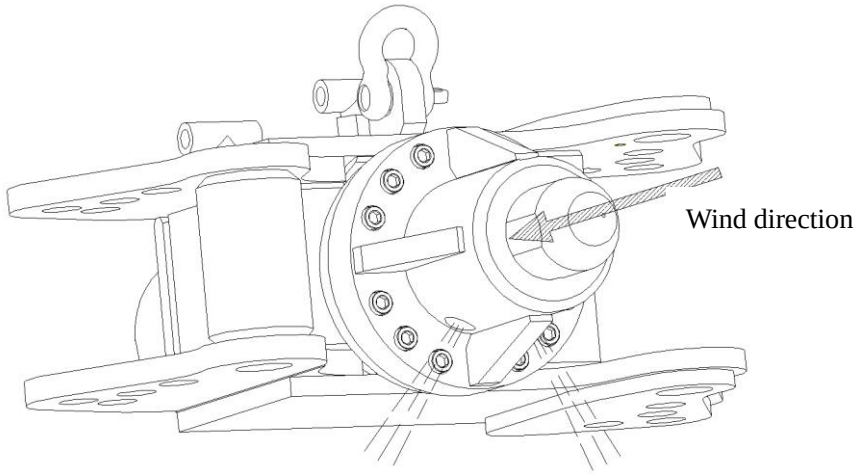
The SP800 hydraulic pile breaker can be repaired and maintained easily. When the pile breaker works continuously for 1 month or cuts 1000 piles, it shall be stopped to check whether each part is in good condition.

The lifting device shall be firstly checked for damage and crack. Especially for sling chain and chain shackle, each part shall be checked carefully. If there is any damage or crack, replacement shall be made immediately!

The working unit shall be checked, especially for drill rod and hydraulic part! Drill rods are direct working parts and are prone to damage after reaching a certain workload. Make all drill rods stretch out through pressurization to check the drill rods one by one. If any damage or crack is found, immediate replacement shall be made. If all drill rods are in good condition, all hydraulic parts shall also be checked one by one. In case any damage or crack is discovered, immediate replacement shall be made.

Key points for daily maintenance:

After everyday work, air pump shall be used for cleaning with its air pipe aligning with guide flanges and gap between drill rods (as shown below). In this way, dust inside guide flanges will be blown out, which is good for maintenance of drill rod, guide flange and cylinder.



Special tips:

Hunan Unimate Heavy Industry Co., Ltd. shall undertake no responsibility for consequences caused by violation of the following provisions:

Refit and repair the pile breaker at will without permission of the Company;

Remove components & parts from or weld or add components & parts onto the pile breaker without permission of the Company;

Use drill rods or other accessories which are not supplied or recognized by the Company without its permission;

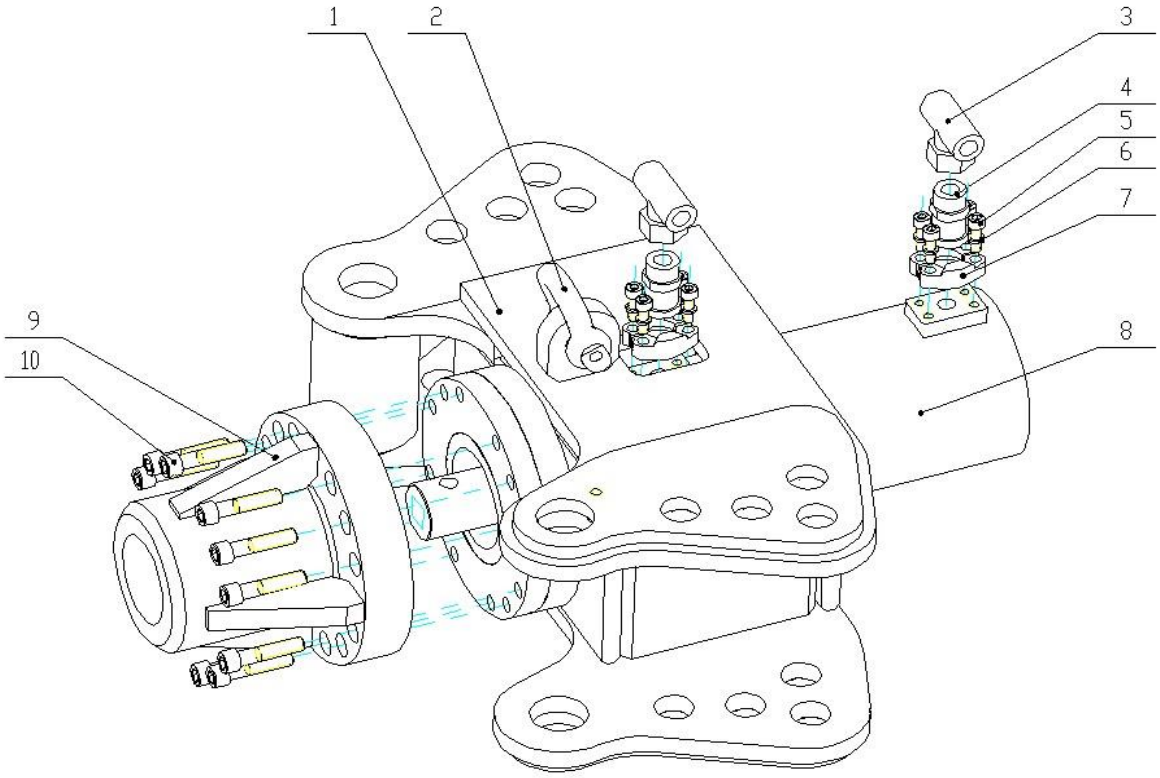
Fail to install, use and stop the pile breaker according to requirements of the service and repair manual;

Fail to maintain the pile breaker timely and effectively according the service and operation manual.

