



# OPERATION AND MAINTENANCE MANUAL

V450 V500 V630

# FORWORD

Dear Customers and Partners,

Thank you very much for purchasing our products, and we are confident it will create more value to your business.

In this manual book, you will find all the information and suggestions needed to operate our V series butt fusion machine in a safe, professional and proper way. Therefore we strongly request you to read all messages in this book before the operators start using the machines.

As this machine is a professional device, and it must be limited to skilled and certificated personnel.

Now enjoy the welding journey through using Riyang welding machines.

Note: We reserve the rights to change the technical parameters without prior notice.

Sincerely

Jack Chan



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## 1. Technical Parameter

Riyang V series is on-site hydraulic butt fusion welding machine. It is used to butt weld pipe and fittings such as elbow, tees, wye and flange necks without any additional equipment by simply adjusting the clamps` drag bar. It is suitable for welding plastic pipe and fittings made of HDPE, PP, PVDF and other thermoplastics material.

Each person who operates the machine has to conform to the instructions of this manual.

Technical Parameters	V450	V500	V630
Welding Range O.D. (mm)	200 - 450	(200, 225, 250) * 280 - 500	315 - 630
Applicable Materials	HDPE, PP, PVDF and other thermoplastics material		
Power Supply	380V (220V*), 50/60Hz, 3P		
Rated Power (kW)	8.38	10.3	12.3
Overall Machine Weight	405Kg/891lb	430Kg/946lb	618Kg/1360lb
<b>Machine Chassis</b>			
Piston Area(cm <sup>2</sup> )	22.37	23.06	23.06
Chassis Dimension (mm)	1270x800x820 50x31.5x32.3in	1540x900x920 60.6x35.4x36.2in	1540x1040x1040 60.6x40.9x40.9in
Weight	204Kg/449lb	290Kg/638lb	395Kg/869lb
<b>Hydraulic Power Unit</b>			
Rated Power (kW)	1.5		
Working Pressure Range (Bar)	0-120		
Hydraulic Oil	#46, SHELL TELLUS T46 is recommended		
Oil Tank Volume (L)	6		
Chassis Dimension (mm)	700x320x370 27.6x12.6x14.6in		
Weight	47Kg/103lb		
<b>Heating Plate</b>			
Rated Power (kW)	5.38	7.3	9.3
Temperature Range	Maximum 320 C		
Dimension (mm)	800x70x700 31.5x2.8x27.6in	950x70x790 37.4x2.8x31.1in	950x70x930 37.4x2.8x36.6in
Weight	24Kg/52.8lb	28Kg/61.6lb	34Kg/74.8lb
<b>Trimmer</b>			
Rated Power (kW)	1.5		
Chassis Dimension (mm)	630x220x1000 24.8x8.7x39.4in	720x220x1050 28.3x8.7x41.3in	820x220x1200 32.3x8.7x47.2in
Weight	60Kg/132lb	80Kg/176lb	86Kg/189lb
<b>Support</b>			
Overall Dimension (mm)	540x470x550 21.3x18.5x21.7in	540x620x640 21.3x24.4x25.2in	630x570x730 24.8x22.4x28.7in
Weight	36Kg/79.2lb	46Kg/101lb	56Kg/123lb

\* Available as option

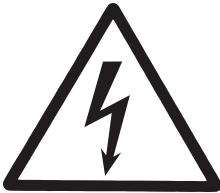
## ◀ 2. Safety Precautions

*The use of butt welding machine V series is limited to skilled and certified personnel only. Any irregular operation could probably cause any injury. Attention please.*

The safety precautions herein indicated must be taken into consideration all the time when operating the machine.

You should promptly replace the worn-out or damaged parts with original Riyang spare parts only. Any sort of repair and maintenance must be conducted by authorized skilled and qualified personnel only.

### 2.1 Electrical Hazard



**Hazard:** Electric Shock

**Parts involved:** Hydraulic Power Unit  
Heating Plate  
Trimmer  
Distribution Box

Make sure that the power supply correspond to the request of the machine. And all connections are done properly.



