ROTHENBERGER

ROWELD® E SERIES

PLASTIC PIPE WELDING TECHNOLOGIES

# BUTT FUSION WELDING MACHINE

# Instruction Manual

- SHD160
- SHD250
- SHD315
- SHD355
- SHD450
- SHD500
- SHD630
- SHD800
- SHD1000
- SHD1200
- SHDS110
- SHDS160A2
- SHDS160A4
- SHDS160B4
- SHDS200A2
- SHDS200A4
- SHDS200B4

# CONTENTS

# Brief

Along with the property of PE material continuous perfecting and raising, PE pipes are extensively used in gas and water supply, sewage disposal, chemical industry, mine and so on.

For more than ten years, our factory has been researching and developing SH series plastics pipe butt fusion machine that is suit for PE, PP, and PVDF. We have fulfilled the techniques requirements of ISO12176-1. Our products have outstanding features in convenience, reliability, safety and lower price.

Today, our products include nine kinds and over than 20 types that can be applied to plastics pipe construction and make fittings in workshop as follow:

* SHS series socket welder
* SJC series band saw
* SHDS series manual butt fusion machine
* SHG series workshop butt fusion machine
* SHD series butt fusion machine
* Series special tools
* SHDA series Auto-butt fusion machine
* SHM series saddle fusion machine

This manual is suit for SHD – 160/250/315 plastic pipe butt fusion welding machine. It's suggested to read and follow carefully the following safety rules and maintenance rules before operating the machine.

# Special Description

Before operating the machine, anyone should read this description carefully and keep it well to ensure the equipment and operator's safety, as well as others' safety.

2.1 The machine is used to weld pipes made from PE, PP, PVDF and can not be used to weld material without description, otherwise the machine may be damaged or some accident may be resulted in.

2.2 Don't use the machine in a place with potential hazard of explosion

2.3 The machine should be operated by responsible, qualified and trained personnel.

2.4 The machine should be operated on a dry area. The protective measures should be adopted when it is used in rain or on wet ground.

2.5 The machine is operated by 220V±10%, 50/60 Hz. If extended wire should be used, it should have enough lead section according its length.

2.6 Before using the machine, fill 46# hydraulic oil. Make sure the hydraulic oil is enough for working; the oil level should be 2/3 of the tank. Replace the iron oil tank cap by the red plastic air bleed cap or the pressure can not be hold.

# Safety

3.1 safety marks

The following marks are affixed to the machine:

Hot！ Keep distance from parts with this sign, for they are very hot!


Danger, Electrical shock
Parts with this sign have a danger of electricity leak. Be careful when working here.


No approaching! Moving parts can crush. Keep fingers, feet, arms, legs, and head out of the jaw area between the moving tables.


Caution, injure hand

Caution, heavy

3.2 Precautions for Safety

Take care when operating and transporting the machine according to all the safety rules in this instruction.

3.2.1 Notice when using

- The operator should be responsible and trained personnel.
- Completely inspect and maintain the machine per year for the safety and machine's reliability.
- Dirty and crowed work site would not only lower working efficiency, but cause accident easily, so it is important to keep work site clean and no other obstacles

3.2.2 Power

The electricity distribution box should have ground fault interrupter with relevant electricity safety standard. All safety protection devices are indicated by easily understandable words or marks.

Earthing: The whole site should share the same ground wire and the ground connection system should be completed and tested by professional people.

3.2.3 Connection of machine to power

The cable connecting machine to power should be mechanical concussion and chemical corrosion proof. If the extended wire is used, it must have enough lead section according to its length.

3.2.4 Storage of electrical equipment

For the min. dangers, all equipment must be used and stored correctly as follows:

※Avoid using temporary wire not complying with standard

※ Do not touch electrophorus parts

※ Forbid hauling off the cable to disconnect

※ Forbid hauling cables for lifting equipment

※ Do not put heavy or sharp object on the cables, and control the temperature of cable within limiting temperature (70℃)

※ Do not work in the wet environment. Check if the groove and shoes is dry.

※ Do not splash the machine

3.2.5 Check insulation condition of machine periodically

※ Check the insulation of cables specially the points extruded

※ Do not operate the machine under extreme condition.

※ Check if the leakage switch works well at least per week.

※ Check the earthing of the machine by qualified personnel

3.2.6 Clean and check the machine carefully

※Do not use materials (like abrasive, and other solvents) damaging the insulation easily when cleaning the machine.

※ Make sure the power is disconnected when finishing job.

※Make sure there is no any damage in the machine before reusing.

If only following above mentioned, the precaution can work well.

3.2.7 Starting

Make sure the switch of the machine is closed before powering it on.

3.2.8 Tightness of parts

Make sure the pipes are fixed correctly. Ensure that it can move well and prevent it from sliding down.

3.2.9 Work in environment with hazards

When work in a ditch, check if there is fender which stop the earth or stones from falling down to the machine, and also check if it has a water or other fluid leaking, if there be, the operator may get an electric shock.

When lift the machine to ditch, the weight of the machine should be within the rated lifting weight, and person is forbidden staying under the lifting arm.

Avoid using the machine in the environment full of paint, gas, smoke and deoil, since the infection of eyes and respiratory tract would be caused.

Do not put the machine in a dirty place.

3.2.12 Personnel safety while working

Remove jewelry and rings, and does not wear loose-fitting clothing avoid wearing shoe lace, long mustache or long hair that may be hooked into the machine

The following is the operation rules:

---Wear safety groove 

---Wear safety shoes 

---Dress work clothes 

---Wear safety glasses 

---Wear earmuffs 

3.2.14 Untrained person is not allowed to operate the machine anytime.

3.3. Potential Dangers

3.3.1 Butt fusion machine controlled by hydraulic unit:

This machine is only operated by professional person or others with a certificate for operation, otherwise unwanted accident maybe caused.

3.3.2 Heating Plate

The max temperature can reach 270℃, so the following things should be noticed:

------Wear safety groove 

-------Never touch the surface of the heating plate 

3.3.3 Planing tool

Before shaving the pipes, ends of pipes should be cleaned, especially clean the sand or other draff crowed around the ends. By doing this, the lifetime of edge can be prolonged, and also prevent the shavings are thrown out to danger people.

3.3.4 Basic Frame:

Make sure the pipes or fittings are fixed correctly to get the right alignment. When joining pipes, the operator should keep a certain space to the machine for personnel safety.

Before transporting, make sure all the clamps are fixed well and can not fall down during transportation.

Follow all the safety marks in the machine.

# 1. Applicable Range and Technical Parameter

| Type | SHD-160/63 | SHD250/63 | SHD315/90 | SHD355/90 |
|---|---|---|---|---|
| Materials | PE， PP，PVDF | | | |
| Max.range of diameter | 63~160mm | 63~250mm | 90~315mm | 90~355mm |
| Ambient temp. | －5～45℃ | | | |
| Power supply | ～220V±10 | | | |
| Total current | 10A | 17.5A | 22.1A | 26.6A |
| Total power | 2.45KW | 3.85KW | 4.85KW | 5.85KW |
| Include：Heating plate | 1KW | 2 KW | 3KW | 4KW |
| Planing tool motor | 0.7KW IP54 | 1.1 KW IP54 | 1.1KW IP54 | 1.1KW |
| Hydraulic unit motor | 0.75 kW IP54 | | | |
| Dielectric resistance | >1MΩ | | | |
| Max. Pressure | 6 MPa | | | |
| Total section of cylinders | 6.26 $cm^2$ | 10.98 $cm^2$ | 20 $cm^2$ | 20 $cm^2$ |
| Volume of oil box | 3L | | | |
| Hydraulic oil | 40～50（kinematic viscosity)$mm^2/s$, 40℃ | | | |
| Undesired sound | <70 dB | | | |
| Max.Temperature of heating plate | 270℃ | | | |
| Difference in surface temperature of heating plate | ±5℃ | | | |
| Weight | 106 kg | 130 kg | 202.6 kg | 260 kg |

* The special voltage is based on the actual voltage.

# 2. Descriptions

The machine consists of basic frame, hydraulic unit, heating plate, Planing tool, and support.

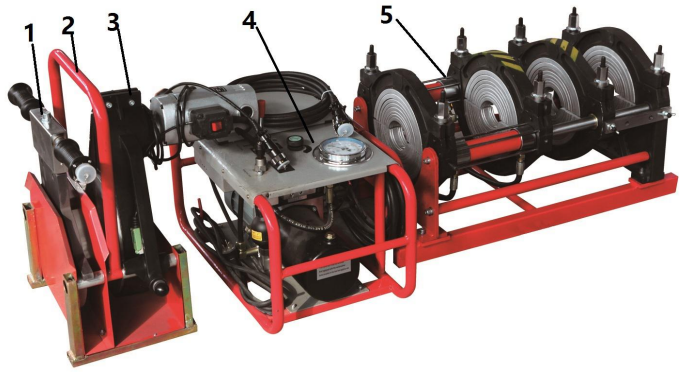



Figure .1

1. Heating plate 2.Support 3. Planing tool 4.Hydraulic unit 5. Basic frame

2.1 Basic Frame

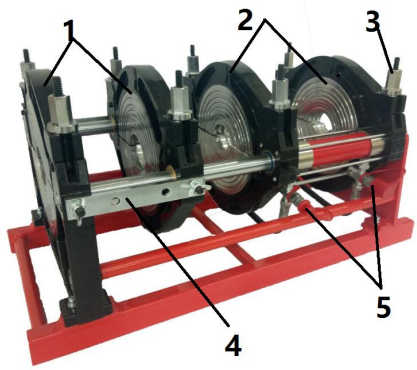



Figure .2

1. Main clamp 2. Stub end device 3. Adjust screw 4. Cylinder 5. Connection

2.2 Hydraulic Unit

2.2.1 Hydraulic unit

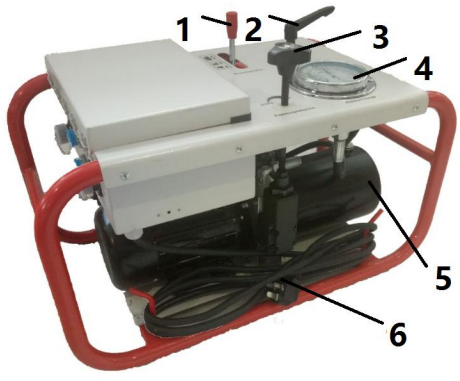



Figure.3

1. Direction valve 2. Pressure regulation valve 3. Pressure gauge

4. Swing check valve 5. Oil tank 6. Power cable

2.2.2 Hydraulic unit operation panel

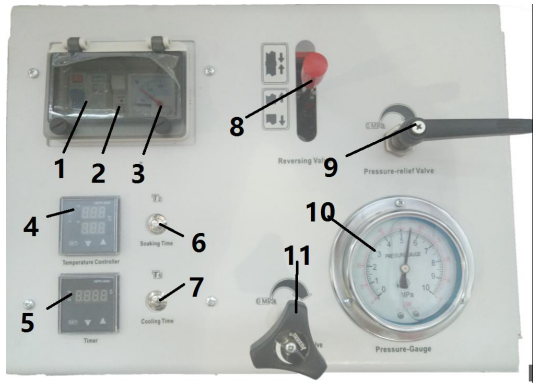



Figure .4

| | | | | | |
|---|---|---|---|---|---|
| 1.Switch | 2.Fuse | 3. Voltmeter | 4. Temperature controller | 5.Timer | 6.Endothermic time button |
| 7.Cooling time button | 8.Direction valve | 9.Pressure relief valve | 10. Pressure gauge | 11.Pressure regulation valve | |

2.2.3 Hydraulic unit sockets

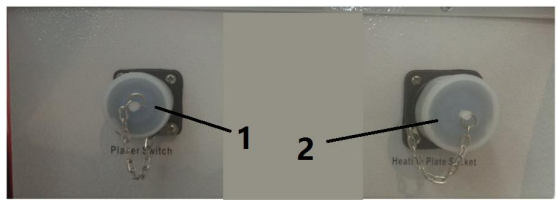



Figure 5

1. Planning tool socket 2. Heating plate socket

# 3. Instruction for Use

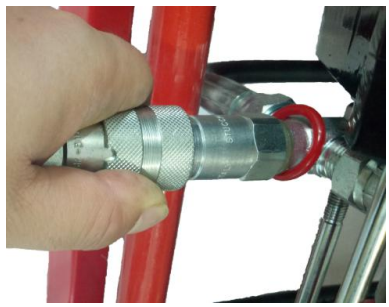
3.1 The whole equipment should be placed on a stable and dry plane to operate.

3.2 Before operation make sure the following things:

- The machine is in good conditions
- The power complies with the requirements according to the butt fusion machine
- Power line is not broken or worn
- All instruments are normal
- The blades of planning tool are sharp
- All necessary parts and tools are available

3.3 Connection and preparation

3.3.1 Connect the basic frame to hydraulic unit by quick couplers.



3.3.2 Connect the heating plate to the hydraulic unit with the special cable.

Connection the cable with electrical box

Connection between the cable and heating plate

3.3.3 Install appropriate inserts to frame according to the outside diameter of pipes/fittings.

3.3.4 According to the requirements of fitting and welding process, set the temperature in temperature controller and set time in timer. (See section 7 this manual).

3..4 Welding Steps

3.4.1 Pipes

Before welding, firstly, check if the material and its pressure grade are the required ones. Secondly check if there are scratches or fissures on the surface of pipes/fittings. If the depth of scratches or fissures exceeds 10% of the wall thickness, cut the section of scratches or fissures. Clean the pipe end's surfaces with clean cloth to keep the pipe's ends clean.

3.4.2 Clamping

Place the pipes/fittings in inserts of frame and keep the ends to be welded be the same length (no effect on the planning and heating of the pipe). The pipe out of the basic frame should be supported to the same central axial of clamps. Fasten the screws of clamps to fix the pipes/fittings.

3.4.3 Adjust the pressure

Open fully the pressure regulation valve completely, lock the swing check valve tightly and then push forward the direction valve meanwhile adjust the pressure regulation valve till the cylinder begin to move, at this point the pressure in the system is the drag pressure.

Open the pressure regulation valve completely, lock the swing check valve tightly and then push forward the direction valve meanwhile adjust the pressure regulation valve to set the system pressure equals to drag pressure add butting pressure.

3.4.4 Planing

Open the pipes/fittings ends after turning swing check valve anti-clockwise to the end. Put the planning tool between the pipes/fittings ends and switch it on, close the pipes/fittings ends by acting on the direction valve meanwhile slowly turn swing check valve clockwise until there are continuous shavings appearing on both sides. Turn the swing valve anti clockwise to relief the pressure, in a moment later open the frame, switch off the planing tool and remove it.

Close the pipes/fitting ends and checks the alignment of them. The maximal misalignment should not exceed 10% of the wall thickness, and it could be improved by loosening or tightening the screws of clamps. The gap between two pipe ends should not exceed 10% of wall thickness; otherwise the pipes/fittings should be planed again.

Caution: The shavings thickness should be within 0.2~0.5 mm and it can be adjusted by adjusting the height of the planning tool blades.

3.4.5 Heating

Clear the dust or slit on the surface of heating plate (Caution: Don't damage PTFE layer on the surface of heating plate.), and make sure the temperature has reached the required one.

Put the heating plate between the pipe ends after it reaches required temperature. Close the pipes/fittings ends by operating direction valve and raise the pressure to specified pressure by swinging pressure regulation valve till the bead reaches specified height.

Turn swing check valve anti-clockwise to reduce the pressure (not more than drag pressure) and turn swing check valve in clockwise direction to the end.

Press the button "$T_2$" , the soaking time begins to count and the time will count down to zero by second, then the buzzer will buzz（see section 7）

3.4.6 Joining and cooling

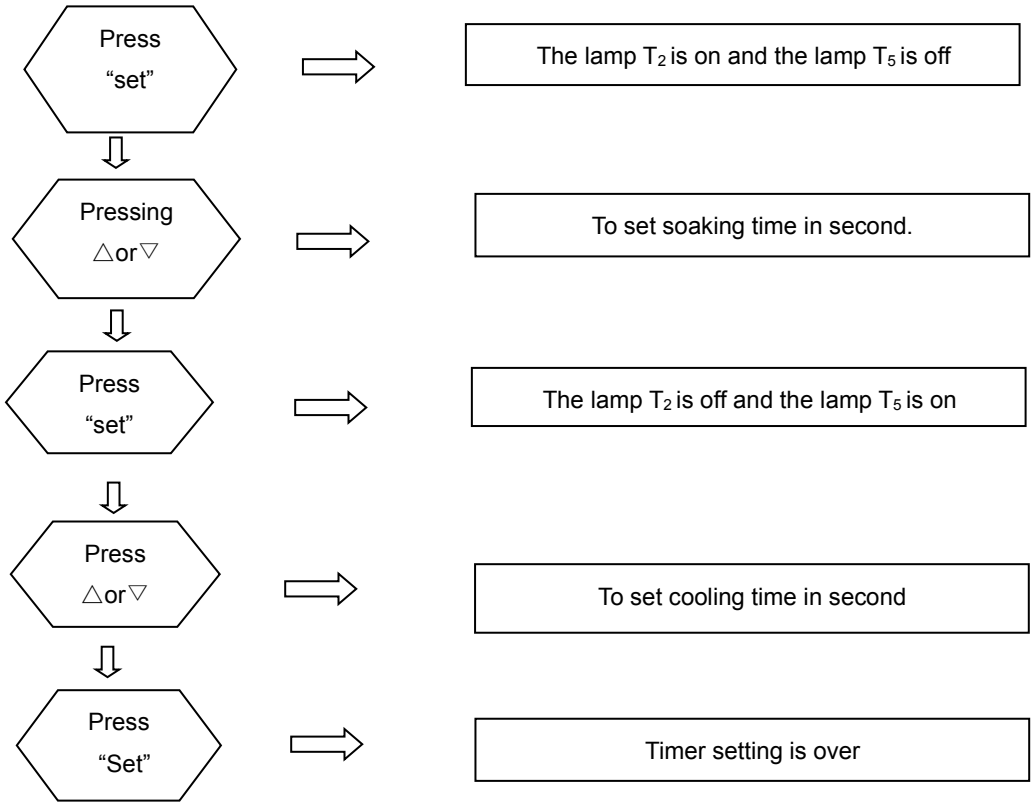
Open the frame and take out the heating plate and close two melting ends as quickly as possible.

Keep the bar of direction valve on the close position for 2~3 minutes, put the bar of direction valve on middle position and press the button （"T5"） to count cooling time until it is over. At this point, the machine will give an alarm again. Relief the pressure, loose the screw of clamps and then take out the jointed pipes.

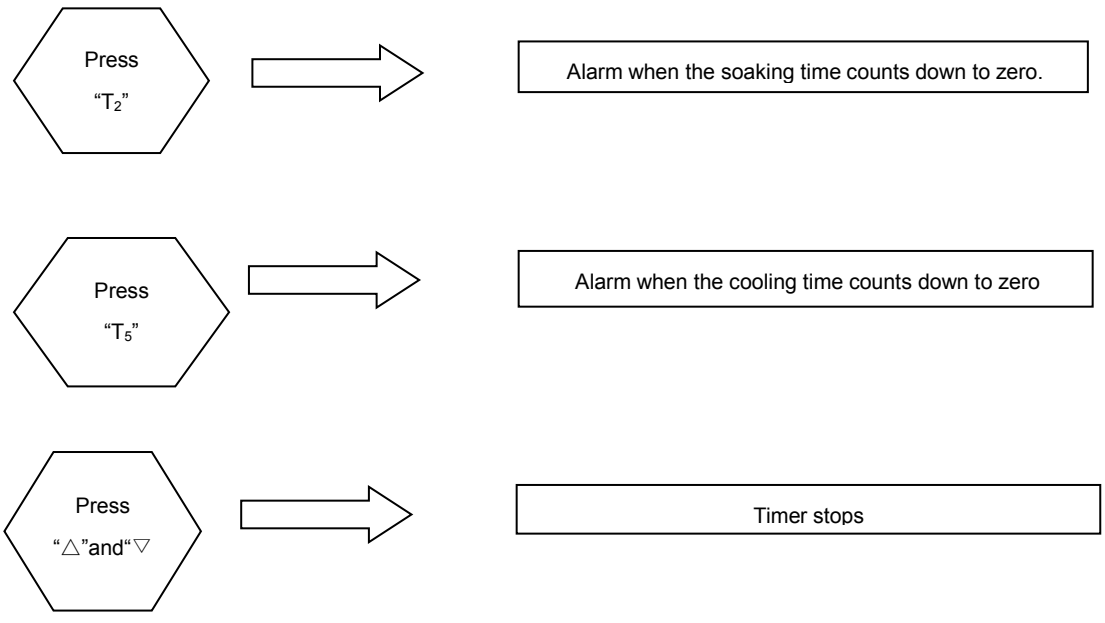
# 4.Timer and Temperature Controller

If one of the parameters is changed, such as outside diameter, SDR or material of pipes, the soaking time and cooling time should be reset according to the welding standard.

4.1 Timer setting




4.2 Instruction for Use



4.3 Temperature controller setting

（1）Temperature controller setting

Switch on

⇩

Press “SET” for more than 4 seconds till “Sd” is shown in the upper window

⇩

Press “△” or “▽”key, enter the setting temperature, and press "SET" to confirm

（2）Deviation Correction of temperature Control instrument

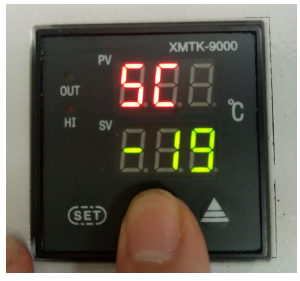
Switch on


Press “SET” for more than 3 seconds till “SI” is shown in the upper window



Press “SET” till “SC” is shown in the upper window


Press “△” or “▽”key, enter temperature correction value, press "SET" key to confirm

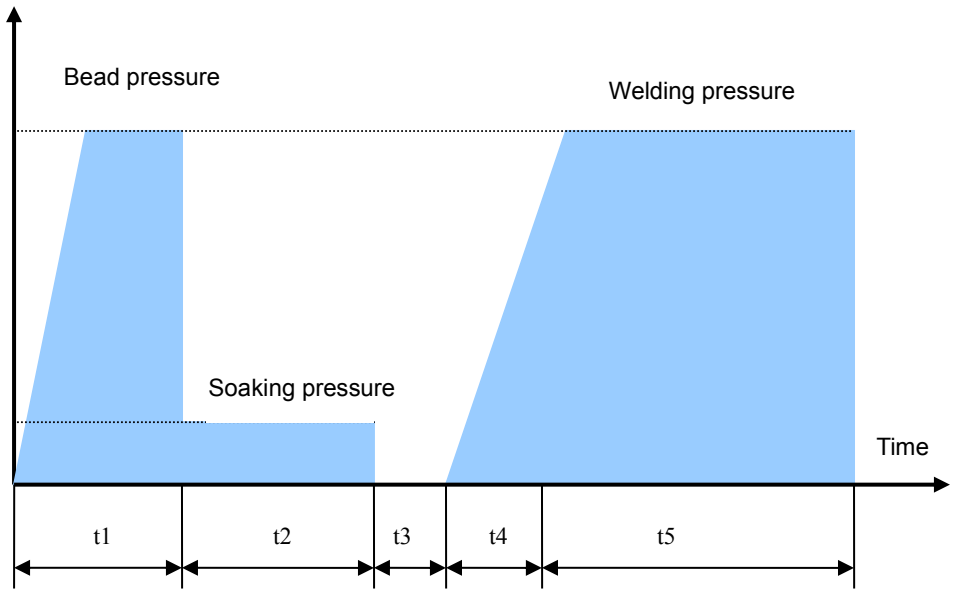



# 5.Reference of Welding Standard（DVS2207-1-1995）

5.1 Because of difference in welding standard and PE material, the time and pressure vary in different phases of welding. It suggests that the actual welding parameters should be offered by pipes and fittings' manufacturers.

5.2 Given welding temperature of pipes made from PE、PP and PVDF by DVS standard ranges from180℃ to 270℃. Application temperature of heating plate is within 180～230℃, and its max. surface temperature can reach 270℃.

5.3 Reference standard DVS2207-1-1995




| Pipe diameter | Wall thickness | Bead build-up pressure | Bead height | Soaking pressure | Soaking time | Change-over time | Pressure build -up time | Welding pressure | Cooling time |
|---|---|---|---|---|---|---|---|---|---|
| D | e | P1 | H | P2 | t2 | t3 | t4 | P3 | t5 |

Bead build-up pressure ）Welding pressure =（P1）P3+Drag pressure

$$\text{welding pressure} = \frac{\text{Section of welding pipe ends}}{\text{Total section of cylinders}} \times 0.15 + \text{Drag pressure（MPa）}$$

Section of welding pipe ends = 3.14 ×(Pipe diameter − Wall thickness）× Wall thickness

Note:The drag pressure is not more than 50% of the welding pressure.

# 6.Malfunctions Analyses and Solutions

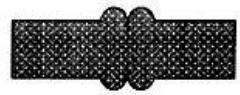
6.1 Frequent joints quality problems analyze:

- Visually check：round bead, good joint

- Narrow and fall bead. Too high pressure while welding

- Too small bead. Pressure is not enough while welding

- There is a ditch between the welding surfaces. Temperature is not enough or change-over time is too long while welding.