Chapter 6: SP800 Full- hydraulic Pile Breakers Parts Atlas

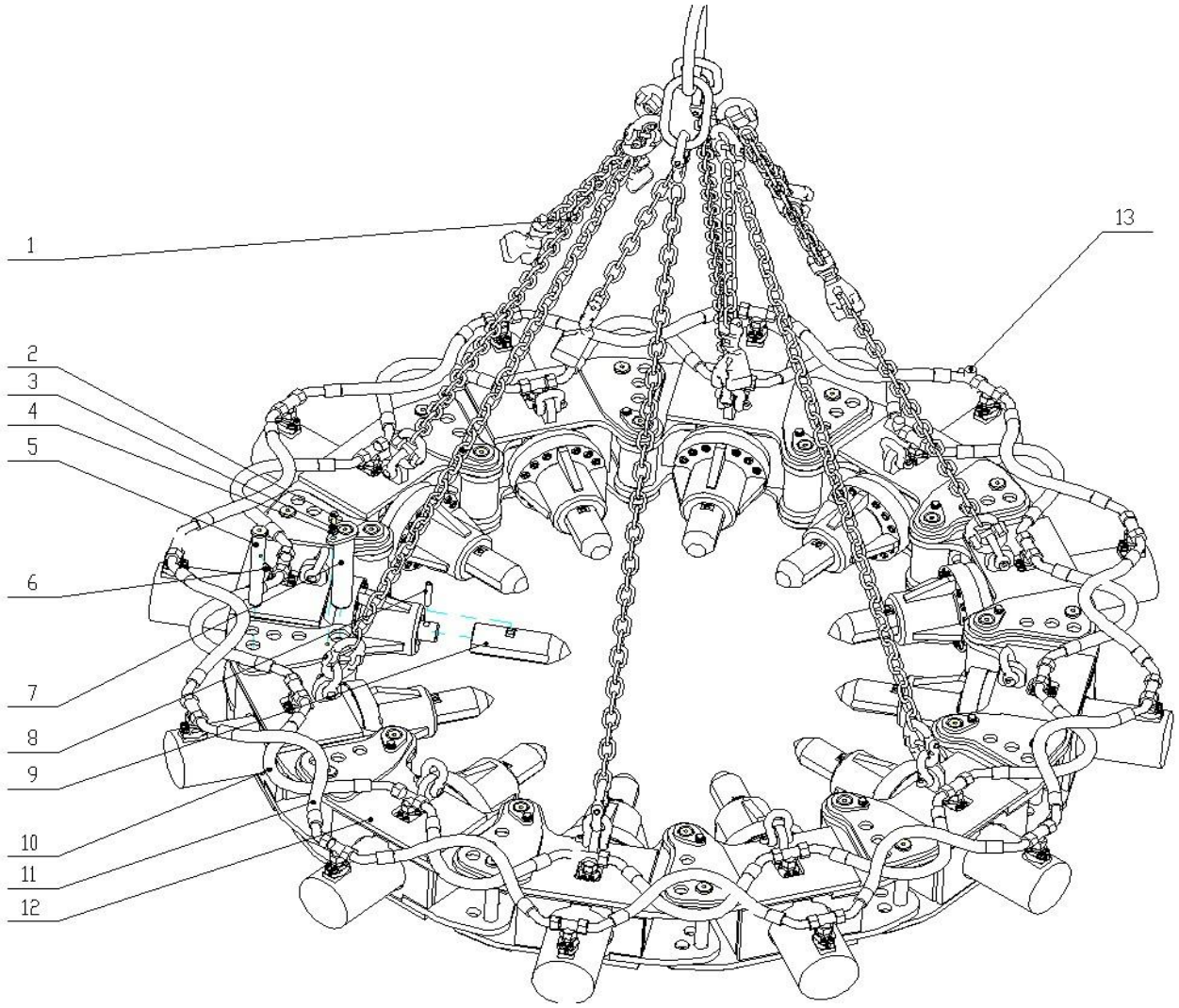
I. SP800 Hydraulic Pile Breakers Parts Atlas

1. Module Assembly SP800.1



NO.	CODE	DRAWING No.	NAME	QTY.
1		SP800.1.1	Module welding part	1
2			Bow shackle 3.25t	1
3			Pipe coupling	2
4			Pipe coupling	2
5			Screw M8×25 GB70.1	8
6			Gasket 8 GB93	8
7			Split flange	2
8		SP800.1.3	Cylinder	1
9		SP800.1.2	Flange	1
10			Screw M12×55 GB70.1	12
11				

2. Pile Breaker SP800



NO.	DRAWING No.	NAME	QTY.
1		Sling chain	1
2		Bolt M10×25 GB5783	12
3		Gasket 10 GB93	12
4		Gasket 10 GB97.1	12
5	SP800-2	Hinge pin	12
6		Screw M8×12 GB70.1	12
7	SP800.2	Hinge pin	12
8		Elastic cylindrical pin	12
9	SP800-1	Alloy head	12
10		Rubber hose	12
11		Rubber hose	12
12	SP800.1	Module assembly	12
13		Pipe coupling	2