**Earth the machine**

Please make sure the earthed system is working properly.

#### ⚠ **Important:**

The panel board plug must accord with the IEC 309 type with IP44 minimum protection degree.

Do not expose the machine to rain or any other liquids.

Do not expose the cables to chemical environment, mechanical strain, and keep it away from some sharp objects.

Make sure the the isolation protection device, such as safety gloves and shoes, are completely dry when machine working in wet environment.

It is forbidden to splash the machine in purpose of cleaning the machine.

Should clean the machine after use. It is forbidden to use solvents, gasoline, abrasive liquids and corrosive liquids, these could probably destroy the isolating parts.

Check insulation condition of machine periodically by qualified personnel, including earthed system, leakage switch, cables insulation.

Unplug the machine from power source immediately after use.

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## 2.2 Cutting Hazard



**Hazard:** Cutting  
**Parts involved:** Trimmer

Please pay attention to the blade when handle the trimmer by hand.  
Keep a safe distance from the trimmer when it is working.



Keep in mind that safety gloves is always needed.

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## 2.3 Splintering Hazard



**Hazard:** Splintering  
**Part involved:** Trimmer

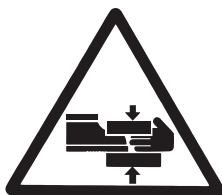
Keep a safe distance from the trimmer when it is working.  
Remember to clean the pipe ends before trimming them, nothing remains on the trimming area.



Always wear safety glasses or goggles

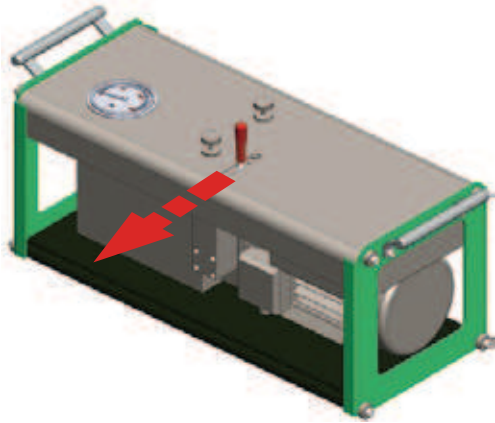
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## 2.4 Crush Hazard



**Hazard:** Crush  
**Part involved:** Machine Chassis

When crush happened, immediately activate the directional lever to open the carriage. (the lever must go to the direction as show below )



Make sure that you are familiar to operate the machine before welding.

Make sure that the machine is stable at all times during the welding.

Make sure that nothing stays in the welding area before close the carriage.

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## 2.5 Scald Hazard



**Hazard:** Scald

**Part involved:** Heating Plate  
Support

Keep a safe distance from the heating plate when it is working.

Do not touch the plate when it is working or still hot.

Clean the heating plate with maximum caution.

Do not touch the heating plate support when the plate is heating or just take out.



Please always wear your safety gloves.

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## 2.6 Fire Hazard



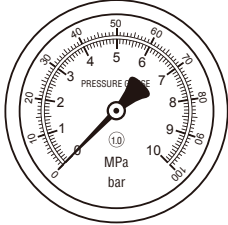
**Hazard:** Fire

**Part Involved:** Heating Plate  
Support

Be sure that flammable material kept away from the heating plate and support.

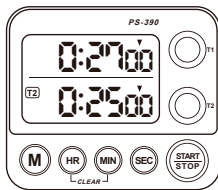
## 3. General Welding Knowledge

### 3.1 Parts you should know



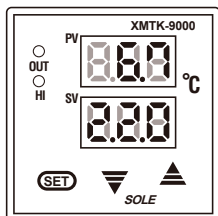
**Part name:** Pressure Gauge

**Functionality:** Show the force applied during welding  
Verify the functionality before welding



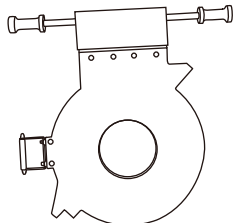
**Part Name:** Timer

**Functionality:** Set the time applied to each welding process  
Verify the functionality before welding



**Part Name:** Temperature Controller

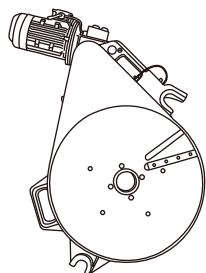
**Functionality:** Set and control the temperature applied to the welding  
Verify the functionality before welding



**Heating plate**

Check the integrity of Teflon coating.