- High & low bead. Different heating time or fusion temperature causes that.

- Misalignment. Welding under the condition that the misalignment exceeds 10% of pipe wall thickness while align the two ends.

6.2.2 Maintenance & Inspection

Ordinary inspection

| Item | Description | Inspect before use | First month | Every 6 months | Every year |
|---|---|---|---|---|---|
| Planning tool | Mill or replace the blade | | | | ● |
| | Replace the cable if it is broken | ● | | | ● |
| | Retighten mechanical connections | ● | ● | | |
| Heating plate | | ● | | | |
| | Rejoined the cable and socket | ● | | | ● |
| | Clean surface of heating plate, recoat PTFE layer again if necessary | ● | | | |
| | Retighten mechanical connections | | ● | | |
| Temp. control system | Checkout the temperature indicator | | | | ● |
| | Replace the cable if it is broken | ● | | | ● |
| Hydraulic system | Checkout pressure gauge | | | | ● |
| | Replace seals if the hydraulic unit is leak | | | | ● |
| | Clean the filter | | | | |
| | Make sure the oil is enough for operation | ● | | | ● |
| | Change the hydraulic oil | ● | | | ● |
| | Replace if the oil hose is breakage | ● | | ● | |
| Basic Frame | Retighten screws in the end of frame axis | ● | ● | ● | |
| | Spray antirust paint again if necessary | | | | ● |
| Power Supply | Press the testing button of circuit protector to make sure it can working normally | ● | | | |
| | Replace the cable if it is broken | ● | | | |
| | | | | ● | |

"●"…… maintenance period

6.3 Frequent malfunction analyses and solutions

During the using, hydraulic unit and electrical units may appear some problems. Frequent malfunction is listed as follows:

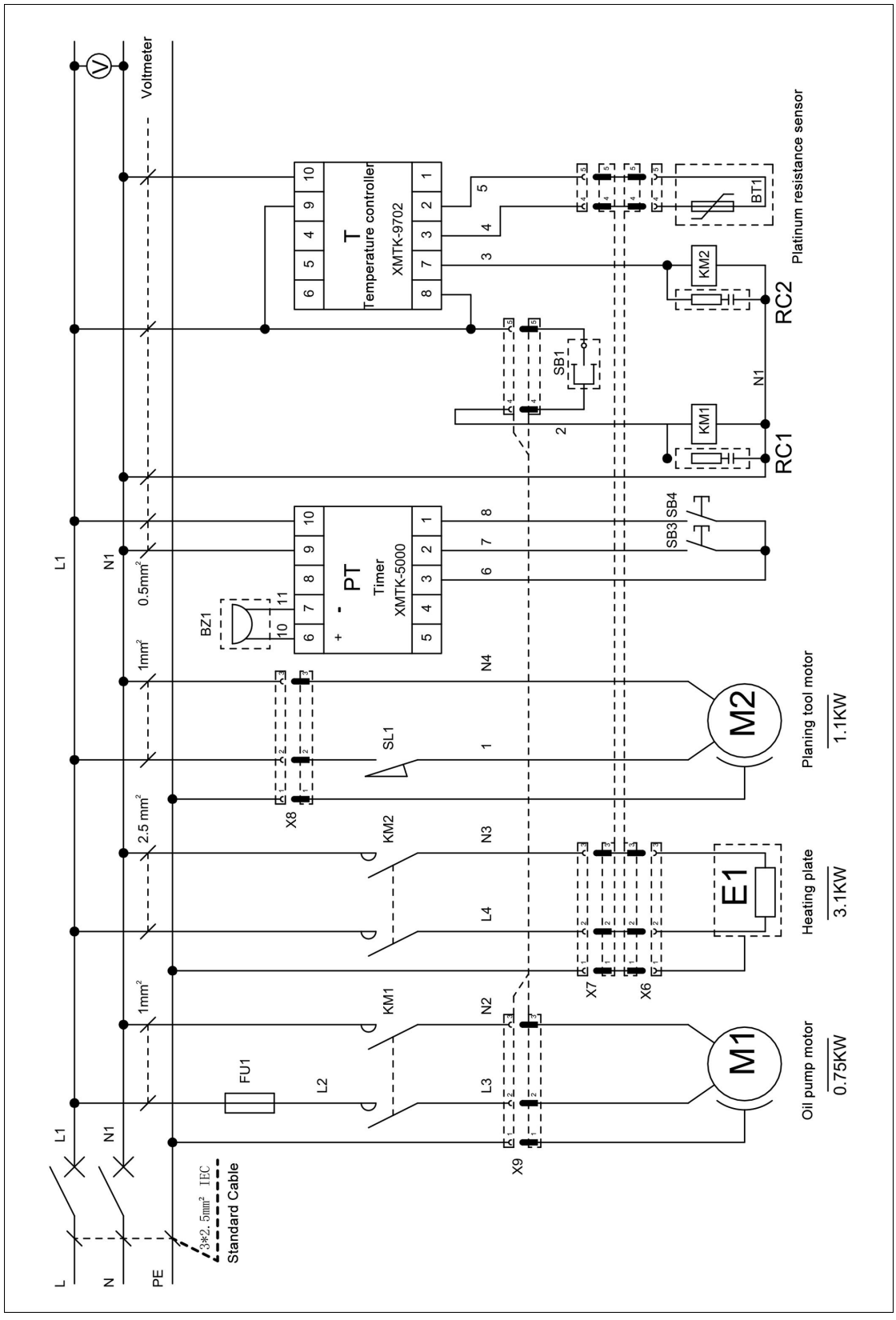
Please use tools attached, spare parts or other tools with a safety certificate while maintain or replace parts. Tools and spare parts without safety certificate are forbidden to be used.

| Malfunctions of hydraulic unit | | | |
|---|---|---|---|
| No | malfunction | malfunction analyzes | Solutions |
| 1 | The pump motor does not work | 1. switch is fault.<br>2. Power source is not connected well.<br>3. The socket inside connection is loosen<br>4. The machine is not grounded correctly | 1. Check the switch<br>2. Connect the power well<br>3. Check the connection<br>4. Check the earthing connection |
| 2 | The pump motor rotate too slowly with abnormality noise | 1. The motor is overloaded<br>2. The motor is fault<br>3. The oil filter is blocked<br>4. The working voltage is instable | 1. Make sure the motor load is less that 3 MPa<br>2. Repair or replace the pump<br>3. Clean the filter<br>4. Check the instability of power |
| 3 | The cylinder works abnormally | 1. The direction valve is damaged<br>2. There is air in system<br>3. The system pressure is too low<br>4. The quick coupler is blocked<br>5. The pressure relief valve is not locked | 1. Replace the direction valve.<br>2. Move the cylinder several times to outgo the air.<br>3. Adjust the system pressure<br>4. Replace the quick coupler<br>5. Lock the valve |
| 4 | Cylinder leak | 1. The oil ring is fault<br>2. The cylinder or piston is damaged badly | 1. Replace the oil ring<br>2. Replace the cylinder |
| 5 | The pressure can not be increased or the fluctuation is too big | 1. The core of overflow valve is blocked.<br>2. The pump is leak.<br>3. The joint slack of pump is loosened or key groove is skid.<br>4. 4. The pressure relief valve is not locked | 1. Clean or replace the core of over-flow valve<br>2. Replace the pump<br>3. Replace the joint slack<br>4. 4. Lock the valve |

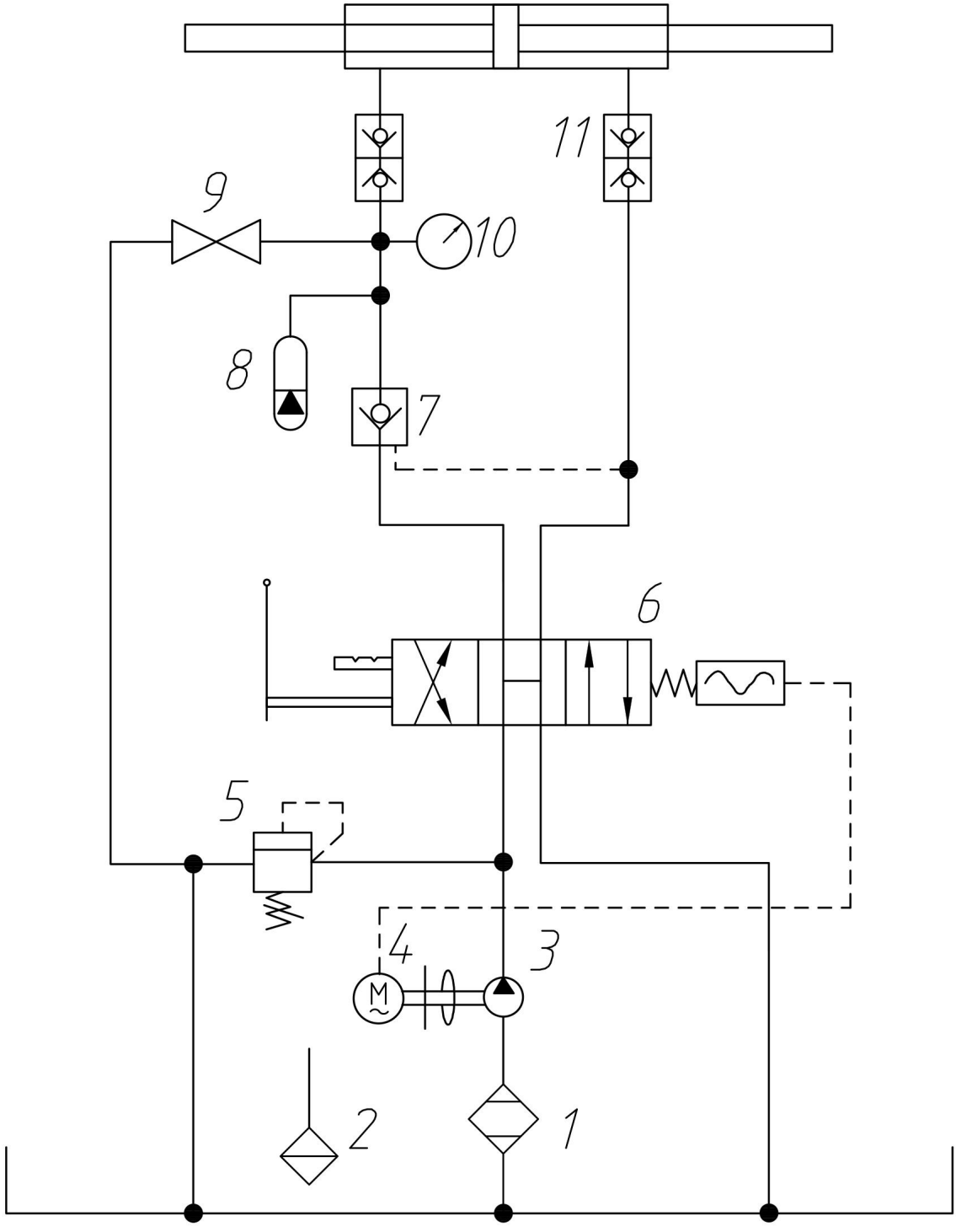
| Malfunctions of electrical units | | | |
|---|---|---|---|
| 1 | The machine does not work | 1. The power cable is damaged<br>2. Source power is abnormal<br>3. The ground fault switch is closed | 1. Check the power cable<br>2. Check the working power<br>3. Open the ground fault interrupter |
| 2 | Ground fault switch trips | 1. Power cable of heating plate, the motor of pump and planing tool may be damaged<br>2. Electrical components are t affected with damp<br>3. The higher-up power has not a ground fault safety device | 1. Check the power cables<br>2. Check the electrical elements.<br>3. Check the higher-up power safety device |
| 3 | Abnormal temperature increasing | 1. The temperature controller switch is open<br>2. The sensor （pt100）is abnormal. The resistance value of4 and 5 of heating plate socket should be within 100~183**Ω**<br>3. The heating stick inside heating plate is abnormal. The resistances between 2and 3 should be within23**Ω**. Insulation resistance between head of heating stick and outside shell must be more than 1M**Ω**<br>4. Should the temperature controller readings be more than 300℃, which suggest he sensor may be damaged or the connection is loosen. Should the temperature controller indicate LL, which suggests the sensor have a short circuit. Should the temperature controller indicate HH, which suggests the circuit of sensor is open.<br>5. Correct the temperature by button located on the temperature controller.<br>6. The temperature fluctuate abnormally | 1. Check the connection of contactors<br>2. Replace the sensor<br>3. Replace the heating plate<br>4. Replace the temperature controller<br>5. Refer to the methods to set the temperature<br>6. Check and replace the contactors if necessary |
| 4 | Lose of control when heating | The red light is shine, but the temperature still goes up, that is because the connector is fault or the joints 7 and 8 can not open when get the required temperature. | Replace the temperature controller |
| 5 | Planing tool does not rotate | The limit switch is ineffective or the mechanical parts of planing tool are clipped. | Replace the planning tool limit switch or minor sprocket |

# 7.Electrical draw diagram and Hydraulic schematic diagram

7.1 Electrical draw diagram



7.2 Hydraulic schematic diagram



# 8.Accessories list

**SHD 160/63 Butt fusion welding machine**

| Item | Description | Unit | Qty | Remark |
|---|---|---|---|---|
| 1 | Basic frame | set | 1 | 4pcs bottom clamp |
| 2 | Inserts | set | 1 | Φ140,Φ125 ,Φ110 ,Φ90,Φ75,Φ63 |
| 3 | Stub end device for short flange | set | | Optional |
| 4 | Single clamp | set | | Optional |
| 5 | Hydraulic unit | set | 1 | Include 2pcs high-pressure oil hose |
| 6 | Support | set | 1 | |
| 7 | Planing tool | set | 1 | |
| 8 | Heating plate | set | 1 | Include 1 pcs connecting cable of heating plate |
| Attachment with machine | | | | |
| 1 | Special bolt for clamp （M6） | Set | 1 | L= 15、20、30、40、45、55 (10pcs/each spec) |
| 2 | Double open wrench | Pcs | 1 | 22X24 |
| 3 | Cross screwdriver | Pcs | 1 | 6#*150 |
| 4 | Special screw bolt | Set | 2 | SHD250 |
| 5 | Fuse | Pcs | 1 | 10A |
| 6 | Oil plug | pcs | 1 | |
| 7 | Cutter of planning tool | Pcs | 2 | SHD160 |
| 8 | Tool box | Pcs | 1 | |
| 9 | Product qualification certificate | pcs | 1 | |
| 10 | Operation instruction | Pcs | 1 | |

**SHD 250/63Butt fusion welding machine**

| Item | Description | Unit | Qty | Remark |
|---|---|---|---|---|
| 1 | Basic frame | set | 1 | 4pcs bottom clamp |
| 2 | Inserts | set | 1 | Φ225,Φ200,Φ180,Φ160,Φ140,Φ125 ,Φ110 ,Φ90,Φ75,Φ63 |
| 3 | Stub end device for short flange | set | | Optional |
| 4 | Single clamp | set | | Optional |
| 5 | Hydraulic unit | set | 1 | Include 2pcs high-pressure oil hose |
| 6 | Support | set | 1 | |
| 7 | Planing tool | set | 1 | |
| 8 | Heating plate | set | 1 | Include 1 pcs connecting cable of heating plate |
| Attachment with machine | | | | |
| 1 | Special bolt for clamp （M6） | Set | 1 | L= 15、30、40、50、60、70、80、85、95、100 (10pcs/each spec) |
| 2 | Double open wrench | Pcs | 1 | 22X24 |
| 3 | Cross screwdriver | Pcs | 1 | 6#*150 |
| 4 | Special screw bolt | Set | 2 | SHD250 |
| 5 | Fuse | Pcs | 1 | 10A |
| 6 | Oil plug | pcs | 1 | |
| 7 | Cutter of planning tool | Pcs | 2 | SHD250 |
| 8 | Tool box | Pcs | 1 | |
| 9 | Product qualification certificate | pcs | 1 | |
| 10 | Operation instruction | Pcs | 1 | |

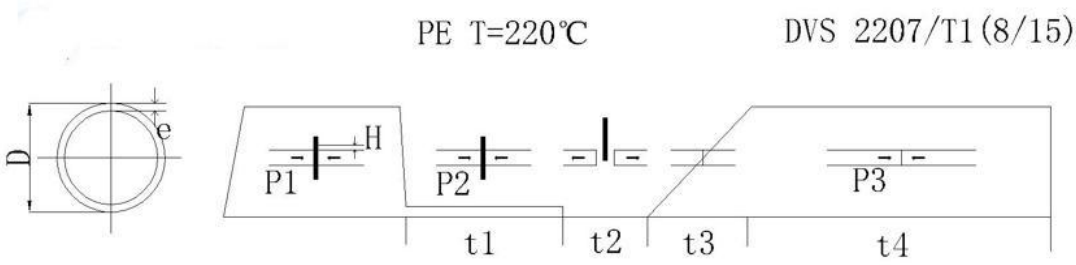
**SHD 315/90 Butt fusion welding machine**

| Item | Description | Unit | Qty | Remark |
|---|---|---|---|---|
| 1 | Basic frame | set | 1 | 4pcs bottom clamp |
| 2 | Inserts | set | 1 | Φ280,Φ250,Φ225,Φ200,Φ180, Φ160,Φ140,Φ125 ,Φ110 ,Φ90 |
| 3 | Stub end device for short flange | set | | Optional |
| 4 | Single clamp | set | | Optional |
| 5 | Hydraulic unit | set | 1 | Include 2pcs high-pressure oil hose |
| 6 | Support | set | 1 | |
| 7 | Planing tool | set | 1 | |
| 8 | Heating plate | set | 1 | Include 1 pcs connecting cable of heating plate |
| Attachment with machine | | | | |
| 1 | Special bolt for clamp （M6） | Set | 1 | L= 20、35、50、65、80、85、95、100、110、120 (10pcs/each spec) |
| 2 | Double open wrench | Pcs | 1 | 30X32 |
| 3 | Cross screwdriver | Pcs | 1 | 6#*150 |
| 4 | Special screw bolt | Set | 2 | SHD315 |
| 5 | Fuse | Pcs | 1 | 10A |
| 6 | Oil plug | pcs | 1 | |
| 7 | Cutter of planning tool | Pcs | 2 | SHD315 |
| 8 | Tool box | Pcs | 1 | |
| 9 | Product qualification certificate | pcs | 1 | |
| 10 | Operation instruction | Pcs | 1 | |

**SHD 355/90 Butt fusion welding machine**

| Item | Description | Unit | Qty | Remark |
|---|---|---|---|---|
| 1 | Basic frame | set | 1 | 4pcs bottom clamp |
| 2 | Inserts | set | 1 | Φ315,Φ280,Φ250,Φ225,Φ200,Φ180,Φ160,Φ140,Φ125 ,Φ110 ,Φ90 |
| 3 | Stub end device for short flange | set | | Optional |
| 4 | Single clamp | set | | Optional |
| 5 | Hydraulic unit | set | 1 | Include 2pcs high-pressure oil hose |
| 6 | Support | set | 1 | |
| 7 | Planing tool | set | 1 | |
| 8 | Heating plate | set | 1 | Include 1 pcs connecting cable of heating plate |
| Attachment with machine | | | | |
| 1 | Special bolt for clamp （M6） | Set | 1 | L= 25、40、55、70、80、95、100、110、120、130、140 (10pcs/each spec) |
| 2 | Double open wrench | Pcs | 1 | 30X32 |
| 3 | Cross screwdriver | Pcs | 1 | 6#*150 |
| 4 | Special screw bolt | Set | 2 | SHD315 |
| 5 | Fuse | Pcs | 1 | 10A |
| 6 | Oil plug | pcs | 1 | |
| 7 | Cutter of planning tool | Pcs | 2 | SHD355 |
| 8 | Tool box | Pcs | 1 | |
| 9 | Product qualification certificate | pcs | 1 | |
| 10 | Operation instruction | Pcs | 1 | |

# Welding parameter




**SHD160 （Cylinder area=6.26cm²）**

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 63 | 9 | 7.0 | 2.9 | 1 | 0.2 | 70 | 6 | 6 | 2.9 | 9.5 |
| | 11 | 5.7 | 2.5 | 1 | 0.2 | 57 | 5 | 5 | 2.5 | 8.5 |
| | 13.6 | 4.6 | 2.0 | 1 | 0.1 | 46 | 5 | 5 | 2.0 | 6.5 |
| | 17 | 3.7 | 1.7 | 0.5 | 0.1 | 37 | 5 | 5 | 1.7 | 6.5 |
| | 17.6 | 3.6 | 1.6 | 0.5 | 0.1 | 36 | 5 | 5 | 1.6 | 6.5 |
| | 21 | 3.0 | 1.4 | 0.5 | 0.1 | 30 | 5 | 5 | 1.4 | 6.5 |
| | 26 | 2.4 | 1.1 | 0.5 | 0.1 | 24 | 5 | 5 | 1.1 | 6.5 |
| | 33 | 1.9 | 0.9 | 0.5 | 0.1 | 19 | 5 | 5 | 0.9 | 6.5 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 75 | 9 | 8.3 | 4.2 | 1.5 | 0.3 | 83 | 6 | 6 | 4.2 | 10.5 |
| | 11 | 6.8 | 3.5 | 1 | 0.2 | 68 | 5 | 5 | 3.5 | 9.5 |
| | 13.6 | 5.5 | 2.9 | 1 | 0.2 | 55 | 5 | 5 | 2.9 | 8 |
| | 17 | 4.4 | 2.3 | 0.5 | 0.2 | 44 | 5 | 5 | 2.3 | 6.5 |
| | 17.6 | 4.3 | 2.3 | 0.5 | 0.2 | 43 | 5 | 5 | 2.3 | 6.5 |
| | 21 | 3.6 | 1.9 | 0.5 | 0.1 | 36 | 5 | 5 | 1.9 | 6.5 |
| | 26 | 2.9 | 1.6 | 0.5 | 0.1 | 29 | 5 | 5 | 1.6 | 6.5 |
| | 33 | 2.3 | 1.2 | 0.5 | 0.1 | 23 | 5 | 5 | 1.2 | 6.5 |