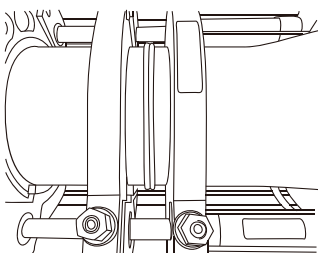
Should verify the heating plate if could reach to the temperature which set by temperature controller.



**Trimmer**

Before welding, be sure the trimmer works well.

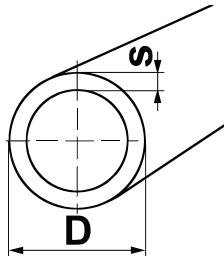
Be sure the blades are sharp enough and could face the pipe end properly.



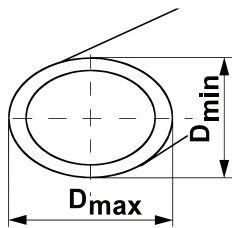
Please make a test welding.



Pipes specifications should respect the tolerance range established by the National Legislation and Regulation:

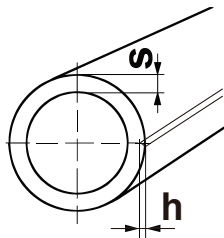


It must have same nominal outside diameter(D) and nominal thickness(S).



The oval-shaped

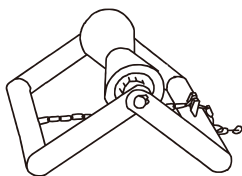
$$\frac{D_{\max} - D_{\min}}{D} \times 100$$



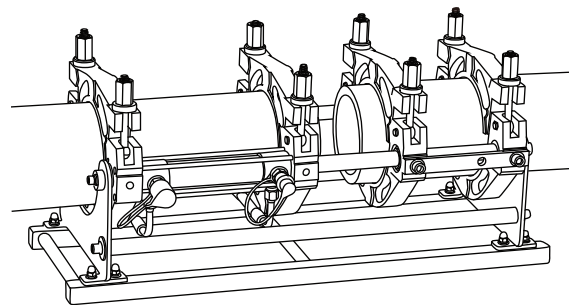
Scratches percentage(h: scratch depth)

$$\frac{h}{s} \times 100$$

### 3.2 Welding Criteria



Sustain the pipes with rollers to reduce the friction, therefore reduce the dragging pressure.



The dragging pressure must be measured with pipes/fittings clamped.

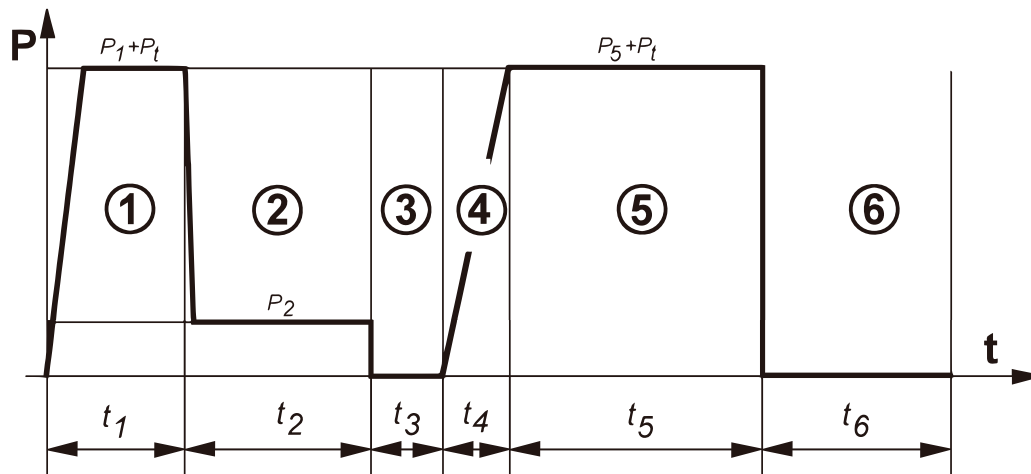


Be sure the internal and external surfaces of the pipe ends be cleaned well.



Please protect the welding in case of rain, sand wind, snow, very low or very high temperatures.

### 3.3 Welding Procedure



**P1:** Bead-up pressure

**P2:** Maximum soaking pressure

**P5:** Welding pressure

**Pt:** Dragging pressure (a pressure required to overcome the overall friction when machine carriage start to move with pipes/fittings fastened in the clamp. Operator read it from pressure gauge.)

**t1, t2, t3, t4, t5, t6:** Time requested for each phase 1, 2, 3, 4, 5, 6.

#### **Phase 1 : Bead-up.**

Approach both ends to be welded to the heating plate at the ( $P_1+P_t$ ) pressure, and wait until the bead has reached the expected size from the standard requested.

#### **Phase 2: Soaking**

Reduce pressure to  $P_2$  maximum value, to keep the ends in touch with the heating plate for the entire  $t_2$  time.

**IMPORTANT!** The ends to be welded **MUST NOT** detach from the heating plate while the pressure is being reduced. If that happens, the welding must absolutely be repeated.

#### **Phase 3: Removal of heating plate.**

Remove the heating plate within the maximum  $t_3$  time, without damaging the beads.

#### **Phase 4: Reach of welding pressure.**

Get both ends together while gradually increasing the pressure up to ( $P_5+P_t$ ) value, within  $t_4$  time.

#### **Phase 5: Welding.**

Keep both ends together at the ( $P_5+P_t$ ) pressure for the entire  $t_5$  time.

### Phase 6: Cooling.

The joint must not be removed or suffer any sort of mechanical strain for the entire t6 time. Do not use water or compressed air to rush cooling. Protect the joint from very low or very high temperature, rain.

You are requested to follow the welding procedure strictly to make the right joints without any intention to reduce the welding time by mechanical strain.

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### 3.4 Welding joint overview and analysis



Qualified joint by visual checking.



Narrow and fall bead. Too high pressure while welding.



Too small bead. Pressure is not enough while welding.



A ditch in the joint. Temperature is not reached or change-over time is too long before welding.