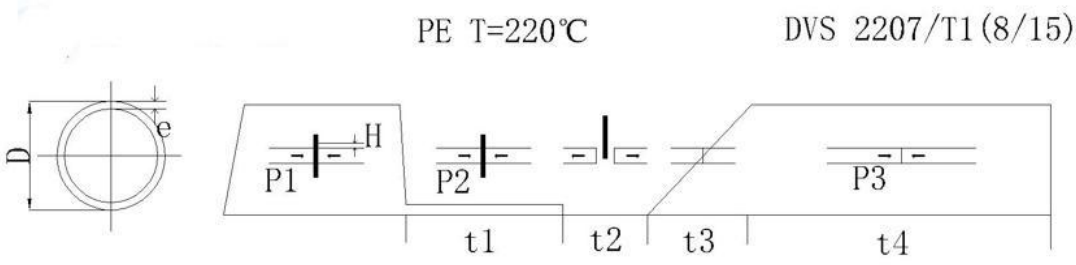
| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 9 | 10.0 | 6.0 | 1.5 | 0.4 | 100 | 7 | 7 | 6.0 | 12 |
| | 11 | 8.2 | 5.0 | 1.5 | 0.3 | 82 | 6 | 6 | 5.0 | 10.5 |
| | 13.6 | 6.6 | 4.2 | 1 | 0.3 | 66 | 6 | 6 | 4.2 | 9 |
| | 17 | 5.3 | 3.4 | 1 | 0.2 | 53 | 5 | 5 | 3.4 | 8 |
| | 17.6 | 5.1 | 3.3 | 1 | 0.2 | 51 | 5 | 5 | 3.3 | 7 |
| | 21 | 4.3 | 2.8 | 0.5 | 0.2 | 43 | 5 | 5 | 2.8 | 6.5 |
| | 26 | 3.5 | 2.3 | 0.5 | 0.2 | 35 | 5 | 5 | 2.3 | 6.5 |
| | 33 | 2.7 | 1.8 | 0.5 | 0.1 | 27 | 5 | 5 | 1.8 | 6.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 110 | 9 | 12.2 | 9.0 | 2 | 0.6 | 122 | 8 | 8 | 9.0 | 15.5 |
| | 11 | 10.0 | 7.5 | 1.5 | 0.5 | 100 | 7 | 7 | 7.5 | 12 |
| | 13.6 | 8.1 | 6.2 | 1.5 | 0.4 | 81 | 7 | 7 | 6.2 | 10.5 |
| | 17 | 6.5 | 5.0 | 1 | 0.3 | 65 | 6 | 6 | 5.0 | 9 |
| | 17.6 | 6.3 | 4.9 | 1 | 0.3 | 63 | 6 | 6 | 4.9 | 9 |
| | 21 | 5.2 | 4.1 | 1 | 0.3 | 52 | 5 | 5 | 4.1 | 7 |
| | 26 | 4.2 | 3.4 | 0.5 | 0.2 | 42 | 5 | 5 | 3.4 | 6.5 |
| | 33 | 3.3 | 2.7 | 0.5 | 0.2 | 33 | 5 | 5 | 2.7 | 6.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 125 | 9 | 13.9 | 11.6 | 2 | 0.8 | 139 | 8 | 8 | 11.6 | 18 |
| | 11 | 11.4 | 9.7 | 1.5 | 0.6 | 114 | 8 | 8 | 9.7 | 14 |
| | 13.6 | 9.2 | 8.0 | 1.5 | 0.5 | 92 | 7 | 7 | 8.0 | 11 |
| | 17 | 7.4 | 6.5 | 1.5 | 0.4 | 74 | 6 | 6 | 6.5 | 10 |
| | 17.6 | 7.1 | 6.3 | 1.5 | 0.4 | 71 | 6 | 6 | 6.3 | 9.5 |
| | 21 | 6.0 | 5.3 | 1 | 0.4 | 60 | 6 | 6 | 5.3 | 8.5 |
| | 26 | 4.8 | 4.3 | 0.5 | 0.3 | 48 | 5 | 5 | 4.3 | 7 |
| | 33 | 3.8 | 3.5 | 0.5 | 0.2 | 38 | 5 | 5 | 3.5 | 6.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 140 | 9 | 15.6 | 14.6 | 2 | 1.0 | 156 | 9 | 9 | 14.6 | 21 |
| | 11 | 12.7 | 12.2 | 2 | 0.8 | 127 | 8 | 8 | 12.2 | 16.5 |
| | 13.6 | 10.3 | 10.0 | 1.5 | 0.7 | 103 | 7 | 7 | 10.0 | 12 |
| | 17 | 8.2 | 8.2 | 1.5 | 0.5 | 82 | 6 | 6 | 8.2 | 10.5 |
| | 17.6 | 8.0 | 7.9 | 1.5 | 0.5 | 80 | 6 | 6 | 7.9 | 10.5 |
| | 21 | 6.7 | 6.7 | 1 | 0.4 | 67 | 6 | 6 | 6.7 | 9 |
| | 26 | 5.4 | 5.5 | 1 | 0.4 | 54 | 5 | 5 | 5.5 | 8 |
| | 33 | 4.2 | 4.3 | 0.5 | 0.3 | 42 | 5 | 5 | 4.3 | 6.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 160 | 9 | 17.8 | 19.0 | 2 | 1.3 | 178 | 10 | 10 | 19.0 | 23 |
| | 11 | 14.5 | 15.9 | 2 | 1.1 | 145 | 9 | 9 | 15.9 | 19 |
| | 13.6 | 11.8 | 13.1 | 1.5 | 0.9 | 118 | 8 | 8 | 13.1 | 15.5 |
| | 17 | 9.4 | 10.7 | 1.5 | 0.7 | 94 | 7 | 7 | 10.7 | 11 |
| | 17.6 | 9.1 | 10.3 | 1.5 | 0.7 | 91 | 7 | 7 | 10.3 | 11 |
| | 21 | 7.6 | 8.7 | 1.5 | 0.6 | 76 | 6 | 6 | 8.7 | 10 |
| | 26 | 6.2 | 7.1 | 1 | 0.5 | 62 | 6 | 6 | 7.1 | 8.5 |
| | 33 | 4.8 | 5.7 | 1 | 0.4 | 48 | 5 | 5 | 5.7 | 7 |




**SHD250 （Cylinder area=10.98cm²）**

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 63 | 9 | 7.0 | 2.5 | 1 | 0.2 | 70 | 6 | 6 | 2.5 | 9.5 |
| | 11 | 5.7 | 2.1 | 1 | 0.1 | 57 | 5 | 5 | 2.1 | 8.5 |
| | 13.6 | 4.6 | 1.7 | 1 | 0.1 | 46 | 5 | 5 | 1.7 | 6.5 |
| | 17 | 3.7 | 1.4 | 0.5 | 0.1 | 37 | 5 | 5 | 1.4 | 6.5 |
| | 17.6 | 3.6 | 1.3 | 0.5 | 0.1 | 36 | 5 | 5 | 1.3 | 6.5 |
| | 21 | 3.0 | 1.1 | 0.5 | 0.1 | 30 | 5 | 5 | 1.1 | 6.5 |
| | 26 | 2.4 | 0.9 | 0.5 | 0.1 | 24 | 5 | 5 | 0.9 | 6.5 |
| | 33 | 1.9 | 0.7 | 0.5 | 0.0 | 19 | 5 | 5 | 0.7 | 6.5 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 75 | 9 | 8.3 | 2.9 | 1.5 | 0.2 | 83 | 7 | 7 | 2.9 | 10.5 |
| | 11 | 6.8 | 2.4 | 1 | 0.2 | 68 | 6 | 6 | 2.4 | 9.5 |
| | 13.6 | 5.5 | 2.0 | 1 | 0.1 | 55 | 5 | 5 | 2.0 | 8 |
| | 17 | 4.4 | 1.6 | 0.5 | 0.1 | 44 | 5 | 5 | 1.6 | 6.5 |
| | 17.6 | 4.3 | 1.6 | 0.5 | 0.1 | 43 | 5 | 5 | 1.6 | 6.5 |
| | 21 | 3.6 | 1.3 | 0.5 | 0.1 | 36 | 5 | 5 | 1.3 | 6.5 |
| | 26 | 2.9 | 1.1 | 0.5 | 0.1 | 29 | 5 | 5 | 1.1 | 6.5 |
| | 33 | 2.3 | 0.9 | 0.5 | 0.1 | 23 | 5 | 5 | 0.9 | 6.5 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 9 | 10.0 | 3.4 | 1.5 | 0.2 | 100 | 7 | 7 | 3.4 | 12 |
| | 11 | 8.2 | 2.9 | 1.5 | 0.2 | 82 | 7 | 7 | 2.9 | 10.5 |
| | 13.6 | 6.6 | 2.4 | 1 | 0.2 | 66 | 6 | 6 | 2.4 | 9 |
| | 17 | 5.3 | 1.9 | 1 | 0.1 | 53 | 5 | 5 | 1.9 | 8 |
| | 17.6 | 5.1 | 1.9 | 1 | 0.1 | 51 | 5 | 5 | 1.9 | 7 |
| | 21 | 4.3 | 1.6 | 0.5 | 0.1 | 43 | 5 | 5 | 1.6 | 6.5 |
| | 26 | 3.5 | 1.3 | 0.5 | 0.1 | 35 | 5 | 5 | 1.3 | 6.5 |
| | 33 | 2.7 | 1.0 | 0.5 | 0.1 | 27 | 5 | 5 | 1.0 | 6.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 110 | 9 | 12.2 | 5.1 | 2 | 0.3 | 122 | 8 | 8 | 5.1 | 15.5 |
| | 11 | 10.0 | 4.3 | 1.5 | 0.3 | 100 | 7 | 7 | 4.3 | 12 |
| | 13.6 | 8.1 | 3.5 | 1.5 | 0.2 | 81 | 7 | 7 | 3.5 | 10.5 |
| | 17 | 6.5 | 2.9 | 1 | 0.2 | 65 | 6 | 6 | 2.9 | 9 |
| | 17.6 | 6.3 | 2.8 | 1 | 0.2 | 63 | 6 | 6 | 2.8 | 9 |
| | 21 | 5.2 | 2.4 | 1 | 0.2 | 52 | 5 | 5 | 2.4 | 7 |
| | 26 | 4.2 | 1.9 | 0.5 | 0.1 | 42 | 5 | 5 | 1.9 | 6.5 |
| | 33 | 3.3 | 1.5 | 0.5 | 0.1 | 33 | 5 | 5 | 1.5 | 6.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 125 | 9 | 13.9 | 6.6 | 2 | 0.4 | 139 | 8 | 8 | 6.6 | 18 |
| | 11 | 11.4 | 5.5 | 1.5 | 0.4 | 114 | 8 | 8 | 5.5 | 14 |
| | 13.6 | 9.2 | 4.6 | 1.5 | 0.3 | 92 | 7 | 7 | 4.6 | 11 |
| | 17 | 7.4 | 3.7 | 1.5 | 0.2 | 74 | 6 | 6 | 3.7 | 10 |
| | 17.6 | 7.1 | 3.6 | 1.5 | 0.2 | 71 | 6 | 6 | 3.6 | 9.5 |
| | 21 | 6.0 | 3.0 | 1 | 0.2 | 60 | 5 | 5 | 3.0 | 8.5 |
| | 26 | 4.8 | 2.5 | 1 | 0.2 | 48 | 5 | 5 | 2.5 | 7 |
| | 33 | 3.8 | 2.0 | 0.5 | 0.1 | 38 | 5 | 5 | 2.0 | 6.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 140 | 9 | 15.6 | 8.3 | 2 | 0.6 | 156 | 9 | 10 | 8.3 | 21 |
| | 11 | 12.7 | 6.9 | 2 | 0.5 | 127 | 8 | 8 | 6.9 | 16 |
| | 13.6 | 10.3 | 5.7 | 1.5 | 0.4 | 103 | 7 | 7 | 5.7 | 12 |
| | 17 | 8.2 | 4.7 | 1.5 | 0.3 | 82 | 7 | 7 | 4.7 | 10.5 |
| | 17.6 | 8.0 | 4.5 | 1.5 | 0.3 | 80 | 6 | 6 | 4.5 | 10.5 |
| | 21 | 6.7 | 3.8 | 1 | 0.3 | 67 | 6 | 6 | 3.8 | 9 |
| | 26 | 5.4 | 3.1 | 1 | 0.2 | 54 | 5 | 5 | 3.1 | 8 |
| | 33 | 4.2 | 2.5 | 0.5 | 0.2 | 42 | 5 | 5 | 2.5 | 6.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 160 | 9 | 17.8 | 10.8 | 2 | 0.7 | 178 | 9 | 10 | 10.8 | 23 |
| | 11 | 14.5 | 9.1 | 2 | 0.6 | 145 | 9 | 10 | 9.1 | 19 |
| | 13.6 | 11.8 | 7.5 | 1.5 | 0.5 | 118 | 8 | 8 | 7.5 | 15 |
| | 17 | 9.4 | 6.1 | 1.5 | 0.4 | 94 | 7 | 7 | 6.1 | 11 |
| | 17.6 | 9.1 | 5.9 | 1.5 | 0.4 | 91 | 7 | 7 | 5.9 | 11 |
| | 21 | 7.6 | 5.0 | 1.5 | 0.3 | 76 | 6 | 6 | 5.0 | 10 |
| | 26 | 6.2 | 4.1 | 1 | 0.3 | 62 | 6 | 6 | 4.1 | 8.5 |
| | 33 | 4.8 | 3.2 | 1 | 0.2 | 48 | 5 | 5 | 3.2 | 7 |

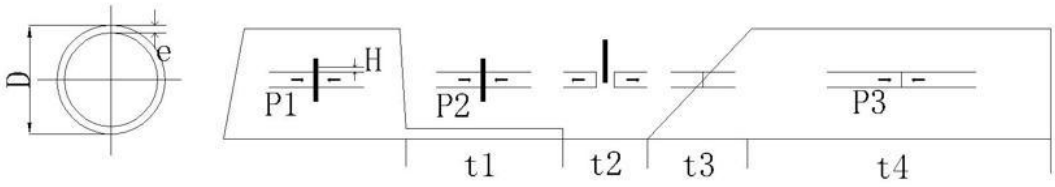
| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 180 | 9 | 20.0 | 13.7 | 2.5 | 0.9 | 200 | 10 | 11 | 13.7 | 25 |
| | 11 | 16.4 | 11.5 | 2 | 0.8 | 164 | 9 | 10 | 11.5 | 21 |
| | 13.6 | 13.2 | 9.5 | 2 | 0.6 | 132 | 8 | 8 | 9.5 | 16.5 |
| | 17 | 10.6 | 7.7 | 1.5 | 0.5 | 106 | 7 | 7 | 7.7 | 13 |
| | 17.6 | 10.2 | 7.4 | 1.5 | 0.5 | 102 | 7 | 7 | 7.4 | 12 |
| | 21 | 8.6 | 6.3 | 1.5 | 0.4 | 86 | 7 | 7 | 6.3 | 11 |
| | 26 | 6.9 | 5.1 | 1 | 0.3 | 69 | 6 | 6 | 5.1 | 9.5 |
| | 33 | 5.5 | 4.1 | 1 | 0.3 | 55 | 5 | 5 | 4.1 | 8 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 9 | 22.2 | 16.9 | 2.5 | 1.1 | 222 | 11 | 13 | 16.9 | 28 |
| | 11 | 18.2 | 14.2 | 2 | 0.9 | 182 | 10 | 11 | 14.2 | 23 |
| | 13.6 | 14.7 | 11.7 | 2 | 0.8 | 147 | 9 | 10 | 11.7 | 19 |
| | 17 | 11.8 | 9.5 | 1.5 | 0.6 | 118 | 8 | 8 | 9.5 | 15 |
| | 17.6 | 11.4 | 9.2 | 1.5 | 0.6 | 114 | 8 | 8 | 9.2 | 15 |
| | 21 | 9.5 | 7.8 | 1.5 | 0.5 | 95 | 7 | 7 | 7.8 | 12 |
| | 26 | 7.7 | 6.3 | 1.5 | 0.4 | 77 | 6 | 6 | 6.3 | 10 |
| | 33 | 6.1 | 5.0 | 1 | 0.3 | 61 | 6 | 6 | 5.0 | 8.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 225 | 9 | 25.0 | 21.4 | 2.5 | 1.4 | 250 | 11 | 13 | 21.4 | 31 |
| | 11 | 20.5 | 17.9 | 2.5 | 1.2 | 205 | 10 | 11 | 17.9 | 26 |
| | 13.6 | 16.5 | 14.8 | 2 | 1.0 | 165 | 9 | 10 | 14.8 | 22 |
| | 17 | 13.2 | 12.0 | 2 | 0.8 | 132 | 8 | 8 | 12.0 | 16.5 |
| | 17.6 | 12.8 | 11.6 | 2 | 0.8 | 128 | 8 | 8 | 11.6 | 16.5 |
| | 21 | 10.7 | 9.8 | 1.5 | 0.7 | 107 | 7 | 7 | 9.8 | 13 |
| | 26 | 8.7 | 8.0 | 1.5 | 0.5 | 87 | 7 | 7 | 8.0 | 11 |
| | 33 | 6.8 | 6.4 | 1 | 0.4 | 68 | 6 | 6 | 6.4 | 9.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 250 | 9 | 27.8 | 26.5 | 3 | 1.8 | 278 | 12 | 14 | 26.5 | 34 |
| | 11 | 22.7 | 22.2 | 2.5 | 1.5 | 227 | 11 | 13 | 22.2 | 29 |
| | 13.6 | 18.4 | 18.3 | 2 | 1.2 | 184 | 10 | 11 | 18.3 | 23 |
| | 17 | 14.7 | 14.8 | 2 | 1.0 | 147 | 9 | 10 | 14.8 | 19 |
| | 17.6 | 14.2 | 14.4 | 2 | 1.0 | 142 | 9 | 10 | 14.4 | 18 |
| | 21 | 11.9 | 12.2 | 1.5 | 0.8 | 119 | 8 | 8 | 12.2 | 15.5 |
| | 26 | 9.6 | 9.9 | 1.5 | 0.7 | 96 | 7 | 7 | 9.9 | 12 |
| | 33 | 7.6 | 7.9 | 1.5 | 0.5 | 76 | 6 | 6 | 7.9 | 10 |

PE T=220℃ DVS 2207/T1(8/15)




**SHD315 （Cylinder area=20cm²）**

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 9 | 10.0 | 1.9 | 1.5 | 0.1 | 100 | 7 | 7 | 1.9 | 12 |
| | 11 | 8.2 | 1.6 | 1.5 | 0.1 | 82 | 7 | 7 | 1.6 | 10.5 |
| | 13.6 | 6.6 | 1.3 | 1 | 0.1 | 66 | 6 | 6 | 1.3 | 9 |
| | 17 | 5.3 | 1.1 | 1 | 0.1 | 53 | 5 | 5 | 1.1 | 8 |
| | 17.6 | 5.1 | 1.0 | 1 | 0.1 | 51 | 5 | 5 | 1.0 | 7 |
| | 21 | 4.3 | 0.9 | 0.5 | 0.1 | 43 | 5 | 5 | 0.9 | 6.5 |
| | 26 | 3.5 | 0.7 | 0.5 | 0.0 | 35 | 5 | 5 | 0.7 | 6.5 |
| | 33 | 2.7 | 0.6 | 0.5 | 0.0 | 27 | 5 | 5 | 0.6 | 6.5 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 110 | 9 | 12.2 | 2.8 | 2 | 0.2 | 122 | 8 | 8 | 2.8 | 16 |
| | 11 | 10.0 | 2.4 | 1.5 | 0.2 | 100 | 7 | 7 | 2.4 | 12 |
| | 13.6 | 8.1 | 1.9 | 1.5 | 0.1 | 81 | 7 | 7 | 1.9 | 10.5 |
| | 17 | 6.5 | 1.6 | 1 | 0.1 | 65 | 6 | 6 | 1.6 | 9 |
| | 17.6 | 6.3 | 1.5 | 1 | 0.1 | 63 | 6 | 6 | 1.5 | 9 |
| | 21 | 5.2 | 1.3 | 1 | 0.1 | 52 | 5 | 5 | 1.3 | 8 |
| | 26 | 4.2 | 1.1 | 0.5 | 0.1 | 42 | 5 | 5 | 1.1 | 6.5 |
| | 33 | 3.3 | 0.8 | 0.5 | 0.1 | 33 | 5 | 5 | 0.8 | 6.5 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 125 | 9 | 13.9 | 3.6 | 2 | 0.2 | 139 | 8 | 8 | 3.6 | 18 |
| | 11 | 11.4 | 3.0 | 1.5 | 0.2 | 114 | 8 | 8 | 3.0 | 15 |
| | 13.6 | 9.2 | 2.5 | 1.5 | 0.2 | 92 | 7 | 7 | 2.5 | 11 |
| | 17 | 7.4 | 2.0 | 1.5 | 0.1 | 74 | 6 | 6 | 2.0 | 10 |
| | 17.6 | 7.1 | 2.0 | 1.5 | 0.1 | 71 | 6 | 6 | 2.0 | 9.5 |
| | 21 | 6.0 | 1.7 | 1 | 0.1 | 60 | 5 | 5 | 1.7 | 8.5 |
| | 26 | 4.8 | 1.4 | 1 | 0.1 | 48 | 5 | 5 | 1.4 | 7 |
| | 33 | 3.8 | 1.1 | 0.5 | 0.1 | 38 | 5 | 5 | 1.1 | 6.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 140 | 9 | 15.6 | 4.6 | 2 | 0.3 | 156 | 9 | 10 | 4.6 | 21 |
| | 11 | 12.7 | 3.8 | 2 | 0.3 | 127 | 8 | 8 | 3.8 | 16 |
| | 13.6 | 10.3 | 3.1 | 1.5 | 0.2 | 103 | 7 | 7 | 3.1 | 13 |
| | 17 | 8.2 | 2.6 | 1.5 | 0.2 | 82 | 7 | 7 | 2.6 | 10.5 |
| | 17.6 | 8.0 | 2.5 | 1.5 | 0.2 | 80 | 6 | 6 | 2.5 | 10.5 |
| | 21 | 6.7 | 2.1 | 1 | 0.1 | 67 | 6 | 6 | 2.1 | 9 |
| | 26 | 5.4 | 1.7 | 1 | 0.1 | 54 | 5 | 5 | 1.7 | 8 |
| | 33 | 4.2 | 1.4 | 0.5 | 0.1 | 42 | 5 | 5 | 1.4 | 6.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 160 | 9 | 17.8 | 6.0 | 2 | 0.4 | 178 | 9 | 10 | 6.0 | 23 |
| | 11 | 14.5 | 5.0 | 2 | 0.3 | 145 | 9 | 10 | 5.0 | 19 |
| | 13.6 | 11.8 | 4.1 | 1.5 | 0.3 | 118 | 8 | 8 | 4.1 | 15 |
| | 17 | 9.4 | 3.3 | 1.5 | 0.2 | 94 | 7 | 7 | 3.3 | 11 |
| | 17.6 | 9.1 | 3.2 | 1.5 | 0.2 | 91 | 7 | 7 | 3.2 | 11 |
| | 21 | 7.6 | 2.7 | 1.5 | 0.2 | 76 | 6 | 6 | 2.7 | 10 |
| | 26 | 6.2 | 2.2 | 1 | 0.1 | 62 | 6 | 6 | 2.2 | 8.5 |
| | 33 | 4.8 | 1.8 | 1 | 0.1 | 48 | 5 | 5 | 1.8 | 7 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 180 | 9 | 20.0 | 7.5 | 2.5 | 0.5 | 200 | 10 | 11 | 7.5 | 25 |
| | 11 | 16.4 | 6.3 | 2 | 0.4 | 164 | 9 | 10 | 6.3 | 21 |
| | 13.6 | 13.2 | 5.2 | 2 | 0.3 | 132 | 8 | 8 | 5.2 | 16.5 |
| | 17 | 10.6 | 4.2 | 1.5 | 0.3 | 106 | 7 | 7 | 4.2 | 13 |
| | 17.6 | 10.2 | 4.1 | 1.5 | 0.3 | 102 | 7 | 7 | 4.1 | 12 |
| | 21 | 8.6 | 3.5 | 1.5 | 0.2 | 86 | 7 | 7 | 3.5 | 11 |
| | 26 | 6.9 | 2.8 | 1 | 0.2 | 69 | 6 | 6 | 2.8 | 9.5 |
| | 33 | 5.5 | 2.2 | 1 | 0.1 | 55 | 5 | 5 | 2.2 | 8 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 9 | 22.2 | 9.3 | 2.5 | 0.6 | 222 | 11 | 13 | 9.3 | 28 |
| | 11 | 18.2 | 7.8 | 2 | 0.5 | 182 | 10 | 11 | 7.8 | 23 |
| | 13.6 | 14.7 | 6.4 | 2 | 0.4 | 147 | 9 | 10 | 6.4 | 19 |
| | 17 | 11.8 | 5.2 | 1.5 | 0.3 | 118 | 8 | 8 | 5.2 | 15 |
| | 17.6 | 11.4 | 5.0 | 1.5 | 0.3 | 114 | 8 | 8 | 5.0 | 15 |
| | 21 | 9.5 | 4.3 | 1.5 | 0.3 | 95 | 7 | 7 | 4.3 | 12 |
| | 26 | 7.7 | 3.5 | 1.5 | 0.2 | 77 | 6 | 6 | 3.5 | 10 |
| | 33 | 6.1 | 2.8 | 1 | 0.2 | 61 | 6 | 6 | 2.8 | 8.5 |

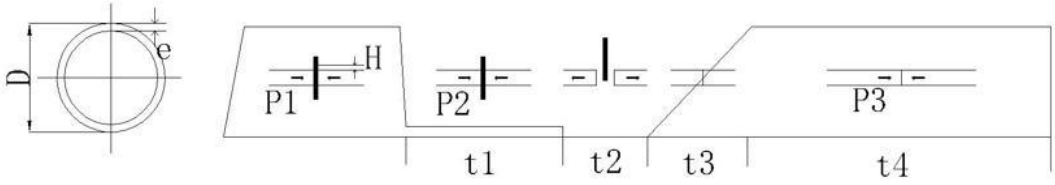
| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 225 | 9 | 25.0 | 11.8 | 2.5 | 0.8 | 250 | 11 | 13 | 11.8 | 31 |
| | 11 | 20.5 | 9.9 | 2.5 | 0.7 | 205 | 10 | 11 | 9.9 | 26 |
| | 13.6 | 16.5 | 8.1 | 2 | 0.5 | 165 | 9 | 10 | 8.1 | 22 |
| | 17 | 13.2 | 6.6 | 2 | 0.4 | 132 | 8 | 8 | 6.6 | 16.5 |
| | 17.6 | 12.8 | 6.4 | 2 | 0.4 | 128 | 8 | 8 | 6.4 | 16.5 |
| | 21 | 10.7 | 5.4 | 1.5 | 0.4 | 107 | 7 | 7 | 5.4 | 13 |
| | 26 | 8.7 | 4.4 | 1.5 | 0.3 | 87 | 7 | 7 | 4.4 | 11 |
| | 33 | 6.8 | 3.5 | 1 | 0.2 | 68 | 6 | 6 | 3.5 | 9.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 250 | 9 | 27.8 | 14.5 | 3 | 1.0 | 278 | 12 | 14 | 14.5 | 34 |
| | 11 | 22.7 | 12.2 | 2.5 | 0.8 | 227 | 11 | 13 | 12.2 | 29 |
| | 13.6 | 18.4 | 10.0 | 2 | 0.7 | 184 | 10 | 11 | 10.0 | 23 |
| | 17 | 14.7 | 8.1 | 2 | 0.5 | 147 | 9 | 10 | 8.1 | 19 |
| | 17.6 | 14.2 | 7.9 | 2 | 0.5 | 142 | 9 | 10 | 7.9 | 18 |
| | 21 | 11.9 | 6.7 | 1.5 | 0.4 | 119 | 8 | 8 | 6.7 | 15.5 |
| | 26 | 9.6 | 5.4 | 1.5 | 0.4 | 96 | 7 | 7 | 5.4 | 12 |
| | 33 | 7.6 | 4.3 | 1.5 | 0.3 | 76 | 6 | 6 | 4.3 | 10 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 280 | 9 | 31.1 | 18.2 | 3 | 1.2 | 311 | 13 | 15 | 18.2 | 38 |
| | 11 | 25.5 | 15.3 | 2.5 | 1.0 | 255 | 12 | 14 | 15.3 | 32 |
| | 13.6 | 20.6 | 12.6 | 2.5 | 0.8 | 206 | 10 | 11 | 12.6 | 26 |
| | 17 | 16.5 | 10.2 | 2 | 0.7 | 165 | 9 | 10 | 10.2 | 22 |
| | 17.6 | 15.9 | 9.9 | 2 | 0.7 | 159 | 9 | 10 | 9.9 | 21 |
| | 21 | 13.3 | 8.4 | 2 | 0.6 | 133 | 8 | 8 | 8.4 | 17 |
| | 26 | 10.8 | 6.8 | 1.5 | 0.5 | 108 | 7 | 7 | 6.8 | 13 |
| | 33 | 8.5 | 5.4 | 1.5 | 0.4 | 85 | 7 | 7 | 5.4 | 11 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 315 | 9 | 35.0 | 23.1 | 3 | 1.5 | 350 | 14 | 17 | 23.1 | 43 |
| | 11 | 28.6 | 19.3 | 3 | 1.3 | 286 | 13 | 15 | 19.3 | 35 |
| | 13.6 | 23.2 | 15.9 | 2.5 | 1.1 | 232 | 11 | 13 | 15.9 | 29 |
| | 17 | 18.5 | 12.9 | 2 | 0.9 | 185 | 10 | 11 | 12.9 | 24 |
| | 17.6 | 17.9 | 12.5 | 2 | 0.8 | 179 | 9 | 10 | 12.5 | 23 |
| | 21 | 15.0 | 10.6 | 2 | 0.7 | 150 | 9 | 10 | 10.6 | 20 |
| | 26 | 12.1 | 8.6 | 2 | 0.6 | 121 | 8 | 8 | 8.6 | 15.5 |
| | 33 | 9.5 | 6.9 | 1.5 | 0.5 | 95 | 7 | 7 | 6.9 | 12 |

PE T=220℃ DVS 2207/T1(8/15)




**SHD355 （Cylinder area=20cm²）**

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 9 | 10.0 | 1.9 | 1.5 | 0.1 | 100 | 7 | 7 | 1.9 | 12 |
| | 11 | 8.2 | 1.6 | 1.5 | 0.1 | 82 | 7 | 7 | 1.6 | 10.5 |
| | 13.6 | 6.6 | 1.3 | 1 | 0.1 | 66 | 6 | 6 | 1.3 | 9 |
| | 17 | 5.3 | 1.1 | 1 | 0.1 | 53 | 5 | 5 | 1.1 | 8 |
| | 17.6 | 5.1 | 1.0 | 1 | 0.1 | 51 | 5 | 5 | 1.0 | 7 |
| | 21 | 4.3 | 0.9 | 0.5 | 0.1 | 43 | 5 | 5 | 0.9 | 6.5 |
| | 26 | 3.5 | 0.7 | 0.5 | 0.0 | 35 | 5 | 5 | 0.7 | 6.5 |
| | 33 | 2.7 | 0.6 | 0.5 | 0.0 | 27 | 5 | 5 | 0.6 | 6.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 110 | 9 | 12.2 | 2.8 | 2 | 0.2 | 122 | 8 | 8 | 2.8 | 16 |
| | 11 | 10.0 | 2.4 | 1.5 | 0.2 | 100 | 7 | 7 | 2.4 | 12 |
| | 13.6 | 8.1 | 1.9 | 1.5 | 0.1 | 81 | 7 | 7 | 1.9 | 10.5 |
| | 17 | 6.5 | 1.6 | 1 | 0.1 | 65 | 6 | 6 | 1.6 | 9 |
| | 17.6 | 6.3 | 1.5 | 1 | 0.1 | 63 | 6 | 6 | 1.5 | 9 |
| | 21 | 5.2 | 1.3 | 1 | 0.1 | 52 | 5 | 5 | 1.3 | 8 |
| | 26 | 4.2 | 1.1 | 0.5 | 0.1 | 42 | 5 | 5 | 1.1 | 6.5 |
| | 33 | 3.3 | 0.8 | 0.5 | 0.1 | 33 | 5 | 5 | 0.8 | 6.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 125 | 9 | 13.9 | 3.6 | 2 | 0.2 | 139 | 8 | 8 | 3.6 | 18 |
| | 11 | 11.4 | 3.0 | 1.5 | 0.2 | 114 | 8 | 8 | 3.0 | 15 |
| | 13.6 | 9.2 | 2.5 | 1.5 | 0.2 | 92 | 7 | 7 | 2.5 | 11 |
| | 17 | 7.4 | 2.0 | 1.5 | 0.1 | 74 | 6 | 6 | 2.0 | 10 |
| | 17.6 | 7.1 | 2.0 | 1.5 | 0.1 | 71 | 6 | 6 | 2.0 | 9.5 |
| | 21 | 6.0 | 1.7 | 1 | 0.1 | 60 | 5 | 5 | 1.7 | 8.5 |
| | 26 | 4.8 | 1.4 | 1 | 0.1 | 48 | 5 | 5 | 1.4 | 7 |
| | 33 | 3.8 | 1.1 | 0.5 | 0.1 | 38 | 5 | 5 | 1.1 | 6.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 140 | 9 | 15.6 | 4.6 | 2 | 0.3 | 156 | 9 | 10 | 4.6 | 21 |
| | 11 | 12.7 | 3.8 | 2 | 0.3 | 127 | 8 | 8 | 3.8 | 16 |
| | 13.6 | 10.3 | 3.1 | 1.5 | 0.2 | 103 | 7 | 7 | 3.1 | 13 |
| | 17 | 8.2 | 2.6 | 1.5 | 0.2 | 82 | 7 | 7 | 2.6 | 10.5 |
| | 17.6 | 8.0 | 2.5 | 1.5 | 0.2 | 80 | 6 | 6 | 2.5 | 10.5 |
| | 21 | 6.7 | 2.1 | 1 | 0.1 | 67 | 6 | 6 | 2.1 | 9 |
| | 26 | 5.4 | 1.7 | 1 | 0.1 | 54 | 5 | 5 | 1.7 | 8 |
| | 33 | 4.2 | 1.4 | 0.5 | 0.1 | 42 | 5 | 5 | 1.4 | 6.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 160 | 9 | 17.8 | 6.0 | 2 | 0.4 | 178 | 9 | 10 | 6.0 | 23 |
| | 11 | 14.5 | 5.0 | 2 | 0.3 | 145 | 9 | 10 | 5.0 | 19 |
| | 13.6 | 11.8 | 4.1 | 1.5 | 0.3 | 118 | 8 | 8 | 4.1 | 15 |
| | 17 | 9.4 | 3.3 | 1.5 | 0.2 | 94 | 7 | 7 | 3.3 | 11 |
| | 17.6 | 9.1 | 3.2 | 1.5 | 0.2 | 91 | 7 | 7 | 3.2 | 11 |
| | 21 | 7.6 | 2.7 | 1.5 | 0.2 | 76 | 6 | 6 | 2.7 | 10 |
| | 26 | 6.2 | 2.2 | 1 | 0.1 | 62 | 6 | 6 | 2.2 | 8.5 |
| | 33 | 4.8 | 1.8 | 1 | 0.1 | 48 | 5 | 5 | 1.8 | 7 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 180 | 9 | 20.0 | 7.5 | 2.5 | 0.5 | 200 | 10 | 11 | 7.5 | 25 |
| | 11 | 16.4 | 6.3 | 2 | 0.4 | 164 | 9 | 10 | 6.3 | 21 |
| | 13.6 | 13.2 | 5.2 | 2 | 0.3 | 132 | 8 | 8 | 5.2 | 16.5 |
| | 17 | 10.6 | 4.2 | 1.5 | 0.3 | 106 | 7 | 7 | 4.2 | 13 |
| | 17.6 | 10.2 | 4.1 | 1.5 | 0.3 | 102 | 7 | 7 | 4.1 | 12 |
| | 21 | 8.6 | 3.5 | 1.5 | 0.2 | 86 | 7 | 7 | 3.5 | 11 |
| | 26 | 6.9 | 2.8 | 1 | 0.2 | 69 | 6 | 6 | 2.8 | 9.5 |
| | 33 | 5.5 | 2.2 | 1 | 0.1 | 55 | 5 | 5 | 2.2 | 8 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 9 | 22.2 | 9.3 | 2.5 | 0.6 | 222 | 11 | 13 | 9.3 | 28 |
| | 11 | 18.2 | 7.8 | 2 | 0.5 | 182 | 10 | 11 | 7.8 | 23 |
| | 13.6 | 14.7 | 6.4 | 2 | 0.4 | 147 | 9 | 10 | 6.4 | 19 |
| | 17 | 11.8 | 5.2 | 1.5 | 0.3 | 118 | 8 | 8 | 5.2 | 15 |
| | 17.6 | 11.4 | 5.0 | 1.5 | 0.3 | 114 | 8 | 8 | 5.0 | 15 |
| | 21 | 9.5 | 4.3 | 1.5 | 0.3 | 95 | 7 | 7 | 4.3 | 12 |
| | 26 | 7.7 | 3.5 | 1.5 | 0.2 | 77 | 6 | 6 | 3.5 | 10 |
| | 33 | 6.1 | 2.8 | 1 | 0.2 | 61 | 6 | 6 | 2.8 | 8.5 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 225 | 9 | 25.0 | 11.8 | 2.5 | 0.8 | 250 | 11 | 13 | 11.8 | 31 |
| | 11 | 20.5 | 9.9 | 2.5 | 0.7 | 205 | 10 | 11 | 9.9 | 26 |
| | 13.6 | 16.5 | 8.1 | 2 | 0.5 | 165 | 9 | 10 | 8.1 | 22 |
| | 17 | 13.2 | 6.6 | 2 | 0.4 | 132 | 8 | 8 | 6.6 | 16.5 |
| | 17.6 | 12.8 | 6.4 | 2 | 0.4 | 128 | 8 | 8 | 6.4 | 16.5 |
| | 21 | 10.7 | 5.4 | 1.5 | 0.4 | 107 | 7 | 7 | 5.4 | 13 |
| | 26 | 8.7 | 4.4 | 1.5 | 0.3 | 87 | 7 | 7 | 4.4 | 11 |
| | 33 | 6.8 | 3.5 | 1 | 0.2 | 68 | 6 | 6 | 3.5 | 9.5 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 250 | 9 | 27.8 | 14.5 | 3 | 1.0 | 278 | 12 | 14 | 14.5 | 34 |
| | 11 | 22.7 | 12.2 | 2.5 | 0.8 | 227 | 11 | 13 | 12.2 | 29 |
| | 13.6 | 18.4 | 10.0 | 2 | 0.7 | 184 | 10 | 11 | 10.0 | 23 |
| | 17 | 14.7 | 8.1 | 2 | 0.5 | 147 | 9 | 10 | 8.1 | 19 |
| | 17.6 | 14.2 | 7.9 | 2 | 0.5 | 142 | 9 | 10 | 7.9 | 18 |
| | 21 | 11.9 | 6.7 | 1.5 | 0.4 | 119 | 8 | 8 | 6.7 | 15.5 |
| | 26 | 9.6 | 5.4 | 1.5 | 0.4 | 96 | 7 | 7 | 5.4 | 12 |
| | 33 | 7.6 | 4.3 | 1.5 | 0.3 | 76 | 6 | 6 | 4.3 | 10 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 280 | 9 | 31.1 | 18.2 | 3 | 1.2 | 311 | 13 | 15 | 18.2 | 38 |
| | 11 | 25.5 | 15.3 | 2.5 | 1.0 | 255 | 12 | 14 | 15.3 | 32 |
| | 13.6 | 20.6 | 12.6 | 2.5 | 0.8 | 206 | 10 | 11 | 12.6 | 26 |
| | 17 | 16.5 | 10.2 | 2 | 0.7 | 165 | 9 | 10 | 10.2 | 22 |
| | 17.6 | 15.9 | 9.9 | 2 | 0.7 | 159 | 9 | 10 | 9.9 | 21 |
| | 21 | 13.3 | 8.4 | 2 | 0.6 | 133 | 8 | 8 | 8.4 | 17 |
| | 26 | 10.8 | 6.8 | 1.5 | 0.5 | 108 | 7 | 7 | 6.8 | 13 |
| | 33 | 8.5 | 5.4 | 1.5 | 0.4 | 85 | 7 | 7 | 5.4 | 11 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 315 | 9 | 35.0 | 23.1 | 3 | 1.5 | 350 | 14 | 17 | 23.1 | 43 |
| | 11 | 28.6 | 19.3 | 3 | 1.3 | 286 | 13 | 15 | 19.3 | 35 |
| | 13.6 | 23.2 | 15.9 | 2.5 | 1.1 | 232 | 11 | 13 | 15.9 | 29 |
| | 17 | 18.5 | 12.9 | 2 | 0.9 | 185 | 10 | 11 | 12.9 | 24 |
| | 17.6 | 17.9 | 12.5 | 2 | 0.8 | 179 | 9 | 10 | 12.5 | 23 |
| | 21 | 15.0 | 10.6 | 2 | 0.7 | 150 | 9 | 10 | 10.6 | 20 |
| | 26 | 12.1 | 8.6 | 2 | 0.6 | 121 | 8 | 8 | 8.6 | 15.5 |
| | 33 | 9.5 | 6.9 | 1.5 | 0.5 | 95 | 7 | 7 | 6.9 | 12 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 355 | 9 | 39.4 | 29.3 | 3.5 | 2.0 | 394 | 15 | 18 | 29.3 | 48 |
| | 11 | 32.3 | 24.5 | 3 | 1.6 | 323 | 14 | 17 | 24.5 | 39 |
| | 13.6 | 26.1 | 20.2 | 3 | 1.3 | 261 | 12 | 14 | 20.2 | 32 |
| | 17 | 20.9 | 16.4 | 2.5 | 1.1 | 209 | 10 | 11 | 16.4 | 26 |
| | 17.6 | 20.2 | 15.9 | 2.5 | 1.1 | 202 | 10 | 11 | 15.9 | 25 |
| | 21 | 16.9 | 13.5 | 2 | 0.9 | 169 | 9 | 10 | 13.5 | 22 |
| | 26 | 13.7 | 11.0 | 2 | 0.7 | 137 | 8 | 8 | 11.0 | 17 |
| | 33 | 10.8 | 8.7 | 1.5 | 0.6 | 108 | 7 | 7 | 8.7 | 14 |

## SHD450 SHD500 SHD630 SHD800 SHD1000 SHD1200

# 1. Applicable Range and Technical Parameter

| Type | SHD-800 | SHD-1000 | SHD-1200 |
|---|---|---|---|
| Materials | PE， PP， PVDF | | |
| Max. range of diameter | 450mm~800 mm | 630mm-1000mm | 630-1200mm |
| Ambient temp. | －5～45℃ | | |
| Power supply | ～380 V±10 ％，50 Hz | | |
| Total current | 28A | 43A | 60A |
| Total power | 18.2kW | 24 kW | 29.5 kW |
| Include :Heating plate | 12.5 kW | 17.5 kW | 21.5 kW |
| Planing tool motor | 2.2 kW | 3 kW | 4 kW |
| Hydraulic unit motor | 3 kW | 3 kW | 3 kW |
| Crane power | 0.5KW | 0.5KW | 1KW |
| Dielectric resistance | >1MΩ | | |
| Max. Pressure | ≤16MPa | ≤16MPa | ≤16MPa |
| Total section of cylinders | 44cm$^2$ | 38.9cm$^2$ | 50.7 cm$^2$ |
| Volume of oil box | 4L | | |
| Hydraulic oil | 270℃ | | |
| Undesired sound | ±5℃ | | |
| Max. Temperature of heating plate | 40～50 (kinematic viscosity)mm$^2$/s, 40℃ | | |
| Difference in surface temperature of heating plate | ＜70 dB | | |
| Weight | 1454 | 2600 | 4500 |

* The special voltage is based on the actual voltage.

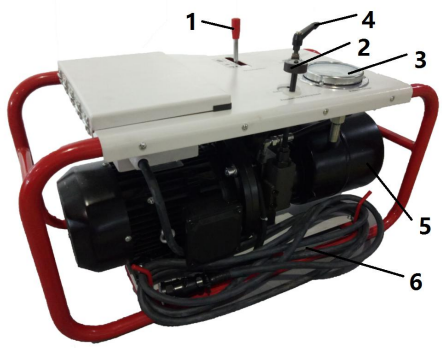
# 2. Descriptions

The machine consists of basic frame, hydraulic unit, heating plate, Planing tool, and support.

2.1 Structure


1.Hydraulic unit 2. Basic frame 3. Support 4. Heating plate 5. Planing tool 6.Crane （SHD450-630 optional） （SHD800-1200 optional）

2.2 Hydraulic Unit




1. Direction valve 2. Pressure regulation valve 3. Pressure gauge

4. Swing check valve 5. Oil tank 6. Power cable

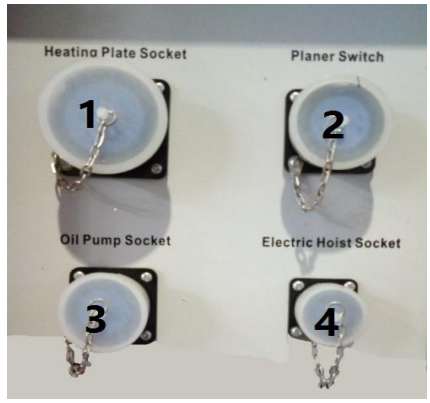
2.3 Hydraulic unit operation panel


1. Timer 2. Endothermic time button 3. Cooling time button

2.4 Electric box


1.Temperature controller 2. Switch 3. Voltmeter 4.Leakage switch

2.5 Hydraulic unit sockets




1. Heating plate socket 2. Planer switch 3. Oil pump socket 4.Electric hoist socket

# 3. Instruction for Use

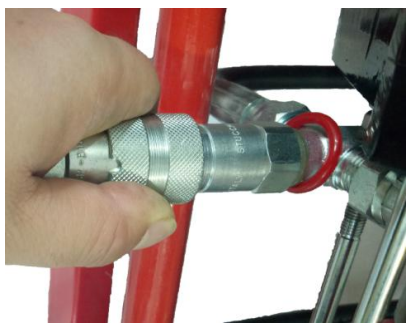
3.1 The whole equipment should be placed on a stable and dry plane to operate.

3.2 Before operation make sure the following things:

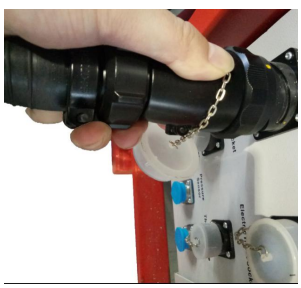
- The machine is in good conditions
- The power complies with the requirements according to the butt fusion machine
- Power line is not broken or worn
- All instruments are normal
- The blades of planning tool are sharp
- All necessary parts and tools are available

3.3 Connection and preparation

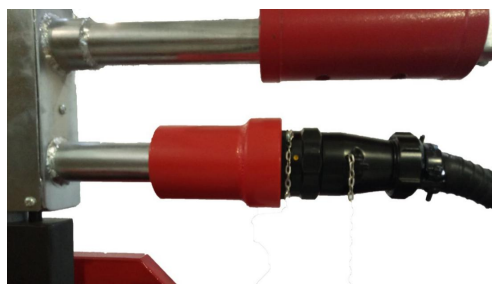
3.3.1 Connect the basic frame to hydraulic unit by quick couplers.



3.3.2 Connect the heating plate to the hydraulic unit with the special cable.



Connection the cable with electrical box



Connection between the cable and heating plate

3.3.3 Install appropriate inserts to frame according to the outside diameter of pipes/fittings.

3.3.4 According to the requirements of fitting and welding process, set the temperature in temperature controller and set time in timer. (See section 7 this manual).

3.4 Welding Steps

3.4.1 Pipes

Before welding, firstly, check if the material and its pressure grade are the required ones. Secondly check if there are scratches or fissures on the surface of pipes/fittings. If the depth of scratches or fissures exceeds 10% of the wall thickness, cut the section of scratches or fissures. Clean the pipe end's surfaces with clean cloth to keep the pipe's ends clean.

3.4.2 Clamping

Place the pipes/fittings in inserts of frame and keep the ends to be welded be the same length (no effect on the planning and heating of the pipe). The pipe out of the basic frame should be supported to the same central axial of clamps. Fasten the screws of clamps to fix the pipes/fittings.

3.4.3Adjust the pressure

3.4.4 Planing

Open the pipes/fittings ends after turning swing check valve anti-clockwise to the end. Put the planning tool between the pipes/fittings ends and switch it on, close the pipes/fittings ends by acting on the direction valve meanwhile slowly turn swing check valve clockwise until there are continuous shavings appearing on both sides. Turn the swing valve anti clockwise to relief the pressure, in a moment later open the frame, switch off the planing tool and remove it.

Close the pipes/fitting ends and checks the alignment of them. The maximal misalignment should not exceed 10% of the wall thickness, and it could be improved by loosening or tightening the screws of clamps. The gap between two pipe ends should not exceed 10% of wall thickness; otherwise the pipes/fittings should be planed again.

Caution: The shavings thickness should be within 0.2~0.5 mm and it can be adjusted by adjusting the height of the planning tool blades.

3.4.5 Heating

Clear the dust or slit on the surface of heating plate (Caution: Don't damage PTFE layer on the surface of heating plate.), and make sure the temperature has reached the required one.

Put the heating plate between the pipe ends after it reaches required temperature. Close the pipes/fittings ends by operating direction valve and raise the pressure to specified pressure by swinging pressure regulation valve till the bead reaches specified height.

Turn swing check valve anti-clockwise to reduce the pressure (not more than drag pressure) and turn swing check valve in clockwise direction to the end.

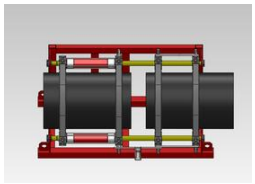
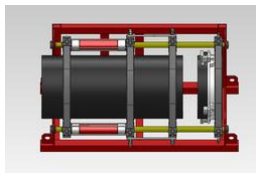
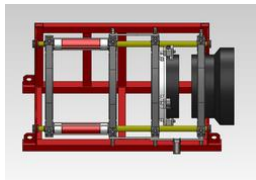
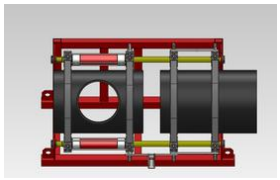
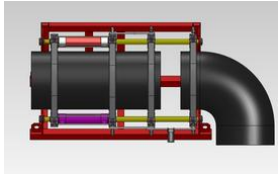
Press the button “$T_2$” , the soaking time begins to count and the time will count down to zero by second, then the buzzer will buzz（see section 7）

3.4.6 Joining and cooling

Open the frame and take out the heating plate and close two melting ends as quickly as possible.

Keep the bar of direction valve on the close position for 2~3 minutes, put the bar of direction valve on middle position and press the button （“T5”） to count cooling time until it is over. At this point, the machine will give an alarm again. Relief the pressure, loose the screw of clamps and then take out the jointed pipes.