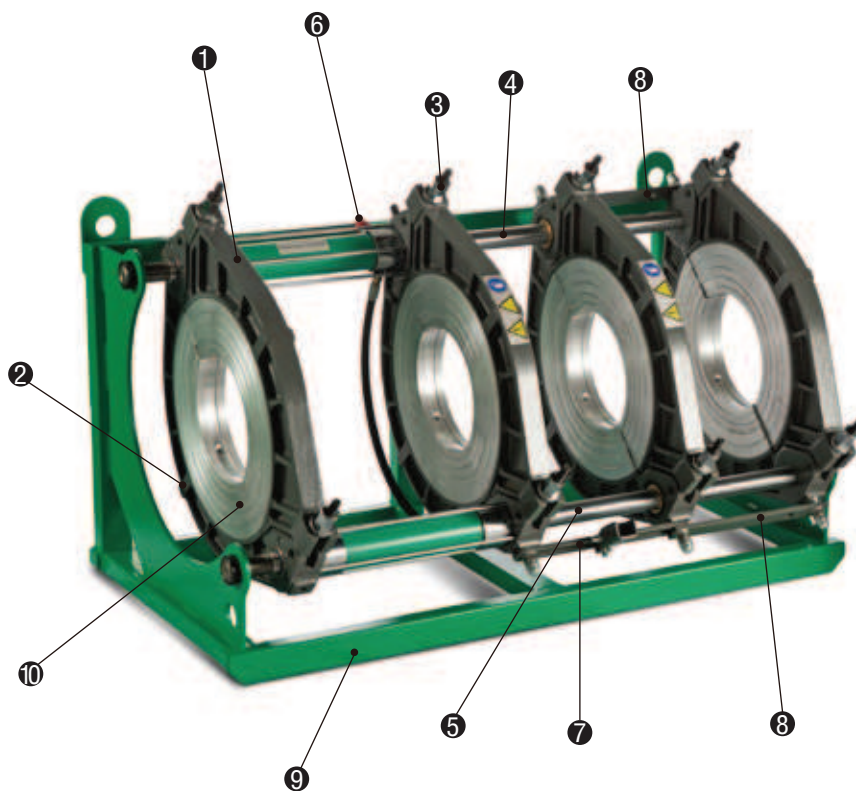


Misalignment. Welding under the condition that the misalignment exceeds 10% of pipe wall thickness while align the two ends.

## 4. Components Description

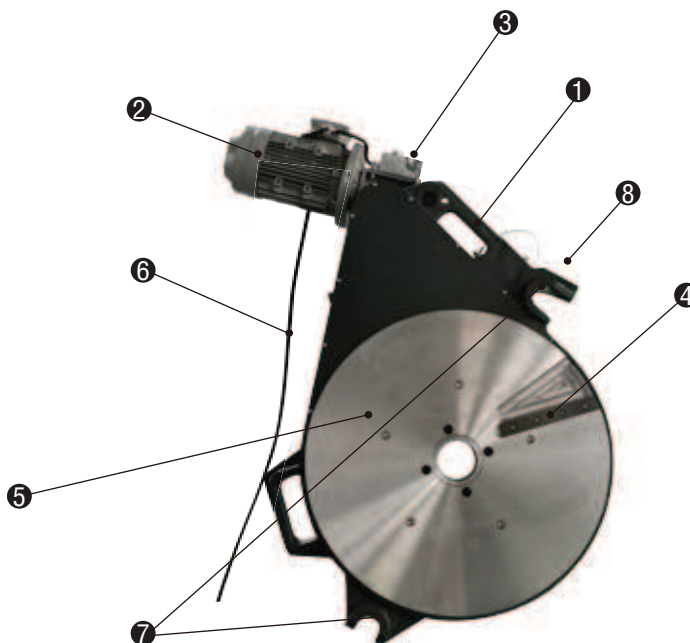
### 4.1 Machine Carriage

- ① Upper jaw
- ② Bottom jaw
- ③ Fasten screws
- ④ Upper piston rod
- ⑤ Lower piston rod
- ⑥ Quick coupling
- ⑦ Heating plate detach device
- ⑧ Dragging bars
- ⑨ Basic support
- ⑩ Reducing inserts



### 4.2 Trimmer

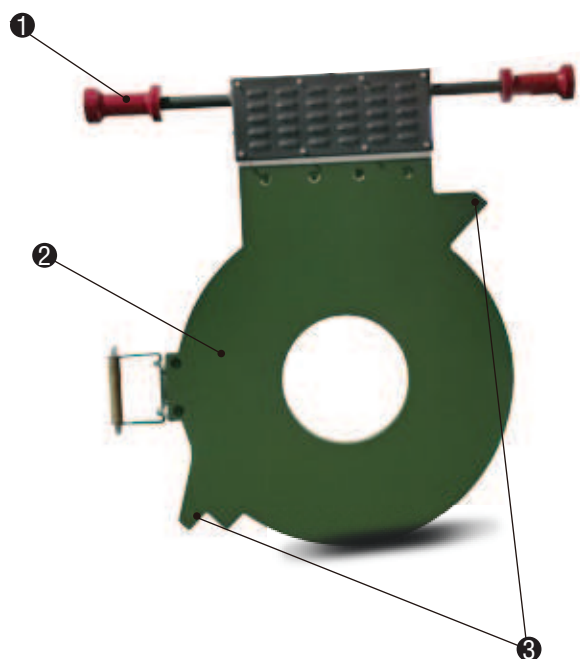
- ① Handgrip
- ② Motor
- ③ Start/Stop button
- ④ Blade
- ⑤ Facer disk
- ⑥ Power supply cable
- ⑦ Support
- ⑧ Blocking Bolt