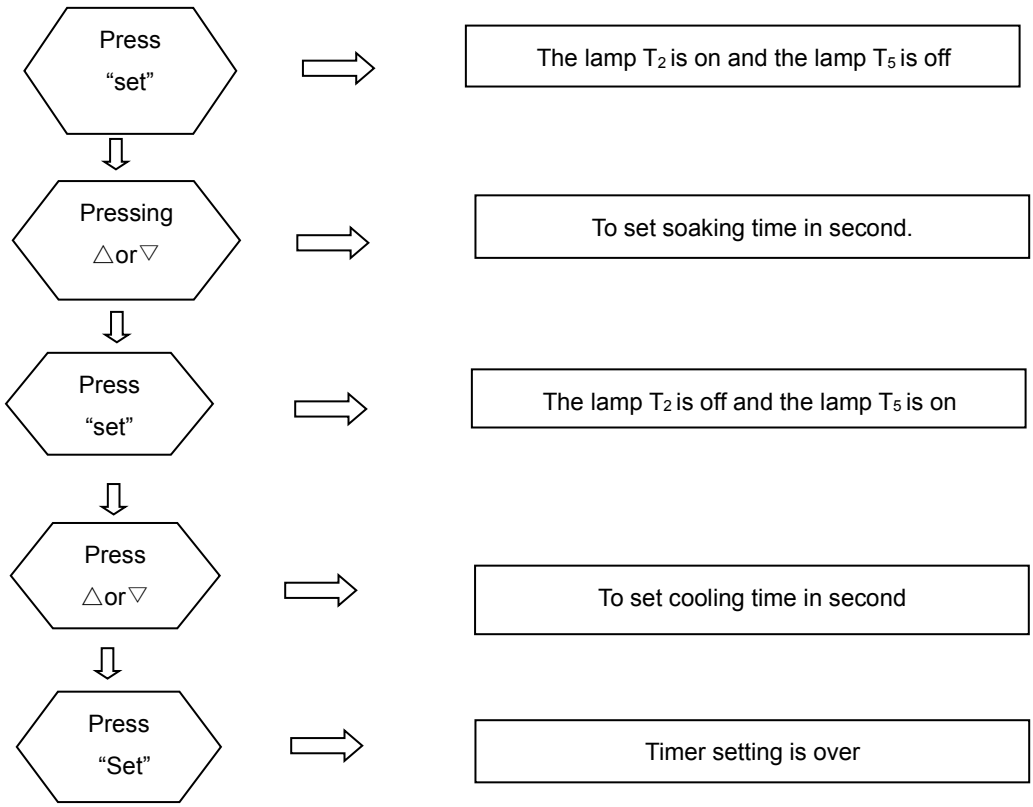
Common welding Sketch

| | |
|---|---|
|  | Long pipe welding |
|  | Short flange&Long pipe |
|  | Short flange&Pipe fitting |
|  | Socket pipe&Long pipe |
|  | Elbow pipe&Long pipe |

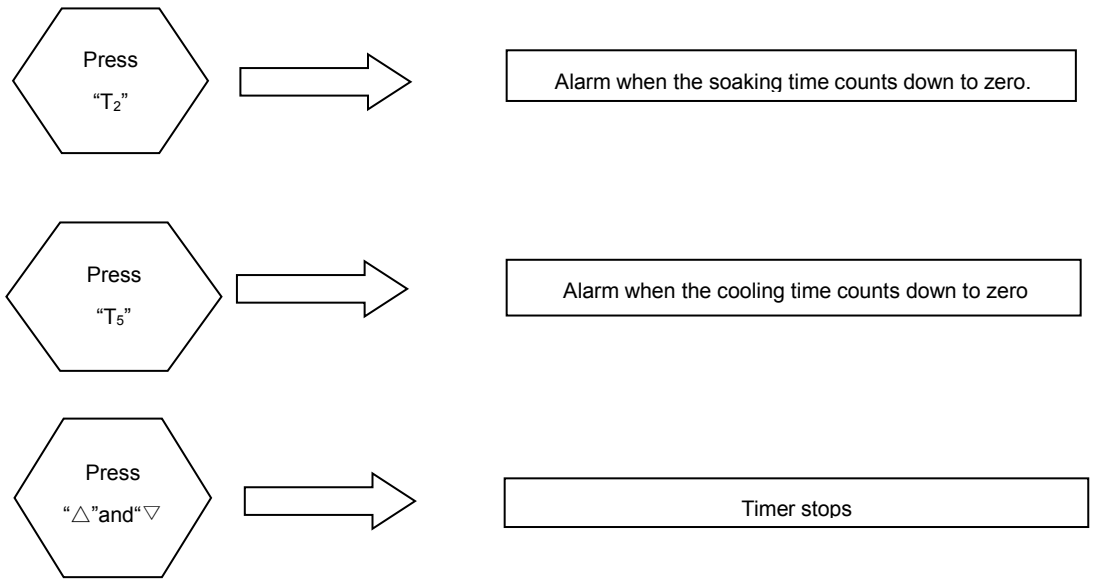
# 4.Timer and Temperature Controller

If one of the parameters is changed, such as outside diameter, SDR or material of pipes, the soaking time and cooling time should be reset according to the welding standard.

4.1 Timer setting




4.2 Instruction for Use



4.3 Temperature controller setting

（1）Temperature controller setting

Switch on

Press “SET” for more than 4 seconds till “Sd” is shown in the upper window

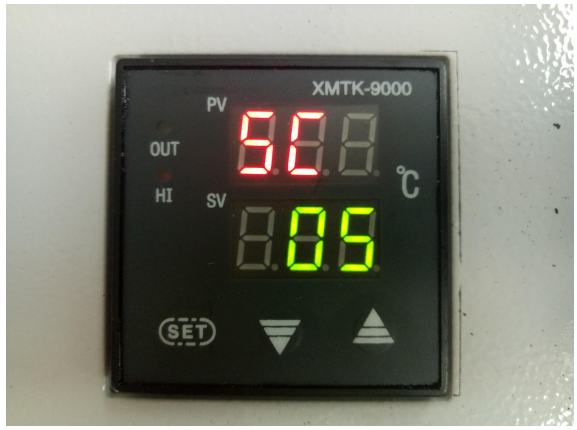
Press “△” or “▽”key, enter the setting temperature, and press "SET" to confirm

（2）Deviation Correction of temperature Control instrument

Switch on


Press “SET” for more than 3 seconds till “SI” is shown in the upper window


Press “SET” till “SC” is shown in the upper window



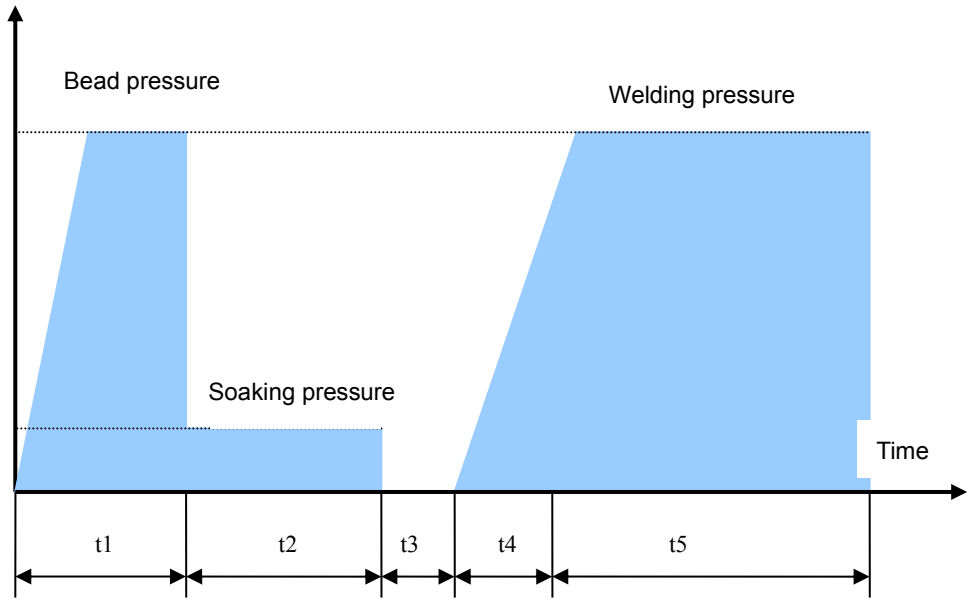

Press “△” or “▽”key, enter temperature correction value, press "SET" key to confirm


# 5.Reference of Welding Standard（DVS2207-1-1995）

5.1 Because of difference in welding standard and PE material, the time and pressure vary in different phases of welding. It suggests that the actual welding parameters should be offered by pipes and fittings' manufacturers.

5.2 Given welding temperature of pipes made from PE、PP and PVDF by DVS standard ranges from180℃ to 270℃. Application temperature of heating plate is within 180～230℃, and its max. surface temperature can reach 270℃.

5.3 Reference standard DVS2207-1-1995




| Pipe diameter | Wall thickness | Bead build-up pressure | Bead height | Soaking pressure | Soaking time | Change-over time | Pressure build -up time | Welding pressure | Cooling time |
|---|---|---|---|---|---|---|---|---|---|
| D | e | P1 | H | P2 | t2 | t3 | t4 | P3 | t5 |

（Bead build-up pressure ）Welding pressure =（P1）P3+Drag pressure

$$\text{welding pressure} = \frac{\text{Section of welding pipe ends}}{\text{Total section of cylinders}} \times 0.15 + \text{Drag pressure（MPa）}$$

Section of welding pipe ends = 3.14 ×(Pipe diameter - Wall thickness）× Wall thickness

Note:The drag pressure is not more than 50% of the welding pressure.

# 6. Malfunctions Analyses and Solutions

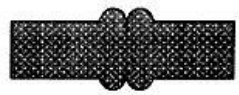
6.1 Frequent joints quality problems analyze:

- Visually check：round bead, good joint

- Narrow and fall bead. Too high pressure while welding

- Too small bead. Pressure is not enough while welding

- There is a ditch between the welding surfaces. Temperature is not enough or change-over time is too long while welding.



- High & low bead. Different heating time or fusion temperature causes that.

- Misalignment. Welding under the condition that the misalignment exceeds 10% of pipe wall thickness while align the two ends.

6.2.2 Maintenance & Inspection

Ordinary inspection

| Item | Description | Inspect before use | First month | Every 6 months | Every year |
|---|---|---|---|---|---|
| Planning tool | Mill or replace the blade | | | | ● |
| | Replace the cable if it is broken | ● | | | ● |
| | Retighten mechanical connections | ● | ● | | |
| Heating plate | | ● | | | |
| | Rejoined the cable and socket | ● | | | ● |
| | Clean surface of heating plate, recoat PTFE layer again if necessary | ● | | | |
| | Retighten mechanical connections | | ● | | |
| Temp. control system | Checkout the temperature indicator | | | | ● |
| | Replace the cable if it is broken | ● | | | ● |
| Hydraulic system | Checkout pressure gauge | | | | ● |
| | Replace seals if the hydraulic unit is leak | | | | ● |
| | Clean the filter | | | | |
| | Make sure the oil is enough for operation | ● | | | ● |
| | Change the hydraulic oil | ● | | | ● |
| | Replace if the oil hose is breakage | ● | | ● | |
| Basic Frame | Retighten screws in the end of frame axis | ● | ● | ● | |
| | Spray antirust paint again if necessary | | | | ● |
| Power Supply | Press the testing button of circuit protector to make sure it can working normally | ● | | | |
| | Replace the cable if it is broken | ● | | ● | |

"●"…… maintenance period

6.3 Frequent malfunction analyses and solutions

During the using, hydraulic unit and electrical units may appear some problems. Frequent malfunction is listed as follows:

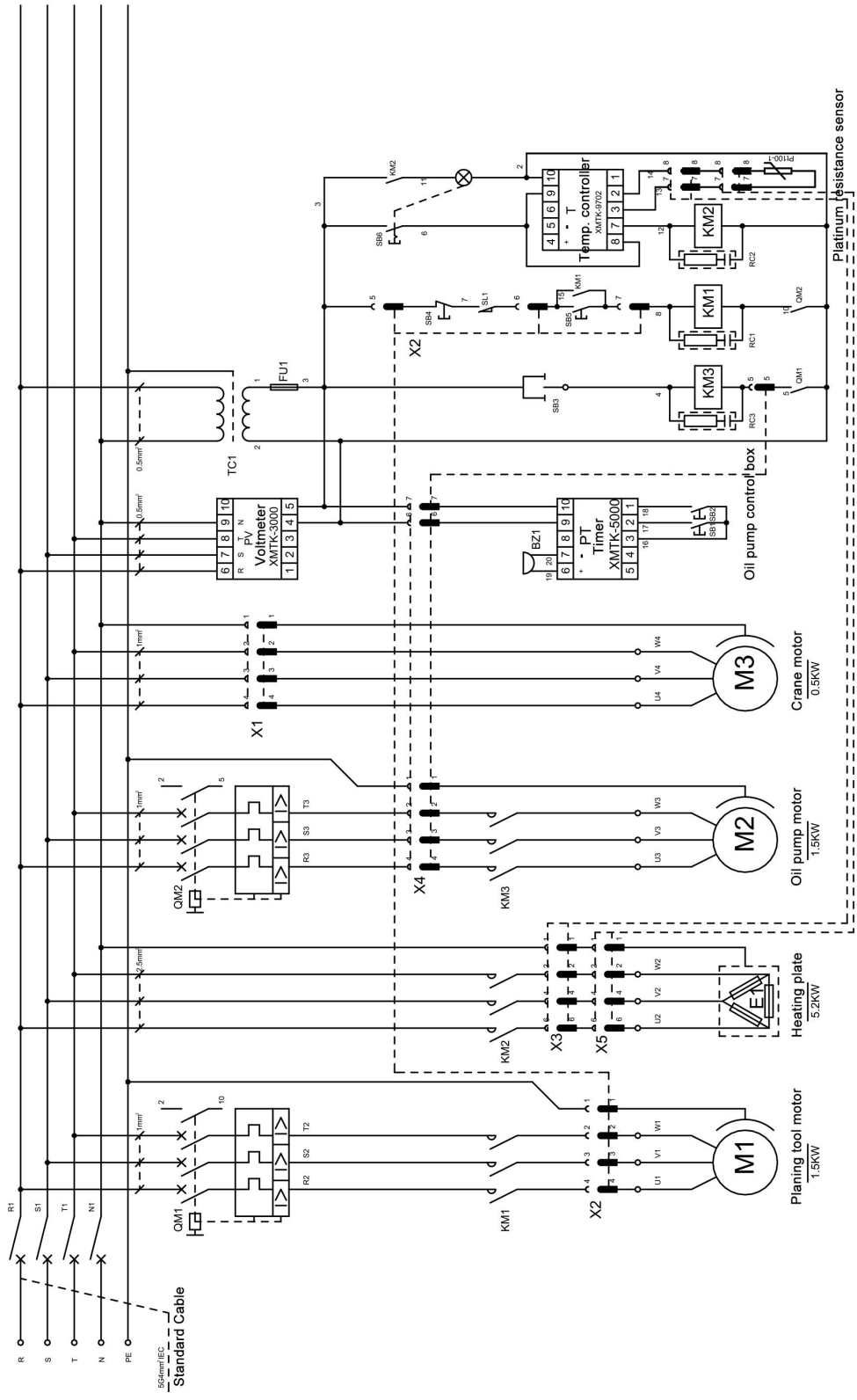
Please use tools attached, spare parts or other tools with a safety certificate while maintain or replace parts. Tools and spare parts without safety certificate are forbidden to be used.

| Malfunctions of hydraulic unit | | | |
|---|---|---|---|
| No | malfunction | malfunction analyzes | Solutions |
| 1 | The pump motor does not work | 5. switch is fault.<br>6. Power source is not connected well.<br>7. The socket inside connection is loosen<br>8. The machine is not grounded correctly | 5. Check the switch<br>6. Connect the power well<br>7. Check the connection<br>8. Check the earthing connection |
| 2 | The pump motor rotate too slowly with abnormality noise | 5. The motor is overloaded<br>6. The motor is fault<br>7. The oil filter is blocked<br>8. The working voltage is instable | 5. Make sure the motor load is less that 3 MPa<br>6. Repair or replace the pump<br>7. Clean the filter<br>8. Check the instability of power |
| 3 | The cylinder works abnormally | 6. The direction valve is damaged<br>7. There is air in system<br>8. The system pressure is too low<br>9. The quick coupler is blocked<br>10. The pressure relief valve is not locked | 6. Replace the direction valve.<br>7. Move the cylinder several times to outgo the air.<br>8. Adjust the system pressure<br>9. Replace the quick coupler<br>10. Lock the valve |
| 4 | Cylinder leak | 3. The oil ring is fault<br>4. The cylinder or piston is damaged badly | 3. Replace the oil ring<br>4. Replace the cylinder |
| 5 | The pressure can not be increased or the fluctuation is too big | 5. The core of overflow valve is blocked.<br>6. The pump is leak.<br>7. The joint slack of pump is loosened or key groove is skid.<br>8. 4. The pressure relief valve is not locked | 5. Clean or replace the core of over-flow valve<br>6. Replace the pump<br>7. Replace the joint slack<br>8. 4. Lock the valve |

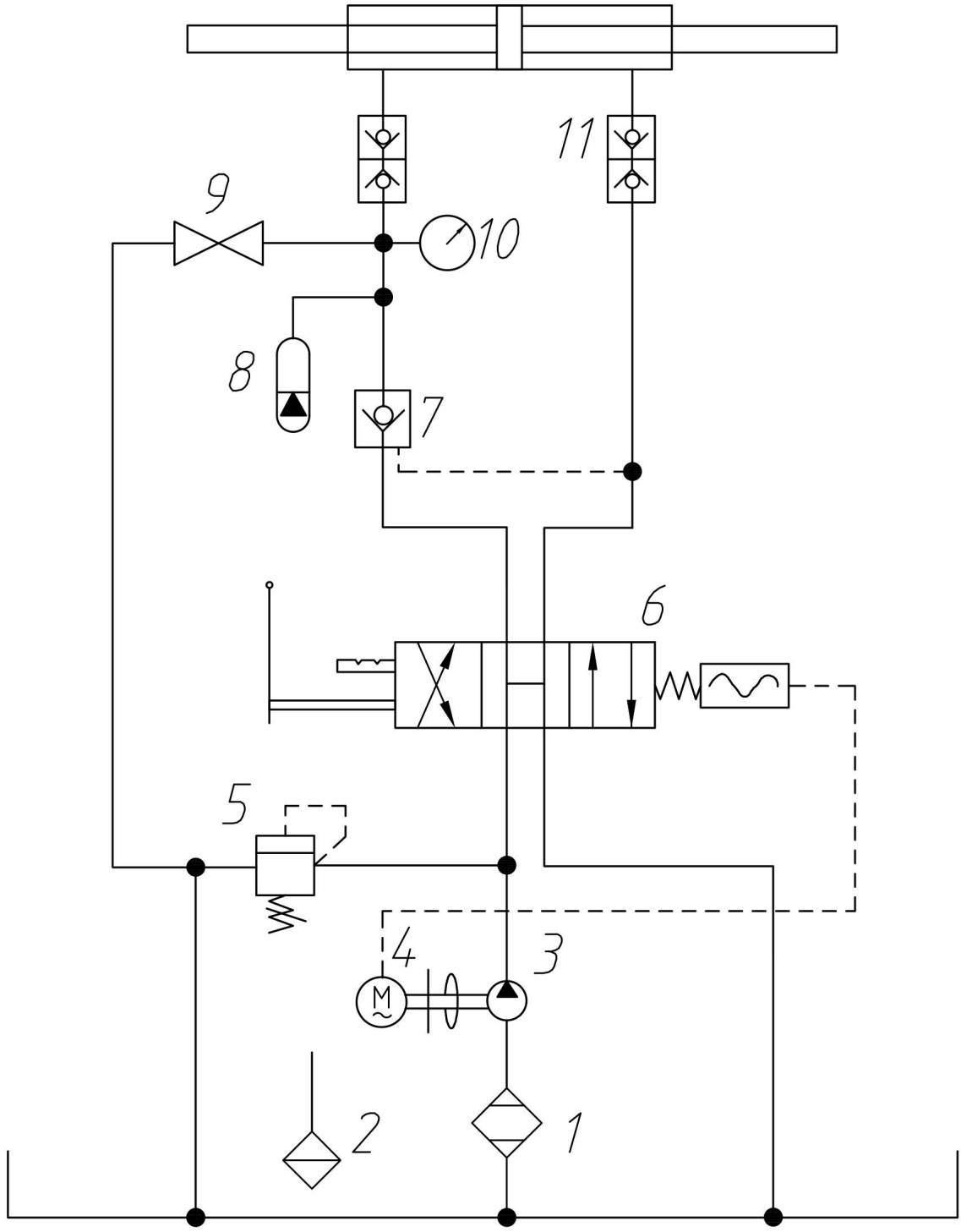
| Malfunctions of electrical units | | | |
|---|---|---|---|
| 1 | The machine does not work | 4. The power cable is damaged<br>5. Source power is abnormal<br>6. The ground fault switch is closed | 4. Check the power cable<br>5. Check the working power<br>6. Open the ground fault interrupter |
| 2 | Ground fault switch trips | 4. Power cable of heating plate, the motor of pump and planing tool may be damaged<br>5. Electrical components are t affected with damp<br>6. The higher-up power has not a ground fault safety device | 4. Check the power cables<br>5. Check the electrical elements.<br>6. Check the higher-up power safety device |
| 3 | Abnormal temperature increasing | 4. The temperature controller switch is open<br>5. The sensor （pt100）is abnormal. The resistance value of4 and 5 of heating plate socket should be within 100~183**Ω**<br>6. The heating stick inside heating plate is abnormal. The resistances between 2and 3 should be within23**Ω**. Insulation resistance between head of heating stick and outside shell must be more than 1M**Ω**<br>4. Should the temperature controller readings be more than 300℃, which suggest he sensor may be damaged or the connection is loosen. Should the temperature controller indicate LL, which suggests the sensor have a short circuit. Should the temperature controller indicate HH, which suggests the circuit of sensor is open.<br>5. Correct the temperature by button located on the temperature controller.<br>7. The temperature fluctuate abnormally | 7. Check the connection of contactors<br>8. Replace the sensor<br>9. Replace the heating plate<br>10. Replace the temperature controller<br>11. Refer to the methods to set the temperature<br>12. Check and replace the contactors if necessary |
| 4 | Lose of control when heating | The red light is shine, but the temperature still goes up, that is because the connector is fault or the joints 7 and 8 can not open when get the required temperature. | Replace the temperature controller |
| 5 | Planing tool does not rotate | The limit switch is ineffective or the mechanical parts of planing tool are clipped. | Replace the planning tool limit switch or minor sprocket |

# 7.Electrical draw diagram and Hydraulic schematic diagram

7.1 Electrical draw diagram



7.2 Hydraulic schematic diagram



# 8.Accessories list

**SHD 450/200 Butt fusion welding machine**

| Item | Description | Unit | Qty | Remark |
|---|---|---|---|---|
| 1 | Basic frame | set | 1 | 4pcs bottom clamp |
| 2 | Inserts | set | 1 | Φ400,Φ355,Φ315,Φ280，Φ250，Φ225，Φ200 |
| 3 | Stub end device for short flange | set | | Optional |
| 4 | Single clamp | set | | Optional |
| 5 | Hydraulic unit | set | 1 | Include 2pcs high-pressure oil hose |
| 6 | Support | set | 1 | |
| 7 | Planing tool | set | 1 | |
| 8 | Heating plate | set | 1 | Include 1 pcs connecting cable of heating plate |
| 9 | Crane | set | 1 | Optional |
| Attachment with machine | | | | |
| 1 | Hexagon socket head bolts（M10） | Set | 1 | L= 25、45、65、85 (10pcs/each spec) |
| 2 | Special bolt for clamp （M10） | Set | 1 | L= 110、125、135 (10pcs/each spec) |
| 3 | Double open wrench | Pcs | 1 | 30X32 |
| 4 | Hexagon wrench | pcs | 1 | 8mm |
| 5 | Cross screwdriver | Pcs | 1 | 8#*200 |
| 6 | Special screw bolt | Set | 2 | SHD450 |
| 7 | Fuse | Pcs | 1 | 2A |
| 8 | Oil plug | pcs | 1 | |
| 9 | Cutter of planning tool | Pcs | 2 | SHD450 |
| 10 | Product qualification certificate | pcs | 1 | |
| 11 | Operation instruction | Pcs | 1 | |

**SHD 500/200 Butt fusion welding machine**

| Item | Description | Unit | Qty | Remark |
|---|---|---|---|---|
| 1 | Basic frame | set | 1 | 4pcs bottom clamp |
| 2 | Inserts | set | 1 | Φ450,Φ400,Φ355,Φ315,Φ280，Φ250，Φ225，Φ200 |
| 3 | Stub end device for short flange | set | | Optional |
| 4 | Single clamp | set | | Optional |
| 5 | Hydraulic unit | set | 1 | Include 2pcs high-pressure oil hose |
| 6 | Support | set | 1 | |
| 7 | Planing tool | set | 1 | |
| 8 | Heating plate | set | 1 | Include 1 pcs connecting cable of heating plate |
| 9 | Crane | set | 1 | Optional |
| Attachment with machine | | | | |
| 1 | Hexagon socket head bolts（M10） | Set | 1 | L= 25、45、65、90 (10pcs/each spec) |
| 2 | Special bolt for clamp（M10） | Set | 1 | L= 125、135、145、155 (10pcs/each spec) |
| 3 | Double open wrench | Pcs | 1 | 32X36 |
| 4 | Hexagon wrench | pcs | 1 | 8mm |
| 5 | Cross screwdriver | Pcs | 1 | 8#*200 |
| 6 | Special screw bolt | Set | 2 | SHD630 |
| 7 | Fuse | Pcs | 1 | 2A |
| 8 | Oil plug | pcs | 1 | |
| 9 | Cutter of planning tool | Pcs | 2 | SHD500 |
| 10 | Product qualification certificate | pcs | 1 | |
| 11 | Operation instruction | Pcs | 1 | |