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### 4.3 Heating plate

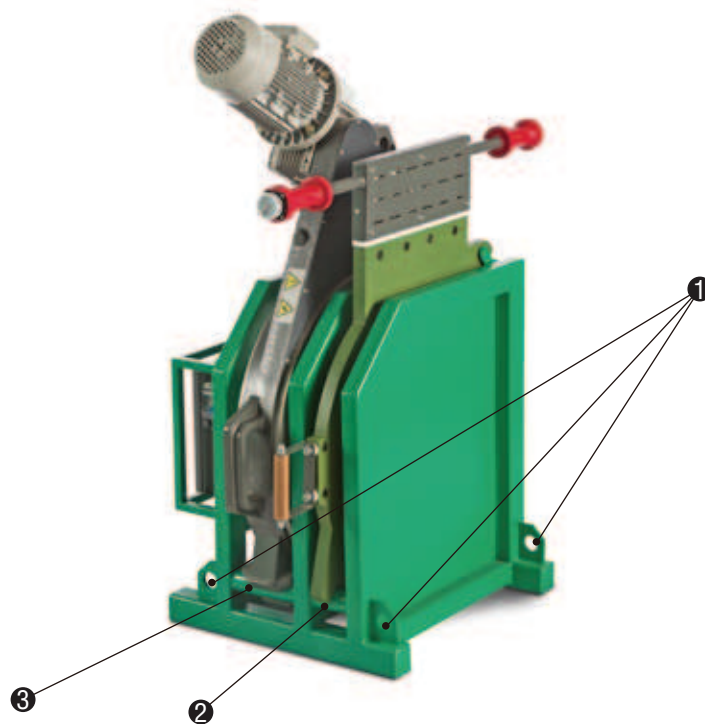
- ❶ Power supply connection
- ❷ Plate
- ❸ Piston rod support



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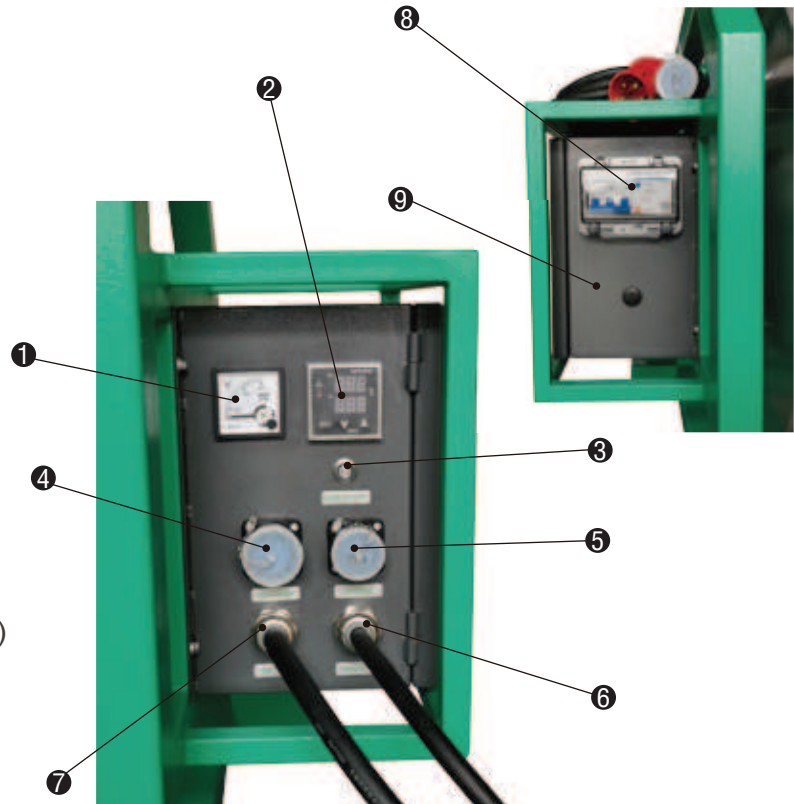
### 4.4 Support for trimmer and heating plate

- ❶ Lifting point
- ❷ Heater support rod
- ❸ Trimmer support rod



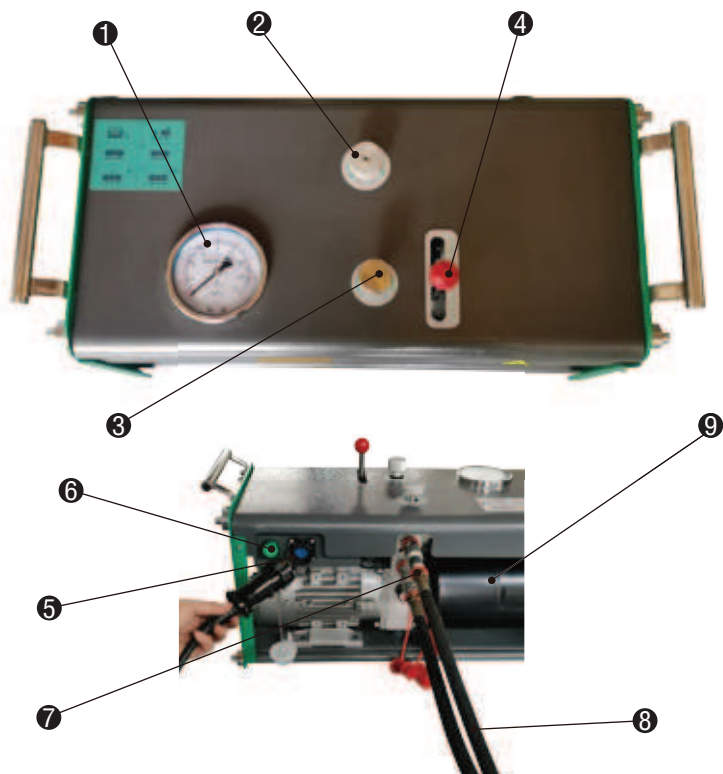
## 4.5 Distribution Box

- ① Voltage display
- ② Temperature controller
- ③ Temperature on/off button
- ④ Power station connection
- ⑤ Trimmer connection
- ⑥ Heating plate connection
- ⑦ Main power
- ⑧ Circuit breaker
- ⑨ Hoist power connection (On request)



## 4.6 Hydraulic Power Unit

- ① Pressure gauge
- ② Pressure relief valve
- ③ Pressure regulated valve
- ④ Direction lever
- ⑤ Main power connection
- ⑥ Power indicator
- ⑦ Quick coupling
- ⑧ Hydraulic oil hoses
- ⑨ Oil tank filler



## ◀ 5. Operating Instruction

Again, please make sure below things are in position before welding:

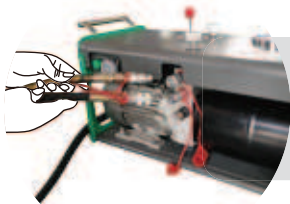
Only qualified personnel is allowed to operate the machine.

The whole unit should be placed on the stable ground without water and fire, keep inflammable material out of heating plate reach.

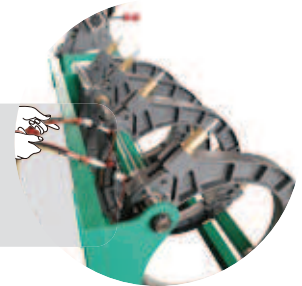
The machine is in good condition, electricity cable and hydraulic hoses are not worn and broken.

The power supply should comply with that the machine requires.