**SHD 630/315 Butt fusion welding machine**

| Item | Description | Unit | Qty | Remark |
|---|---|---|---|---|
| 1 | Basic frame | set | 1 | 4pcs bottom clamp |
| 2 | Inserts | set | 1 | Φ560,Φ500,Φ450,Φ400，Φ355，Φ315 |
| 3 | Stub end device for short flange | set | | Optional |
| 4 | Single clamp | set | | Optional |
| 5 | Hydraulic unit | set | 1 | Include 2pcs high-pressure oil hose |
| 6 | Support | set | 1 | |
| 7 | Planing tool | set | 1 | |
| 8 | Heating plate | set | 1 | Include 1 pcs connecting cable of heating plate |
| 9 | Crane | set | 1 | Optional |
| Attachment with machine | | | | |
| 1 | Hexagon socket head bolts（M10） | Set | 1 | L= 35、65、90、115、140、155 (10pcs/each spec) |
| 2 | Double open wrench | pcs | 1 | 32X36 |
| 3 | Hexagon wrench | pcs | 1 | 8mm |
| 4 | Cross screwdriver | Pcs | 1 | 8#*200 |
| 5 | Special screw bolt | Set | 2 | SHD630 |
| 6 | Fuse | Pcs | 1 | 2A |
| 7 | Oil plug | pcs | 1 | |
| 8 | Cutter of planning tool | Pcs | 2 | SHD630 |
| 9 | Product qualification certificate | pcs | 1 | |
| 10 | Operation instruction | pcs | 1 | |

**SHD 800/450 Butt fusion welding machine**

| Item | Description | Unit | Qty | Remark |
|---|---|---|---|---|
| 1 | Basic frame | set | 1 | 4pcs bottom clamp |
| 2 | Inserts | set | 1 | Φ710,Φ630，Φ560,Φ500Φ450 |
| 3 | Stub end device for short flange | set | | Optional |
| 4 | Single clamp | set | | Optional |
| 5 | Hydraulic unit | set | 1 | Include 2pcs high-pressure oil hose |
| 6 | Support | set | 1 | |
| 7 | Planing tool | set | 1 | |
| 8 | Heating plate | set | 1 | Include 1 pcs connecting cable of heating plate |
| 9 | Crane | set | 1 | |
| Attachment with machine | | | | |
| 1 | Hexagon socket head bolts（M10） | set | 1 | L＝40、80、120、150、175 (10pcs/each spec) |
| 2 | Double open wrench | pcs | 1 | 22X24 |
| 3 | Adjustable wrench | pcs | 1 | 18” |
| 4 | Hexagon wrench | pcs | 1 | 8mm |
| 5 | Hexagon wrench | pcs | 1 | 10mm |
| 6 | Hexagon wrench | pcs | 1 | 12mm |
| 7 | Special screw bolt | Set | 2 | SHD800 |
| 8 | Fuse | Pcs | 1 | 2A |
| 9 | Oil plug | pcs | 1 | |
| 10 | Cutter of planning tool | Pcs | 2 | SHD800 |
| 11 | Product qualification certificate | pcs | 1 | |
| 12 | Operation instruction | pcs | 1 | |

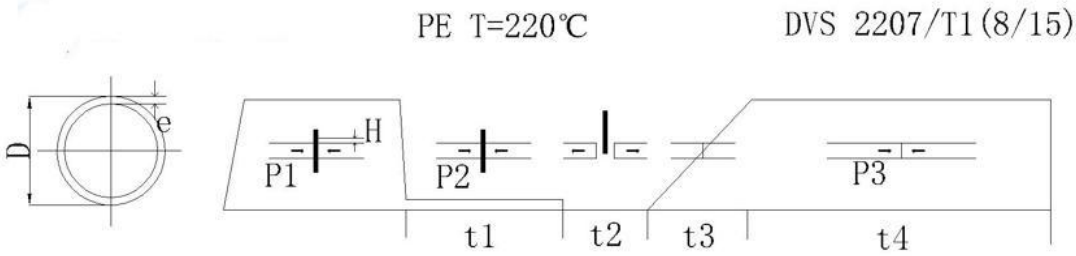
**SHD 1000/630 Butt fusion welding machine**

| Item | Description | Unit | Qty | Remark |
|---|---|---|---|---|
| 1 | Basic frame | set | 1 | 4pcs bottom clamp |
| 2 | Inserts | set | 1 | Φ900,Φ800,Φ710，Φ630 |
| 3 | Stub end device for short flange | set | | Optional |
| 4 | Single clamp | set | | Optional |
| 5 | Hydraulic unit | set | 1 | Include 2pcs high-pressure oil hose |
| 6 | Support | set | 1 | |
| 7 | Planing tool | set | 1 | |
| 8 | Heating plate | set | 1 | Include 1 pcs connecting cable of heating plate |
| 9 | Crane | set | 1 | |
| Attachment with machine | | | | |
| 1 | Hexagon socket head bolts（M10） | set | 1 | L= 50、100、150、200 (10pcs/each spec) |
| 2 | Double open wrench | pcs | 1 | 22X24 |
| 3 | Adjustable wrench | pcs | 1 | 18” |
| 4 | Hexagon wrench | pcs | 1 | 8mm |
| 5 | Hexagon wrench | pcs | 1 | 10mm |
| 6 | Hexagon wrench | pcs | 1 | 12mm |
| 7 | Special screw bolt | Set | 2 | SHD1000 |
| 8 | Nylon ropeΦ6 | 米 | 10 | Φ6 |
| 9 | Fuse | Pcs | 1 | 2A |
| 10 | Oil plug | pcs | 1 | |
| 11 | Cutter of planning tool | Pcs | 2 | SHD1000 |
| 12 | Product qualification certificate | pcs | 1 | |
| 13 | Operation instruction | pcs | 1 | |

**SHD 1200/630 Butt fusion welding machine**

| Item | Description | Unit | Qty | Remark |
|---|---|---|---|---|
| 1 | Basic frame | set | 1 | 4pcs bottom clamp |
| 2 | Inserts | set | 1 | Φ1100,Φ1000,Φ900,Φ800,Φ710，Φ630 |
| 3 | Stub end device for short flange | set | | Optional |
| 4 | Single clamp | set | | Optional |
| 5 | Hydraulic unit | set | 1 | Include 2pcs high-pressure oil hose |
| 6 | Support | set | 1 | |
| 7 | Planing tool | set | 1 | |
| 8 | Heating plate | set | 1 | Include 1 pcs connecting cable of heating plate |
| 9 | Crane | set | 1 | |
| Attachment with machine | | | | |
| 1 | Hexagon socket head bolts（M10） | set | 1 | L= 50、100、155、200、250、290 (10pcs/each spec) |
| 2 | Double open wrench | pcs | 1 | 22X24 |
| 3 | Adjustable wrench | pcs | 1 | 18” |
| 4 | Hexagon wrench | pcs | 1 | 8mm |
| 5 | Hexagon wrench | pcs | 1 | 10mm |
| 6 | Hexagon wrench | pcs | 1 | 12mm |
| 7 | Special screw bolt | Set | 2 | SHD1200 |
| 8 | Nylon ropeΦ6 | 米 | 10 | Φ6 |
| 9 | Fuse | Pcs | 1 | 2A |
| 10 | Oil plug | pcs | 1 | |
| 11 | Cutter of planning tool | Pcs | 2 | SHD1200 |
| 12 | Product qualification certificate | pcs | 1 | |
| 13 | Operation instruction | pcs | 1 | |

# Welding parameter




**SHD450 （Cylinder area=22.36cm²）**

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 9 | 22.2 | 8.3 | 2.5 | 0.6 | 222 | 11 | 13 | 8.3 | 28 |
| | 11 | 18.2 | 7.0 | 2 | 0.5 | 182 | 10 | 11 | 7.0 | 23 |
| | 13.6 | 14.7 | 5.7 | 2 | 0.4 | 147 | 9 | 10 | 5.7 | 19 |
| | 17 | 11.8 | 4.7 | 1.5 | 0.3 | 118 | 8 | 8 | 4.7 | 15 |
| | 17.6 | 11.4 | 4.5 | 1.5 | 0.3 | 114 | 8 | 8 | 4.5 | 15 |
| | 21 | 9.5 | 3.8 | 1.5 | 0.3 | 95 | 7 | 7 | 3.8 | 12 |
| | 26 | 7.7 | 3.1 | 1.5 | 0.2 | 77 | 6 | 6 | 3.1 | 10 |
| | 33 | 6.1 | 2.5 | 1 | 0.2 | 61 | 6 | 6 | 2.5 | 8.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 225 | 9 | 25.0 | 10.5 | 2.5 | 0.7 | 250 | 11 | 13 | 10.5 | 31 |
| | 11 | 20.5 | 8.8 | 2.5 | 0.6 | 205 | 10 | 11 | 8.8 | 26 |
| | 13.6 | 16.5 | 7.3 | 2 | 0.5 | 165 | 9 | 10 | 7.3 | 22 |
| | 17 | 13.2 | 5.9 | 2 | 0.4 | 132 | 8 | 8 | 5.9 | 16.5 |
| | 17.6 | 12.8 | 5.7 | 2 | 0.4 | 128 | 8 | 8 | 5.7 | 16.5 |
| | 21 | 10.7 | 4.8 | 1.5 | 0.3 | 107 | 7 | 7 | 4.8 | 13 |
| | 26 | 8.7 | 3.9 | 1.5 | 0.3 | 87 | 7 | 7 | 3.9 | 11 |
| | 33 | 6.8 | 3.1 | 1 | 0.2 | 68 | 6 | 6 | 3.1 | 9.5 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 250 | 9 | 27.8 | 13.0 | 3 | 0.9 | 278 | 12 | 14 | 13.0 | 34 |
| | 11 | 22.7 | 10.9 | 2.5 | 0.7 | 227 | 11 | 13 | 10.9 | 29 |
| | 13.6 | 18.4 | 9.0 | 2 | 0.6 | 184 | 10 | 11 | 9.0 | 23 |
| | 17 | 14.7 | 7.3 | 2 | 0.5 | 147 | 9 | 10 | 7.3 | 19 |
| | 17.6 | 14.2 | 7.1 | 2 | 0.5 | 142 | 9 | 10 | 7.1 | 18 |
| | 21 | 11.9 | 6.0 | 1.5 | 0.4 | 119 | 8 | 8 | 6.0 | 15.5 |
| | 26 | 9.6 | 4.9 | 1.5 | 0.3 | 96 | 7 | 7 | 4.9 | 12 |
| | 33 | 7.6 | 3.9 | 1.5 | 0.3 | 76 | 6 | 6 | 3.9 | 10 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 280 | 9 | 31.1 | 16.3 | 3 | 1.1 | 311 | 13 | 15 | 16.3 | 38 |
| | 11 | 25.5 | 13.6 | 2.5 | 0.9 | 255 | 12 | 14 | 13.6 | 32 |
| | 13.6 | 20.6 | 11.3 | 2.5 | 0.8 | 206 | 10 | 11 | 11.3 | 26 |
| | 17 | 16.5 | 9.1 | 2 | 0.6 | 165 | 9 | 10 | 9.1 | 22 |
| | 17.6 | 15.9 | 8.9 | 2 | 0.6 | 159 | 9 | 10 | 8.9 | 21 |
| | 21 | 13.3 | 7.5 | 2 | 0.5 | 133 | 8 | 8 | 7.5 | 17 |
| | 26 | 10.8 | 6.1 | 1.5 | 0.4 | 108 | 7 | 7 | 6.1 | 13 |
| | 33 | 8.5 | 4.9 | 1.5 | 0.3 | 85 | 7 | 7 | 4.9 | 11 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 315 | 9 | 35.0 | 20.6 | 3 | 1.4 | 350 | 14 | 17 | 20.6 | 43 |
| | 11 | 28.6 | 17.3 | 3 | 1.2 | 286 | 13 | 15 | 17.3 | 35 |
| | 13.6 | 23.2 | 14.2 | 2.5 | 0.9 | 232 | 11 | 13 | 14.2 | 29 |
| | 17 | 18.5 | 11.6 | 2 | 0.8 | 185 | 10 | 11 | 11.6 | 24 |
| | 17.6 | 17.9 | 11.2 | 2 | 0.7 | 179 | 9 | 10 | 11.2 | 23 |
| | 21 | 15.0 | 9.5 | 2 | 0.6 | 150 | 9 | 10 | 9.5 | 20 |
| | 26 | 12.1 | 7.7 | 2 | 0.5 | 121 | 8 | 8 | 7.7 | 15.5 |
| | 33 | 9.5 | 6.1 | 1.5 | 0.4 | 95 | 7 | 7 | 6.1 | 12 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 355 | 9 | 39.4 | 26.2 | 3.5 | 1.7 | 394 | 16 | 19 | 26.2 | 48 |
| | 11 | 32.3 | 21.9 | 3 | 1.5 | 323 | 14 | 17 | 21.9 | 39 |
| | 13.6 | 26.1 | 18.1 | 3 | 1.2 | 261 | 12 | 14 | 18.1 | 32 |
| | 17 | 20.9 | 14.7 | 2.5 | 1.0 | 209 | 10 | 11 | 14.7 | 26 |
| | 17.6 | 20.2 | 14.2 | 2.5 | 0.9 | 202 | 10 | 11 | 14.2 | 25 |
| | 21 | 16.9 | 12.0 | 2 | 0.8 | 169 | 9 | 10 | 12.0 | 22 |
| | 26 | 13.7 | 9.8 | 2 | 0.7 | 137 | 8 | 8 | 9.8 | 17 |
| | 33 | 10.8 | 7.8 | 1.5 | 0.5 | 108 | 7 | 7 | 7.8 | 14 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 400 | 9 | 44.4 | 33.3 | 3.5 | 2.2 | 444 | 17 | 20 | 33.3 | 54 |
| | 11 | 36.4 | 27.9 | 3 | 1.9 | 364 | 15 | 18 | 27.9 | 44 |
| | 13.6 | 29.4 | 23.0 | 3 | 1.5 | 294 | 13 | 15 | 23.0 | 35 |
| | 17 | 23.5 | 18.7 | 2.5 | 1.2 | 235 | 11 | 13 | 18.7 | 30 |
| | 17.6 | 22.7 | 18.1 | 2.5 | 1.2 | 227 | 11 | 13 | 18.1 | 29 |
| | 21 | 19.0 | 15.3 | 2.5 | 1.0 | 190 | 10 | 11 | 15.3 | 24 |
| | 26 | 15.4 | 12.5 | 2 | 0.8 | 154 | 9 | 10 | 12.5 | 20 |
| | 33 | 12.1 | 9.9 | 2 | 0.7 | 121 | 8 | 8 | 9.9 | 16 |
| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
| 450 | 9 | 50.0 | 42.1 | 3.5 | 2.8 | 500 | 19 | 24 | 42.1 | 61 |
| | 11 | 40.9 | 35.3 | 3.5 | 2.4 | 409 | 16 | 19 | 35.3 | 50 |
| | 13.6 | 33.1 | 29.1 | 3 | 1.9 | 331 | 14 | 17 | 29.1 | 40 |
| | 17 | 26.5 | 23.6 | 3 | 1.6 | 265 | 12 | 14 | 23.6 | 33 |
| | 17.6 | 25.6 | 22.9 | 2.5 | 1.5 | 256 | 12 | 14 | 22.9 | 32 |
| | 21 | 21.4 | 19.3 | 2.5 | 1.3 | 214 | 10 | 11 | 19.3 | 26 |
| | 26 | 17.3 | 15.8 | 2 | 1.1 | 173 | 9 | 10 | 15.8 | 22 |
| | 33 | 13.6 | 12.5 | 2 | 0.8 | 136 | 8 | 8 | 12.5 | 17 |

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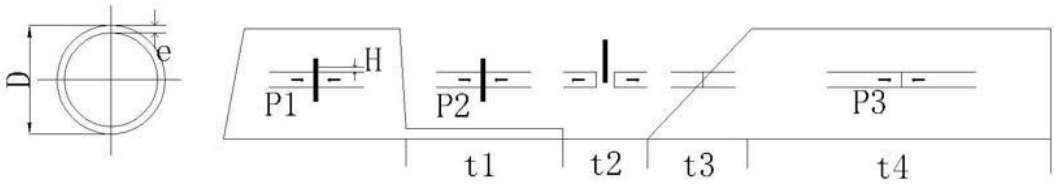


**SHD500** (Cylinder area=37.7cm²)

| D (mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 280 | 9 | 31.1 | 9.7 | 3 | 0.6 | 311 | 13 | 15 | 9.7 | 38 |
| | 11 | 25.5 | 8.1 | 2.5 | 0.5 | 255 | 12 | 14 | 8.1 | 32 |
| | 13.6 | 20.6 | 6.7 | 2.5 | 0.4 | 206 | 10 | 11 | 6.7 | 26 |
| | 17 | 16.5 | 5.4 | 2 | 0.4 | 165 | 9 | 10 | 5.4 | 22 |
| | 17.6 | 15.9 | 5.2 | 2 | 0.3 | 159 | 9 | 10 | 5.2 | 21 |
| | 21 | 13.3 | 4.4 | 2 | 0.3 | 133 | 8 | 8 | 4.4 | 17 |
| | 26 | 10.8 | 3.6 | 1.5 | 0.2 | 108 | 7 | 7 | 3.6 | 13 |
| | 33 | 8.5 | 2.9 | 1.5 | 0.2 | 85 | 7 | 7 | 2.9 | 11 |

| D (mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 315 | 9 | 35.0 | 12.2 | 3 | 0.8 | 350 | 14 | 17 | 12.2 | 43 |
| | 11 | 28.6 | 10.2 | 3 | 0.7 | 286 | 13 | 15 | 10.2 | 35 |
| | 13.6 | 23.2 | 8.4 | 2.5 | 0.6 | 232 | 11 | 13 | 8.4 | 29 |
| | 17 | 18.5 | 6.9 | 2 | 0.5 | 185 | 10 | 11 | 6.9 | 24 |
| | 17.6 | 17.9 | 6.6 | 2 | 0.4 | 179 | 9 | 10 | 6.6 | 23 |
| | 21 | 15.0 | 5.6 | 2 | 0.4 | 150 | 9 | 10 | 5.6 | 20 |
| | 26 | 12.1 | 4.6 | 2 | 0.3 | 121 | 8 | 8 | 4.6 | 15.5 |
| | 33 | 9.5 | 3.6 | 1.5 | 0.2 | 95 | 7 | 7 | 3.6 | 12 |

| D (mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 355 | 9 | 39.4 | 15.6 | 3.5 | 1.0 | 394 | 16 | 19 | 15.6 | 48 |
| | 11 | 32.3 | 13.0 | 3 | 0.9 | 323 | 14 | 17 | 13.0 | 39 |
| | 13.6 | 26.1 | 10.7 | 3 | 0.7 | 261 | 12 | 14 | 10.7 | 32 |
| | 17 | 20.9 | 8.7 | 2.5 | 0.6 | 209 | 10 | 11 | 8.7 | 26 |
| | 17.6 | 20.2 | 8.4 | 2.5 | 0.6 | 202 | 10 | 11 | 8.4 | 25 |
| | 21 | 16.9 | 7.1 | 2 | 0.5 | 169 | 9 | 10 | 7.1 | 22 |
| | 26 | 13.7 | 5.8 | 2 | 0.4 | 137 | 8 | 8 | 5.8 | 17 |
| | 33 | 10.8 | 4.6 | 1.5 | 0.3 | 108 | 7 | 7 | 4.6 | 14 |

| D（㎜） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 400 | 9 | 44.4 | 19.7 | 3.5 | 1.3 | 444 | 17 | 20 | 19.7 | 54 |
| | 11 | 36.4 | 16.5 | 3 | 1.1 | 364 | 15 | 18 | 16.5 | 44 |
| | 13.6 | 29.4 | 13.6 | 3 | 0.9 | 294 | 13 | 15 | 13.6 | 35 |
| | 17 | 23.5 | 11.1 | 2.5 | 0.7 | 235 | 11 | 13 | 11.1 | 30 |
| | 17.6 | 22.7 | 10.7 | 2.5 | 0.7 | 227 | 11 | 13 | | 29 |
| | 21 | 19.0 | 9.1 | 2.5 | 0.6 | 190 | 10 | 11 | 9.1 | 24 |
| | 26 | 15.4 | 7.4 | 2 | 0.5 | 154 | 9 | 10 | 7.4 | 20 |
| | 33 | 12.1 | 5.9 | 2 | 0.4 | 121 | 8 | 8 | 5.9 | 15.5 |

| D（㎜） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 450 | 9 | 50.0 | 25.0 | 3.5 | 1.7 | 500 | 19 | 24 | 25.0 | 61 |
| | 11 | 40.9 | 20.9 | 3.5 | 1.4 | 409 | 16 | 19 | 20.9 | 50 |
| | 13.6 | 33.1 | 17.2 | 3 | 1.1 | 331 | 14 | 17 | 17.2 | 40 |
| | 17 | 26.5 | 14.0 | 3 | 0.9 | 265 | 12 | 14 | 14.0 | 33 |
| | 17.6 | 25.6 | 13.6 | 2.5 | 0.9 | 256 | 12 | 14 | | 32 |
| | 21 | 21.4 | 11.5 | 2.5 | 0.8 | 214 | 10 | 11 | 11.5 | 26 |
| | 26 | 17.3 | 9.4 | 2 | 0.6 | 173 | 9 | 10 | 9.4 | 22 |
| | 33 | 13.6 | 7.4 | 2 | 0.5 | 136 | 8 | 8 | 7.4 | 17 |
| | 33 | 0.0 | 0.0 | 0.5 | 0.0 | 0 | 5 | 5 | 0.0 | 17 |

| D（㎜） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 500 | 9 | 55.6 | 30.8 | 4 | 2.1 | 556 | 20 | 25 | 30.8 | 68 |
| | 11 | 45.5 | 25.8 | 3.5 | 1.7 | 455 | 18 | 22 | 25.8 | 57 |
| | 13.6 | 36.8 | 21.3 | 3 | 1.4 | 368 | 15 | 18 | 21.3 | 45 |
| | 17 | 29.4 | 17.3 | 3 | 1.2 | 294 | 13 | 15 | 17.3 | 35 |
| | 17.6 | 28.4 | 16.7 | 3 | 1.1 | 284 | 13 | 15 | | 34 |
| | 21 | 23.8 | 14.2 | 2.5 | 0.9 | 238 | 11 | 13 | 14.2 | 30 |
| | 26 | 19.2 | 11.6 | 2.5 | 0.8 | 192 | 10 | 11 | 11.6 | 24 |
| | 33 | 15.2 | 9.2 | 2 | 0.6 | 152 | 9 | 10 | 9.2 | 20 |

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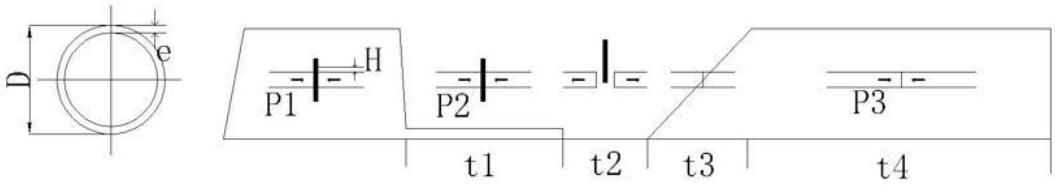



**SHD630 （Cylinder area=37.7cm²）**

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 315 | 9 | 35.0 | 12.2 | 3 | 0.8 | 350 | 14 | 17 | 12.2 | 43 |
| | 11 | 28.6 | 10.2 | 3 | 0.7 | 286 | 13 | 15 | 10.2 | 35 |
| | 13.6 | 23.2 | 8.4 | 2.5 | 0.6 | 232 | 11 | 13 | 8.4 | 29 |
| | 17 | 18.5 | 6.9 | 2 | 0.5 | 185 | 10 | 11 | 6.9 | 24 |
| | 17.6 | 17.9 | 6.6 | 2 | 0.4 | 179 | 9 | 10 | 6.6 | 23 |
| | 21 | 15.0 | 5.6 | 2 | 0.4 | 150 | 9 | 10 | 5.6 | 20 |
| | 26 | 12.1 | 4.6 | 2 | 0.3 | 121 | 8 | 8 | 4.6 | 15.5 |
| | 33 | 9.5 | 3.6 | 1.5 | 0.2 | 95 | 7 | 7 | 3.6 | 12 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 355 | 9 | 39.4 | 15.6 | 3.5 | 1.0 | 394 | 16 | 19 | 15.6 | 48 |
| | 11 | 32.3 | 13.0 | 3 | 0.9 | 323 | 14 | 17 | 13.0 | 39 |
| | 13.6 | 26.1 | 10.7 | 3 | 0.7 | 261 | 12 | 14 | 10.7 | 32 |
| | 17 | 20.9 | 8.7 | 2.5 | 0.6 | 209 | 10 | 11 | 8.7 | 26 |
| | 17.6 | 20.2 | 8.4 | 2.5 | 0.6 | 202 | 10 | 11 | 8.4 | 25 |
| | 21 | 16.9 | 7.1 | 2 | 0.5 | 169 | 9 | 10 | 7.1 | 22 |
| | 26 | 13.7 | 5.8 | 2 | 0.4 | 137 | 8 | 8 | 5.8 | 17 |
| | 33 | 10.8 | 4.6 | 1.5 | 0.3 | 108 | 7 | 7 | 4.6 | 14 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 400 | 9 | 44.4 | 19.7 | 3.5 | 1.3 | 444 | 17 | 20 | 19.7 | 54 |
| | 11 | 36.4 | 16.5 | 3 | 1.1 | 364 | 15 | 18 | 16.5 | 44 |
| | 13.6 | 29.4 | 13.6 | 3 | 0.9 | 294 | 13 | 15 | 13.6 | 35 |
| | 17 | 23.5 | 11.1 | 2.5 | 0.7 | 235 | 11 | 13 | 11.1 | 30 |
| | 17.6 | 22.7 | 10.7 | 2.5 | 0.7 | 227 | 11 | 13 | 10.7 | 29 |
| | 21 | 19.0 | 9.1 | 2.5 | 0.6 | 190 | 10 | 11 | 9.1 | 24 |
| | 26 | 15.4 | 7.4 | 2 | 0.5 | 154 | 9 | 10 | 7.4 | 20 |
| | 33 | 12.1 | 5.9 | 2 | 0.4 | 121 | 8 | 8 | 5.9 | 16 |

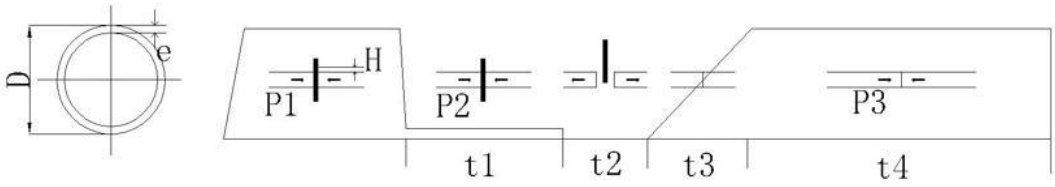
| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 450 | 9 | 50.0 | 25.0 | 3.5 | 1.7 | 500 | 19 | 24 | 25.0 | 61 |
| | 11 | 40.9 | 20.9 | 3.5 | 1.4 | 409 | 16 | 19 | 20.9 | 50 |
| | 13.6 | 33.1 | 17.2 | 3 | 1.1 | 331 | 14 | 17 | 17.2 | 40 |
| | 17 | 26.5 | 14.0 | 3 | 0.9 | 265 | 12 | 14 | 14.0 | 33 |
| | 17.6 | 25.6 | 13.6 | 2.5 | 0.9 | 256 | 12 | 14 | 13.6 | 32 |
| | 21 | 21.4 | 11.5 | 2.5 | 0.8 | 214 | 10 | 11 | 11.5 | 26 |
| | 26 | 17.3 | 9.4 | 2 | 0.6 | 173 | 9 | 10 | 9.4 | 22 |
| | 33 | 13.6 | 7.4 | 2 | 0.5 | 136 | 8 | 8 | 7.4 | 17 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 500 | 9 | 55.6 | 30.8 | 4 | 2.1 | 556 | 20 | 25 | 30.8 | 68 |
| | 11 | 45.5 | 25.8 | 3.5 | 1.7 | 455 | 18 | 22 | 25.8 | 57 |
| | 13.6 | 36.8 | 21.3 | 3 | 1.4 | 368 | 15 | 18 | 21.3 | 45 |
| | 17 | 29.4 | 17.3 | 3 | 1.2 | 294 | 13 | 15 | 17.3 | 35 |
| | 17.6 | 28.4 | 16.7 | 3 | 1.1 | 284 | 13 | 15 | 16.7 | 34 |
| | 21 | 23.8 | 14.2 | 2.5 | 0.9 | 238 | 11 | 13 | 14.2 | 30 |
| | 26 | 19.2 | 11.6 | 2.5 | 0.8 | 192 | 10 | 11 | 11.6 | 24 |
| | 33 | 15.2 | 9.2 | 2 | 0.6 | 152 | 9 | 10 | 9.2 | 20 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 560 | 9 | 62.2 | 38.7 | 4 | 2.6 | 622 | 22 | 29 | 38.7 | 76 |
| | 11 | 50.9 | 32.4 | 4 | 2.2 | 509 | 19 | 24 | 32.4 | 62 |
| | 13.6 | 41.2 | 26.7 | 3.5 | 1.8 | 412 | 16 | 19 | 26.7 | 50 |
| | 17 | 32.9 | 21.7 | 3 | 1.4 | 329 | 14 | 17 | 21.7 | 40 |
| | 17.6 | 31.8 | 21.0 | 3 | 1.4 | 318 | 14 | 17 | 21.0 | 39 |
| | 21 | 26.7 | 17.8 | 3 | 1.2 | 267 | 12 | 14 | 17.8 | 33 |
| | 26 | 21.5 | 14.5 | 2.5 | 1.0 | 215 | 10 | 11 | 14.5 | 28 |
| | 33 | 17.0 | 11.5 | 2 | 0.8 | 170 | 9 | 10 | 11.5 | 22 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 630 | 9 | 70.0 | 49.0 | 4.5 | 3.3 | 700 | 25 | 35 | 49.0 | 85 |
| | 11 | 57.3 | 41.0 | 4 | 2.7 | 573 | 21 | 26 | 41.0 | 70 |
| | 13.6 | 46.3 | 33.8 | 3.5 | 2.3 | 463 | 18 | 22 | 33.8 | 57 |
| | 17 | 37.1 | 27.5 | 3.5 | 1.8 | 371 | 15 | 18 | 27.5 | 45 |
| | 17.6 | 35.8 | 26.6 | 3 | 1.8 | 358 | 15 | 18 | 26.6 | 44 |
| | 21 | 30.0 | 22.5 | 3 | 1.5 | 300 | 13 | 15 | 22.5 | 36 |
| | 26 | 24.2 | 18.3 | 2.5 | 1.2 | 242 | 11 | 13 | 18.3 | 30 |
| | 33 | 19.1 | 14.6 | 2.5 | 1.0 | 191 | 10 | 11 | 14.6 | 24 |

PE T=220℃ DVS 2207/T1(8/15)




**SHD800 （Cylinder area=44cm²）**

| Dmm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 450 | 9 | 50.0 | 21.4 | 3.5 | 1.4 | 500 | 19 | 24 | 21.4 | 61 |
| | 11 | 40.9 | 17.9 | 3.5 | 1.2 | 409 | 16 | 19 | 17.9 | 50 |
| | 13.6 | 33.1 | 14.8 | 3 | 1.0 | 331 | 14 | 17 | 14.8 | 40 |
| | 17 | 26.5 | 12.0 | 3 | 0.8 | 265 | 12 | 14 | 12.0 | 33 |
| | 17.6 | 25.6 | 11.6 | 2.5 | 0.8 | 256 | 12 | 14 | 11.6 | 32 |
| | 21 | 21.4 | 9.8 | 2.5 | 0.7 | 214 | 10 | 11 | 9.8 | 26 |
| | 26 | 17.3 | 8.0 | 2 | 0.5 | 173 | 9 | 10 | 8.0 | 22 |
| | 33 | 13.6 | 6.4 | 2 | 0.4 | 136 | 8 | 8 | 6.4 | 17 |

| Dmm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 500 | 9 | 55.6 | 26.4 | 4 | 1.8 | 556 | 20 | 25 | 26.4 | 68 |
| | 11 | 45.5 | 22.1 | 3.5 | 1.5 | 455 | 18 | 22 | 22.1 | 57 |
| | 13.6 | 36.8 | 18.2 | 3 | 1.2 | 368 | 15 | 18 | 18.2 | 45 |
| | 17 | 29.4 | 14.8 | 3 | 1.0 | 294 | 13 | 15 | 14.8 | 35 |
| | 17.6 | 28.4 | 14.3 | 3 | 1.0 | 284 | 13 | 15 | 14.3 | 34 |
| | 21 | 23.8 | 12.1 | 2.5 | 0.8 | 238 | 11 | 13 | 12.1 | 30 |
| | 26 | 19.2 | 9.9 | 2.5 | 0.7 | 192 | 10 | 11 | 9.9 | 24 |
| | 33 | 15.2 | 7.9 | 2 | 0.5 | 152 | 9 | 10 | 7.9 | 20 |

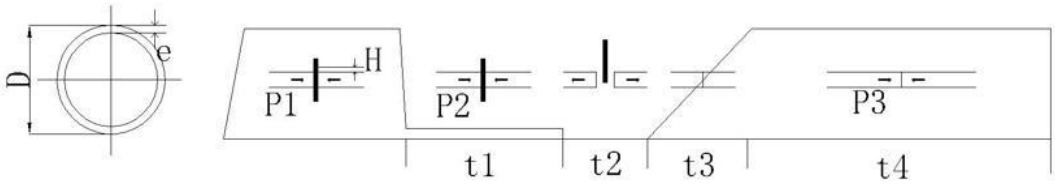
| Dmm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 560 | 9 | 62.2 | 33.2 | 4 | 2.2 | 622 | 22 | 29 | 33.2 | 76 |
| | 11 | 50.9 | 27.7 | 4 | 1.8 | 509 | 19 | 24 | 27.7 | 62 |
| | 13.6 | 41.2 | 22.9 | 3.5 | 1.5 | 412 | 16 | 19 | 22.9 | 50 |
| | 17 | 32.9 | 18.6 | 3 | 1.2 | 329 | 14 | 17 | 18.6 | 40 |
| | 17.6 | 31.8 | 18.0 | 3 | 1.2 | 318 | 14 | 17 | 18.0 | 39 |
| | 21 | 26.7 | 15.2 | 3 | 1.0 | 267 | 12 | 14 | 15.2 | 33 |
| | 26 | 21.5 | 12.4 | 2.5 | 0.8 | 215 | 10 | 11 | 12.4 | 28 |
| | 33 | 17.0 | 9.9 | 2 | 0.7 | 170 | 9 | 10 | 9.9 | 22 |

| Dmm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 630 | 9 | 70.0 | 42.0 | 4.5 | 2.8 | 700 | 25 | 35 | 42.0 | 85 |
| | 11 | 57.3 | 35.1 | 4 | 2.3 | 573 | 21 | 26 | 35.1 | 70 |
| | 13.6 | 46.3 | 28.9 | 3.5 | 1.9 | 463 | 18 | 22 | 28.9 | 57 |
| | 17 | 37.1 | 23.5 | 3.5 | 1.6 | 371 | 15 | 18 | 23.5 | 45 |
| | 17.6 | 35.8 | 22.8 | 3 | 1.5 | 358 | 14 | 17 | 22.8 | 44 |
| | 21 | 30.0 | 19.3 | 3 | 1.3 | 300 | 13 | 15 | 19.3 | 36 |
| | 26 | 24.2 | 15.7 | 2.5 | 1.0 | 242 | 11 | 13 | 15.7 | 30 |
| | 33 | 19.1 | 12.5 | 2.5 | 0.8 | 191 | 10 | 11 | 12.5 | 24 |

| Dmm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 710 | 9 | 78.9 | 53.3 | 4.5 | 3.6 | 789 | 27 | 35 | 53.3 | 96 |
| | 11 | 64.5 | 44.6 | 4 | 3.0 | 645 | 23 | 31 | 44.6 | 79 |
| | 13.6 | 52.2 | 36.8 | 4 | 2.5 | 522 | 19 | 24 | 36.8 | 63 |
| | 17 | 41.8 | 29.9 | 3.5 | 2.0 | 418 | 16 | 19 | 29.9 | 52 |
| | 17.6 | 40.3 | 28.9 | 3.5 | 1.9 | 403 | 16 | 19 | 28.9 | 49 |
| | 21 | 33.8 | 24.5 | 3 | 1.6 | 338 | 14 | 17 | 24.5 | 42 |
| | 26 | 27.3 | 20.0 | 3 | 1.3 | 273 | 12 | 14 | 20.0 | 33 |
| | 33 | 21.5 | 15.9 | 2.5 | 1.1 | 215 | 10 | 11 | 15.9 | 28 |

| Dmm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 800 | 9 | 88.9 | 67.7 | 4.5 | 4.5 | 889 | 30 | 35 | 67.7 | 108 |
| | 11 | 72.7 | 56.6 | 4.5 | 3.8 | 727 | 25 | 35 | 56.6 | 88 |
| | 13.6 | 58.8 | 46.7 | 4 | 3.1 | 588 | 21 | 26 | 46.7 | 72 |
| | 17 | 47.1 | 37.9 | 3.5 | 2.5 | 471 | 18 | 23 | 37.9 | 58 |
| | 17.6 | 45.5 | 36.7 | 3.5 | 2.4 | 455 | 18 | 21 | 36.7 | 57 |
| | 21 | 38.1 | 31.1 | 3.5 | 2.1 | 381 | 15 | 18 | 31.1 | 46 |
| | 26 | 30.8 | 25.3 | 3 | 1.7 | 308 | 13 | 16 | 25.3 | 38 |
| | 33 | 24.2 | 20.1 | 2.5 | 1.3 | 242 | 11 | 13 | 20.1 | 30 |

PE T=220℃ DVS 2207/T1(8/15)




**SHD1000 （Cylinder area=38.9cm²）**

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 630 | 9 | 70.0 | 47.5 | 4.5 | 3.2 | 700 | 25 | 35 | 47.5 | 85 |
| | 11 | 57.3 | 39.7 | 4 | 2.6 | 573 | 21 | 26 | 39.7 | 70 |
| | 13.6 | 46.3 | 32.7 | 3.5 | 2.2 | 463 | 18 | 22 | 32.7 | 57 |
| | 17 | 37.1 | 26.6 | 3.5 | 1.8 | 371 | 15 | 18 | 26.6 | 45 |
| | 17.6 | 35.8 | 25.8 | 3 | 1.7 | 358 | 15 | 18 | 25.8 | 44 |
| | 21 | 30.0 | 21.8 | 3 | 1.5 | 300 | 13 | 16 | 21.8 | 36 |
| | 26 | 24.2 | 17.8 | 2.5 | 1.2 | 242 | 11 | 13 | 17.8 | 30 |
| | 33 | 19.1 | 14.1 | 2.5 | 0.9 | 191 | 10 | 11 | 14.1 | 24 |

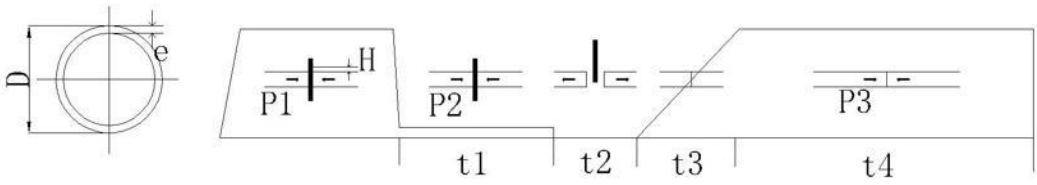
| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 710 | 9 | 78.9 | 60.3 | 4.5 | 4.0 | 789 | 27 | 35 | 60.3 | 96 |
| | 11 | 64.5 | 50.4 | 4 | 3.4 | 645 | 23 | 30 | 50.4 | 79 |
| | 13.6 | 52.2 | 41.6 | 4 | 2.8 | 522 | 19 | 24 | 41.6 | 63 |
| | 17 | 41.8 | 33.8 | 3.5 | 2.3 | 418 | 16 | 19 | 33.8 | 52 |
| | 17.6 | 40.3 | 32.7 | 3.5 | 2.2 | 403 | 16 | 19 | 32.7 | 49 |
| | 21 | 33.8 | 27.7 | 3 | 1.8 | 338 | 14 | 17 | 27.7 | 42 |
| | 26 | 27.3 | 22.6 | 3 | 1.5 | 273 | 12 | 14 | 22.6 | 33 |
| | 33 | 21.5 | 17.9 | 2.5 | 1.2 | 215 | 10 | 11 | 17.9 | 28 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 800 | 9 | 88.9 | 76.5 | 4.5 | 5.1 | 889 | 30 | 35 | 76.5 | 108 |
| | 11 | 72.7 | 64.0 | 4.5 | 4.3 | 727 | 25 | 35 | 64.0 | 88 |
| | 13.6 | 58.8 | 52.8 | 4 | 3.5 | 588 | 21 | 26 | 52.8 | 72 |
| | 17 | 47.1 | 42.9 | 3.5 | 2.9 | 471 | 18 | 22 | 42.9 | 58 |
| | 17.6 | 45.5 | 41.5 | 3.5 | 2.8 | 455 | 18 | 21 | 41.5 | 57 |
| | 21 | 38.1 | 35.1 | 3.5 | 2.3 | 381 | 15 | 18 | 35.1 | 46 |
| | 26 | 30.8 | 28.7 | 3 | 1.9 | 308 | 13 | 16 | 28.7 | 38 |
| | 33 | 24.2 | 22.8 | 2.5 | 1.5 | 242 | 11 | 13 | 22.8 | 30 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 900 | 9 | 100.0 | 96.9 | 5 | 6.5 | 1000 | 34 | 35 | 96.9 | 121 |
| | 11 | 81.8 | 81.1 | 4.5 | 5.4 | 818 | 28 | 35 | 81.1 | 100 |
| | 13.6 | 66.2 | 66.8 | 4 | 4.5 | 662 | 23 | 32 | 66.8 | 80 |
| | 17 | 52.9 | 54.3 | 4 | 3.6 | 529 | 19 | 24 | 54.3 | 65 |
| | 17.6 | 51.1 | 52.6 | 4 | 3.5 | 511 | 19 | 24 | 52.6 | 62 |
| | 21 | 42.9 | 44.5 | 3.5 | 3.0 | 429 | 17 | 20 | 44.5 | 53 |
| | 26 | 34.6 | 36.3 | 3 | 2.4 | 346 | 14 | 17 | 36.3 | 43 |
| | 33 | 27.3 | 28.8 | 3 | 1.9 | 273 | 12 | 14 | 28.8 | 33 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1000 | 9 | 111.1 | 119.6 | 5.5 | 8.0 | 1111 | 35 | 35 | 119.6 | 134 |
| | 11 | 90.9 | 100.1 | 5 | 6.7 | 909 | 30 | 35 | 100.1 | 110 |
| | 13.6 | 73.5 | 82.5 | 4.5 | 5.5 | 735 | 26 | 35 | 82.5 | 90 |
| | 17 | 58.8 | 67.0 | 4 | 4.5 | 588 | 21 | 27 | 67.0 | 72 |
| | 17.6 | 56.8 | 64.9 | 4 | 4.3 | 568 | 20 | 25 | 64.9 | 70 |
| | 21 | 47.6 | 54.9 | 3.5 | 3.7 | 476 | 18 | 23 | 54.9 | 59 |
| | 26 | 38.5 | 44.8 | 3.5 | 3.0 | 385 | 15 | 18 | 44.8 | 48 |
| | 33 | 30.3 | 35.6 | 3 | 2.4 | 303 | 13 | 15 | 35.6 | 36 |

PE T=220℃ DVS 2207/T1(8/15)




**SHD1200 （Cylinder area=50.7cm²）**

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 630 | 9 | 70.0 | 36.4 | 4.5 | 2.4 | 700 | 25 | 35 | 36.4 | 85 |
| | 11 | 57.3 | 30.5 | 4 | 2.0 | 573 | 21 | 26 | 30.5 | 70 |
| | 13.6 | 46.3 | 25.1 | 3.5 | 1.7 | 463 | 18 | 22 | 25.1 | 57 |
| | 17 | 37.1 | 20.4 | 3.5 | 1.4 | 371 | 15 | 18 | 20.4 | 45 |
| | 17.6 | 35.8 | 19.8 | 3 | 1.3 | 358 | 15 | 18 | 19.8 | 44 |
| | 21 | 30.0 | 16.7 | 3 | 1.1 | 300 | 13 | 16 | 16.7 | 36 |
| | 26 | 24.2 | 13.6 | 2.5 | 0.9 | 242 | 11 | 13 | 13.6 | 30 |
| | 33 | 19.1 | 10.8 | 2.5 | 0.7 | 191 | 10 | 11 | 10.8 | 24 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 710 | 9 | 78.9 | 46.3 | 4.5 | 3.1 | 789 | 27 | 35 | 46.3 | 96 |
| | 11 | 64.5 | 38.7 | 4 | 2.6 | 645 | 22 | 30 | 38.7 | 79 |
| | 13.6 | 52.2 | 31.9 | 4 | 2.1 | 522 | 19 | 24 | 31.9 | 63 |
| | 17 | 41.8 | 25.9 | 3.5 | 1.7 | 418 | 16 | 19 | 25.9 | 52 |
| | 17.6 | 40.3 | 25.1 | 3.5 | 1.7 | 403 | 16 | 19 | 25.1 | 49 |
| | 21 | 33.8 | 21.2 | 3 | 1.4 | 338 | 14 | 17 | 21.2 | 42 |
| | 26 | 27.3 | 17.3 | 3 | 1.2 | 273 | 12 | 14 | 17.3 | 33 |
| | 33 | 21.5 | 13.8 | 2.5 | 0.9 | 215 | 10 | 11 | 13.8 | 28 |

| D（mm） | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 800 | 9 | 88.9 | 58.7 | 4.5 | 3.9 | 889 | 30 | 35 | 58.7 | 108 |
| | 11 | 72.7 | 49.1 | 4.5 | 3.3 | 727 | 25 | 35 | 49.1 | 88 |
| | 13.6 | 58.8 | 40.5 | 4 | 2.7 | 588 | 21 | 26 | 40.5 | 72 |
| | 17 | 47.1 | 32.9 | 3.5 | 2.2 | 471 | 18 | 22 | 32.9 | 58 |
| | 17.6 | 45.5 | 31.9 | 3.5 | 2.1 | 455 | 18 | 22 | 31.9 | 57 |
| | 21 | 38.1 | 27.0 | 3.5 | 1.8 | 381 | 15 | 18 | 27.0 | 46 |
| | 26 | 30.8 | 22.0 | 3 | 1.5 | 308 | 13 | 16 | 22.0 | 38 |
| | 33 | 24.2 | 17.5 | 2.5 | 1.2 | 242 | 11 | 13 | 17.5 | 30 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 900 | 9 | 100.0 | 74.3 | 5 | 5.0 | 1000 | 32 | 35 | 74.3 | 121 |
| | 11 | 81.8 | 62.2 | 40.5 | 4.1 | 818 | 28 | 35 | 62.2 | 100 |
| | 13.6 | 66.2 | 51.3 | 4 | 3.4 | 662 | 23 | 32 | 51.3 | 80 |
| | 17 | 52.9 | 41.7 | 4 | 2.8 | 529 | 19 | 24 | 41.7 | 65 |
| | 17.6 | 51.1 | 40.3 | 4 | 2.7 | 511 | 19 | 24 | 40.3 | 62 |
| | 21 | 42.9 | 34.1 | 3.5 | 2.3 | 429 | 17 | 20 | 34.1 | 53 |
| | 26 | 34.6 | 27.8 | 3 | 1.9 | 346 | 14 | 17 | 27.8 | 43 |
| | 33 | 27.3 | 22.1 | 3 | 1.5 | 273 | 12 | 14 | 22.1 | 33 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1000 | 9 | 111.1 | 91.8 | 5.5 | 6.1 | 1111 | 35 | 35 | 91.8 | 134 |
| | 11 | 90.9 | 76.8 | 5 | 5.1 | 909 | 30 | 35 | 76.8 | 110 |
| | 13.6 | 73.5 | 63.3 | 4.5 | 4.2 | 735 | 25 | 35 | 63.3 | 90 |
| | 17 | 58.8 | 51.4 | 4 | 3.4 | 588 | 21 | 26 | 51.4 | 72 |
| | 17.6 | 56.8 | 49.8 | 4 | 3.3 | 568 | 20 | 25 | 49.8 | 70 |
| | 21 | 47.6 | 42.1 | 3.5 | 2.8 | 476 | 18 | 23 | 42.1 | 59 |
| | 26 | 38.5 | 34.4 | 3.5 | 2.3 | 385 | 15 | 18 | 34.4 | 48 |
| | 33 | 30.3 | 27.3 | 3 | 1.8 | 303 | 13 | 15 | 27.3 | 36 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1100 | 9 | 122.2 | 111.0 | 5.5 | 7.4 | 1222 | 35 | 35 | 111.0 | 147 |
| | 11 | 100.0 | 92.9 | 5 | 6.2 | 1000 | 32 | 35 | 92.9 | 121 |
| | 13.6 | 80.9 | 76.6 | 4.5 | 5.1 | 809 | 27 | 35 | 76.6 | 98 |
| | 17 | 64.7 | 62.2 | 4 | 4.1 | 647 | 22 | 30 | 62.2 | 79 |
| | 17.6 | 62.5 | 60.2 | 4 | 4.0 | 625 | 22 | 29 | 60.2 | 77 |
| | 21 | 52.4 | 51.0 | 4 | 3.4 | 524 | 19 | 24 | 51.0 | 63 |
| | 26 | 42.3 | 41.6 | 3.5 | 2.8 | 423 | 16 | 19 | 41.6 | 52 |
| | 33 | 33.3 | 33.0 | 3 | 2.2 | 333 | 14 | 17 | 33.0 | 40 |

| D（mm) | SDR | e(mm) | P1(bar) | H(mm) | P2(bar) | t1(sec) | t2(sec) | t3(sec) | P3(bar) | t4(min) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1200 | 9 | 133.3 | 132.1 | 5.5 | 8.8 | 1333 | 35 | 35 | 132.1 | 157 |
| | 11 | 109.1 | 110.6 | 5 | 7.4 | 1091 | 34 | 35 | 110.6 | 132 |
| | 13.6 | 88.2 | 91.1 | 4.5 | 6.1 | 882 | 29 | 35 | 91.1 | 107 |
| | 17 | 70.6 | 74.1 | 4.5 | 4.9 | 706 | 25 | 35 | 74.1 | 86 |
| | 17.6 | 68.2 | 71.7 | 4 | 4.8 | 682 | 24 | 34 | 71.7 | 83 |
| | 21 | 57.1 | 60.7 | 4 | 4.0 | 571 | 20 | 25 | 60.7 | 70 |
| | 26 | 46.2 | 49.5 | 3.5 | 3.3 | 462 | 18 | 22 | 49.5 | 57 |
| | 33 | 36.4 | 39.3 | 3 | 2.6 | 364 | 15 | 18 | 39.3 | 44 |

# SHDS110 SHDS160A2 SHDS160A4 SHDS160B4 SHDS200A2 SHDS200A4 SHDS200B4

## 1.Applicable Range and Technical Parameter

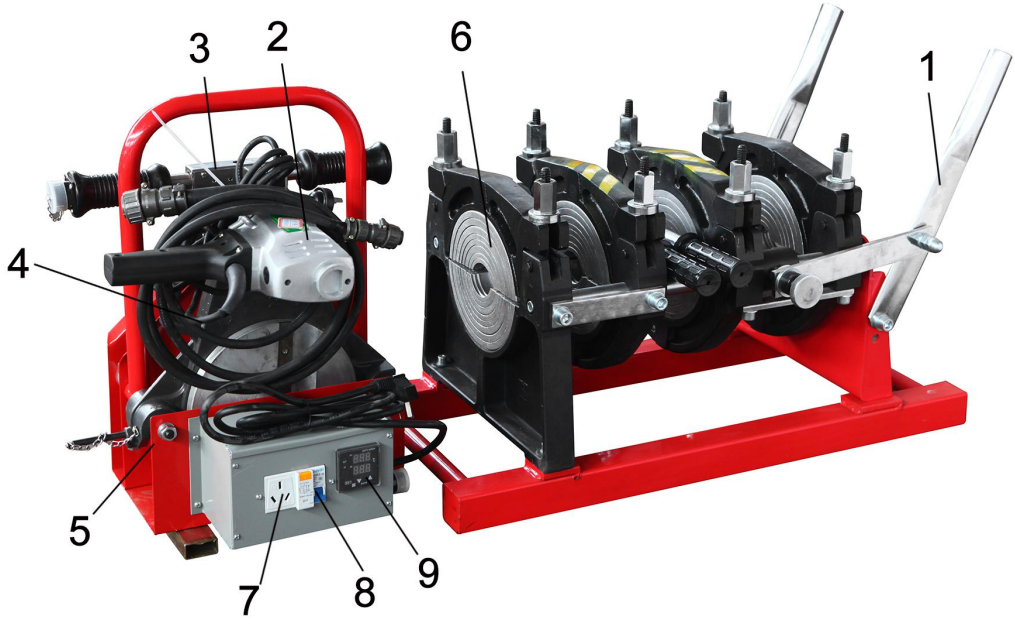
| Type | SHDS-110 | SHDS160A2,SHDS160A4 ,SHDS160B4 | SHDS200A2,SHDS200A4, SHDS200B4 |
|---|---|---|---|
| Materials | PE, PP, PVDF | | |
| Range of diameter | 10mm～110mm | 50mm～160mm | 63mm～200mm |
| Ambient temp. | -5～45℃ | | |
| Power supply | 220V±10％, 50Hz | | |
| Total power | 1.4Kw | 1.7Kw | 2.2Kw |
| Include: Heating plate | 0.7Kw | 1Kw | 1.5Kw |
| Planing tool motor | 0.7Kw | | |
| Max. Temperature of heating plate | <270℃ | | |
| Difference in surface temperature of heating plate | ±5℃ | | |
| Max. Pressure | 1040N | | |
| Weight | 39kg | 2pcs clamp 46kg,4pcs clamp 60kg | 2pcs clamp 60kg,4pcs clamp 69kg |

* The special voltage is based on the actual voltage.

# 2 . Descriptions

The machine consists of basic frame, heating plate, Planing tool, and support.

2.1 Structure




| | | | | |
|---|---|---|---|---|
| 1. Basic frame | 2. Planing tool | 3. Heating plate | 4. connecting cable of heating plate | 5. Support |
| 6.Clamp | 7. Socket | 8.Switch | 9. Temperature Controller | |

# 3. Instruction for Use

3.1 The whole equipment should be placed on a stable and dry plane to operate.

3.2 Before operation make sure the following things:

The power supply is the specified according to the butt fusion machine

Power line is not broken or worn

The blades of planning tool are sharp

All instruments are normal

All necessary parts and tools are available

The machine is in good conditions

3.3 Place appropriate inserts according to outside diameter of pipe /fitting

3.4 Welding procedure

3.4.1. Before welding, firstly, check if there are scratches or fissures on the surface of pipes/fittings. If the depth of scratches or fissures exceeds 10% of the wall thickness, remove the scratches or fissures.

3.4.2 Clean the inside and outside surface of pipe end to be welded.

3.4.3 Place the pipes/fittings and keep the elongated length of pipes/fittings ends to be welded be equal (as short as possible). Another end of pipe should be supported by rollers to reduce friction. Fasten the screws of clamps to fix the pipes/fittings.

3.4.4 Place the planning tool, switch it on and close the pipes/fittings ends by operating two driver rods against the planning tool until continuous and homogenous shavings appear from both sides. Separate the frame, switch off the planning tool and remove it. The shavings thickness should be within 0.2～0.5 mm and it can be adjusted by adjusting the height of the planning tool blades.

3.4.5 Close the pipes/fitting ends and check the alignment. The misalignment should not exceed 10% of the wall thickness, and it could be improved by loosening or tightening the screws of clamps. The gap between two pipe ends should not exceed 10% of wall thickness; otherwise the pipes/fittings should be planed again.

3.4.6 Clear the dust and slit on heating plate (Don’t scratch PTFE layer on the surface of heating plate).

3.4.7 Put the heating plate into frame after it have got the required temperature. Raise the pressure up to specified by acting on the handle till the bead reach required height.

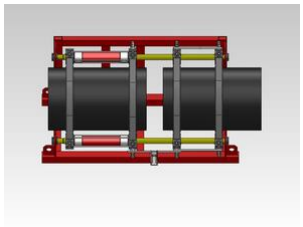
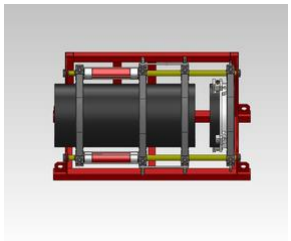
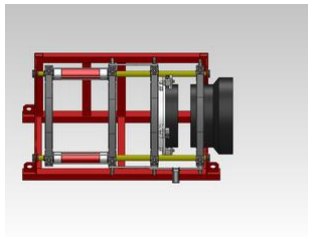
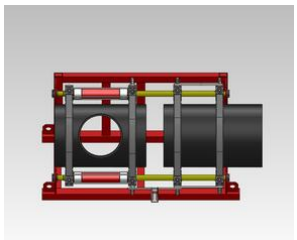
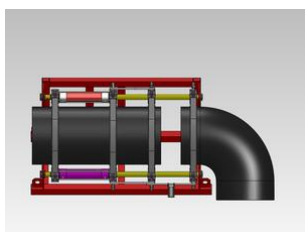
3.4.8 Reduce the pressure to a value which is enough to keep both sides touching with heating plate for specified time.

3.4.9 When the time is over separate the frame and remove the heating plate, join the two sides as quickly as possible.

3.4.10 Increase the pressure until the required bead appears. Fasten the lock device to keep the joint cool down by itself. Finally open clamps and take out the jointed pipe.

3.4.11 Check visually the joint. The joint should be smooth symmetry, and the bottom of groove between the beads should not be lower than the pipe surface. The misalignment of two beads should not exceed 10% of the wall thickness, or the welding is bad.

Common welding Sketch

| | |
|---|---|
|  | Long pipe welding |
|  | Short flange&Long pipe |
|  | Short flange&Pipe fitting |
|  | Socket pipe&Long pipe |
|  | Elbow pipe&Long pipe |

# 4.Temperature controller setting

（1）Temperature controller setting

Switch on

Press “SET” for more than 4 seconds till “Sd” is shown in the upper window

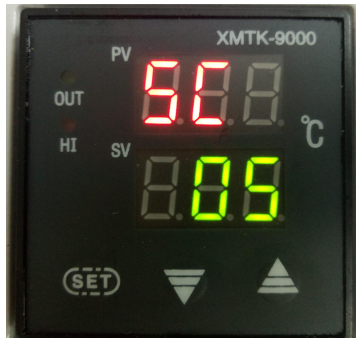
Press “△” or “▽”key, enter the setting temperature, and press "SET" to confirm

（2）Deviation Correction of temperature Control instrument

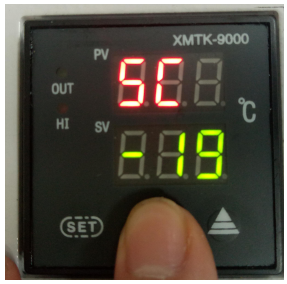
Switch on


Press “SET” for more than 3 seconds till “SI” is shown in the upper window


Press “SET” till “SC” is shown in the upper window



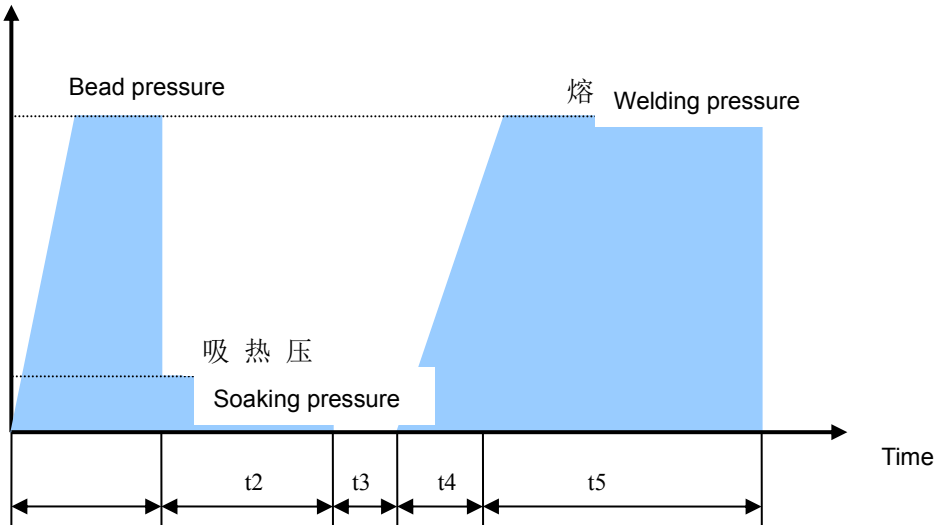

Press “△” or “▽”key, enter temperature correction value, press "SET" key to confirm




# 5.Reference of Welding Standard（DVS2207-1-1995）

**5**.1 Because of difference in welding standard and PE material, the time and pressure vary in different phases of welding. It suggests that the actual welding parameters should be offered by pipes and fittings' manufacturers.

5.2 Reference standard DVS2207-1-1995




| Wall Thickness（mm） | Bead height（mm） | Bead build-up pressure（MPa） | Soaking time $t_2$（sec） | Soaking pressure（MPa） | Change-over time $t_3$（sec） | Pressure build -up time $t_4$（sec） | Welding pressure（MPa） | Cooling time $t_5$（min） |
|---|---|---|---|---|---|---|---|---|
| 0～4.5 | 0.5 | 0.15 | 45 | ≤0.02 | 5 | 5 | 0.15±0.01 | 6 |
| 4.5～7 | 1.0 | 0.15 | 45～70 | ≤0.02 | 5～6 | 5～6 | 0.15±0.01 | 6～10 |
| 7～12 | 1.5 | 0.15 | 70～120 | ≤0.02 | 6～8 | 6～8 | 0.15±0.01 | 10～16 |
| 12～19 | 2.0 | 0.15 | 120～190 | ≤0.02 | 8～10 | 8～11 | 0.15±0.01 | 16～24 |
| 19～26 | 2.5 | 0.15 | 190～260 | ≤0.02 | 10～12 | 11～14 | 0.15±0.01 | 24～32 |
| 26～37 | 3.0 | 0.15 | 260～370 | ≤0.02 | 12～16 | 14～19 | 0.15±0.01 | 32～45 |
| 37～50 | 3.5 | 0.15 | 370～500 | ≤0.02 | 16～20 | 19～25 | 0.15±0.01 | 45～60 |
| 50～70 | 4.0 | 0.15 | 500～700 | ≤0.02 | 20～25 | 25～35 | 0.15±0.01 | 60～80 |

（Bead build-up pressure ）Welding pressure =（P1）P3+Drag pressure

$$\text{welding pressure} = \frac{\text{Section of welding pipe ends}}{\text{Total section of cylinders}} \times 0.15 + \text{Drag pressure（MPa）}$$

Section of welding pipe ends = 3.14 ×(Pipe diameter - Wall thickness）× Wall thickness

Note:The drag pressure is not more than 50% of the welding pressure.

# 6. Malfunctions Analyses and Solutions

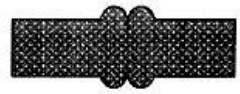
6.1 Frequent joints quality problems analyze:

- Visually check：round bead, good joint

- Narrow and fall bead. Too high pressure while welding

- Too small bead. Pressure is not enough while welding

- There is a ditch between the welding surfaces. Temperature is not enough or change-over time is too long while welding.



- High & low bead. Different heating time or fusion temperature causes that.

- Misalignment. Welding under the condition that the misalignment exceeds 10% of pipe wall thickness while align the two ends.

6.2.2 Maintenance & Inspection

Ordinary inspection

| Item | Description | Inspect before use | First month | Every 6 months | Every year |
|---|---|---|---|---|---|
| Planning tool | Mill or replace the blade | | | | ● |
| | Replace the cable if it is broken | ● | | | ● |
| | Retighten mechanical connections | ● | ● | | |
| Heating plate | Rejoined the cable and socket | ● | | | |
| | Clean surface of heating plate, recoat PTFE layer again if necessary | ● | | | ● |
| | Retighten mechanical connections | | ● | | |
| Temp. control system | Checkout the temperature indicator | | | | ● |
| | Replace the cable if it is broken | ● | | | ● |
| Basic Frame | Retighten screws in the end of frame axis | ● | ● | ● | |
| | Spray antirust paint again if necessary | | | | ● |
| Power Supply | Press the testing button of circuit protector to make sure it can working normally | ● | | | |
| | Replace the cable if it is broken | ● | | | |
| | | | | ● | |

"●"…… maintenance period

6.3 Frequent malfunction analyses and solutions

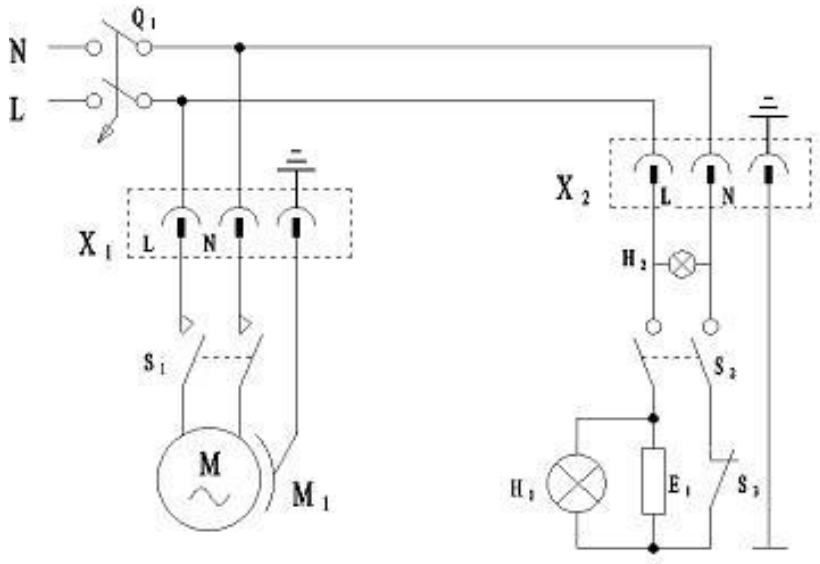
During the using, electrical units may appear some problems. Frequent malfunction is listed as follows:

Please use tools attached, spare parts or other tools with a safety certificate while maintain or replace parts. Tools and spare parts without safety certificate are forbidden to be used.

| Malfunctions of hydraulic unit | | | |
|---|---|---|---|
| No | malfunction | malfunction analyzes | Solutions |
| 1 | The pump motor does not work | 9. switch is fault.<br>10. Power source is not connected well.<br>11. The socket inside connection is loosen<br>12. The machine is not grounded correctly | 9. Check the switch<br>10. Connect the power well<br>11. Check the connection<br>12. Check the earthing connection |
| 2 | The pump motor rotate too slowly with abnormality noise | 9. The motor is overloaded<br>10. The motor is fault<br>11. The oil filter is blocked<br>12. The working voltage is instable | 9. Make sure the motor load is less that 3 MPa<br>10. Repair or replace the pump<br>11. Clean the filter<br>12. Check the instability of power |
| 3 | The cylinder works abnormally | 11. The direction valve is damaged<br>12. There is air in system<br>13. The system pressure is too low<br>14. The quick coupler is blocked<br>15. The pressure relief valve is not locked | 11. Replace the direction valve.<br>12. Move the cylinder several times to outgo the air.<br>13. Adjust the system pressure<br>14. Replace the quick coupler<br>15. Lock the valve |
| 4 | Cylinder leak | 5. The oil ring is fault<br>6. The cylinder or piston is damaged badly | 5. Replace the oil ring<br>6. Replace the cylinder |
| 5 | The pressure can not be increased or the fluctuation is too big | 9. The core of overflow valve is blocked.<br>10. The pump is leak.<br>11. The joint slack of pump is loosened or key groove is skid.<br>12. 4. The pressure relief valve is not locked | 9. Clean or replace the core of over-flow valve<br>10. Replace the pump<br>11. Replace the joint slack<br>12. 4. Lock the valve |
| Malfunctions of electrical units | | | |

| | | | |
|---|---|---|---|
| 1 | The machine does not work | 7. The power cable is damaged<br>8. Source power is abnormal<br>9. The ground fault switch is closed | 7. Check the power cable<br>8. Check the working power<br>9. Open the ground fault interrupter |
| 2 | Ground fault switch trips | 7. Power cable of heating plate, the motor of pump and planing tool may be damaged<br>8. Electrical components are t affected with damp<br>9. The higher-up power has not a ground fault safety device | 7. Check the power cables<br>8. Check the electrical elements.<br>9. Check the higher-up power safety device |
| 3 | Abnormal temperature increasing | 7. The temperature controller switch is open<br>8. The sensor （pt100）is abnormal. The resistance value of4 and 5 of heating plate socket should be within 100~183**Ω**<br>9. The heating stick inside heating plate is abnormal. The resistances between 2and 3 should be within23**Ω**. Insulation resistance between head of heating stick and outside shell must be more than 1M**Ω**<br>4. Should the temperature controller readings be more than 300℃, which suggest he sensor may be damaged or the connection is loosen. Should the temperature controller indicate LL, which suggests the sensor have a short circuit. Should the temperature controller indicate HH, which suggests the circuit of sensor is open.<br>5. Correct the temperature by button located on the temperature controller.<br>8. The temperature fluctuate abnormally | 13. Check the connection of contactors<br>14. Replace the sensor<br>15. Replace the heating plate<br>16. Replace the temperature controller<br>17. Refer to the methods to set the temperature<br>18. Check and replace the contactors if necessary |
| 4 | Lose of control when heating | The red light is shine, but the temperature still goes up, that is because the connector is fault or the joints 7 and 8 can not open when get the required temperature. | Replace the temperature controller |
| 5 | Planing tool does not rotate | The limit switch is ineffective or the mechanical parts of planing tool are clipped. | Replace the planning tool limit switch or minor sprocket |

# 7. Electrical draw diagram




Motor Heating plate

# 8.Accessories list

**SHDS 110⁄40 Butt fusion welding machine**

| Item | Description | Unit | Qty | Remark |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | Basic frame | set | 1 | |
| 2 | Inserts | set | 1 | Φ90 ,Φ75 ,Φ63 ,Φ50,Φ40 |
| 3 | Hand push rod | pcs | 2 | |
| 4 | Support | set | 1 | Electrical box |
| 5 | Planing tool | set | 1 | |
| 6 | Heating plate | set | 1 | |
| Attachment with machine | | | | |
| 1 | Special bolt for clamp（M6） | set | 1 | L＝ 15、20、30、35、40 (10pcs/each spec) |
| 2 | Double open wrench | Pcs | 1 | 22X24 |
| 3 | Cross screwdriver | Pcs | 1 | 6#*150 |
| 4 | Special screw bolt | Set | 2 | SHDS110 |
| 5 | Cutter of planning tool | Pcs | 2 | S110 |
| 6 | Product qualification certificate | pcs | 1 | |
| 7 | Operation instruction | Pcs | 1 | |

**SHDS 160A2/A4/B4 Butt fusion welding machine**

| Item | Description | Unit | Qty | Remark |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | Basic frame | set | 1 | A4/B4(4pcs bottom clamp) |
| 2 | Inserts | set | 1 | Φ140,Φ125 ,Φ110 ,Φ90,Φ75,Φ63,Φ50 |
| 3 | Hand push rod | pcs | 2 | B4(Optional) |
| 4 | Support | set | 1 | Electrical box |
| 5 | Planing tool | set | 1 | |
| 6 | Heating plate | set | 1 | Include 1 pcs connecting cable of heating plate |
| Attachment with machine | | | | |
| 1 | Special bolt for clamp （M6） | set | 1 | L= 15、20、30、40、45、55、60 (10pcs/each spec) |
| 2 | Double open wrench | Pcs | 1 | 22X24 |
| 3 | Cross screwdriver | Pcs | 1 | 6#*150 |
| 4 | Cutter of planning tool | Pcs | 2 | SHD160 |
| 5 | Special screw bolt | Set | 2 | SHD250 |
| 6 | Tool case | set | 1 | |
| 7 | Product qualification certificate | pcs | 1 | |
| 8 | Operation instruction | Pcs | 1 | |

**SHDS 200A2/A4/B4 Butt fusion welding machine**

| Item | Description | Unit | Qty | Remark |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | Basic frame | set | 1 | A4/B4(4pcs bottom clamp) |
| 2 | Inserts | set | 1 | Φ180 ,Φ160 ,Φ140 ,Φ125<br>Φ110 ,Φ90 ,Φ75 ,Φ63 |
| 3 | Hand push rod | pcs | 2 | A2(Optional) |
| 4 | Support | set | 1 | Electrical box |
| 5 | Planing tool | set | 1 | |
| 6 | Heating plate | set | 1 | Include 1 pcs connecting cable of heating plate |
| Attachment with machine | | | | |
| 1 | Special bolt for clamp<br>（M6） | set | 1 | L＝15、25、35、40、50、60、70、75<br>(10pcs/each spec) |
| 2 | Double open wrench | Pcs | 1 | 22X24 |
| 3 | Cross screwdriver | Pcs | 1 | 6#*150 |
| 5 | Special screw bolt | Set | 2 | SHD250 |
| 5 | Cutter of planning tool | Pcs | 2 | SHDS200 |
| 6 | Tool case | set | 1 | |
| 7 | Product qualification certificate | pcs | 1 | |
| 8 | Operation instruction | Pcs | 1 | |

# Guarantee Clauses

1. The guarantee range refers to the whole machine.

2. Maintenance for malfunctions during normal utilization is free of charge within guarantee time that is 12 months

3. The guarantee time starts with the date of delivery.

4. Fees are charged in case of the following condition:

   4.1 Malfunction caused by improper operation

   4.2 Damages caused by fire, flood, and abnormal voltage

   4.3 Working exceeds its normal function

5. Fees are charged as actual expense. A contract about the fees shall be abided if there is one.

6. Please contact us or our agent if any questions.

# ROTHENBERGER Quality Certificate

**Dear Customer,**

Before delivering your product we have tested your welding machine.

| | | |
|---|---|---|
| SHD 160 ☐ | SHD 250 ☐ | SHD 315 ☐ |
| SHD 355 ☐ | SHD 450 ☐ | SHD 500 ☐ |
| SHD 630 ☐ | SHD 800 ☐ | SHD 1000 ☐ |
| SHD1200 ☐ | SHDS110 ☐ | SHDS160A2 ☐ |
| SHDS160A4 ☐ | SHDS160B4 ☐ | SHDS200A2 ☐ |
| SHDS200A4 ☐ | SHDS200B4 ☐ | |

The welding machine meets the ROTHENBERGER quality standards and is released for the competent use.

Date:_____

Signature: Fred.Z