### 5.1 Hydraulic Connections

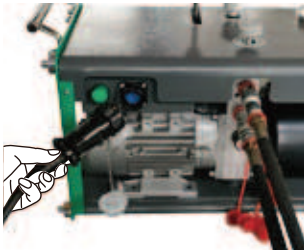


Connect the hydraulic hoses to hydraulic power unit.



Connect the hydraulic hoses to machine carriage.

### 5.2 Electrical Connections



Connect power station cable to hydraulic station. It is connected properly only when sound "Click" made.



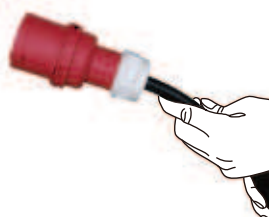
Connect power station cable to distribution box. It is connected properly only when sound "Click" made.



Connect heating plate cable to heating plate. It is connected properly only when sound "Click" made.



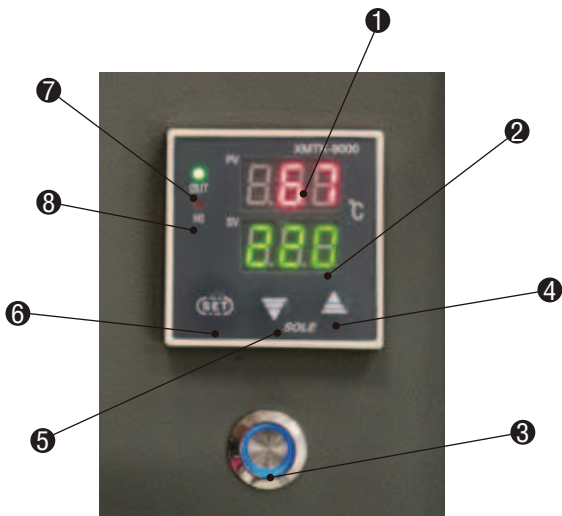
Connect the trimmer cable to distribution box. It is connected properly only when sound "Click" made.



At last, please plug into the main power source.



### 5.3 Temperature Set Up



- ❶ Value of current temperature
- ❷ Value of temperature set
- ❸ On/Off button
- ❹ Up button
- ❺ Down button
- ❻ Set button
- ❼ Signal of heating up
- ❽ Signal of temperature reached

Plug the power cable to the main power, and turn on the circuit breaker.

Activate the temperature controller by pressing the “On/Off” button. Then the button light will turn to be “blue”, and display shows up the values of current temperature and temperature set. The heater is thermoregulating now.

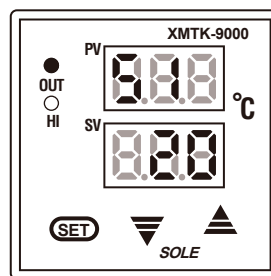
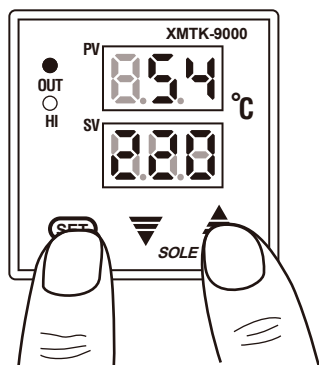
Increase and decrease the temperature value by pressing button “▲” or “▼” accordingly. After setting, the temperature is memorized immediately and automatically reflect the temperature controller.

### 5.4 How To Rectify The Temperature Deviation

Due to the different environmental temperature, the actual temperature shows up and temperature set may need a deviation rectification, please follow below ways:

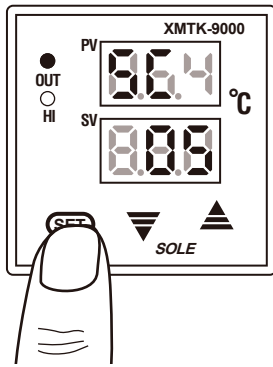
<Example: after contact thermometer detecting the heater, the actual temperature is less 10°C than temperature set>

- ❶ Keep “SET” and “▲” pressed for approximately 3 seconds until the value display shows “S1”



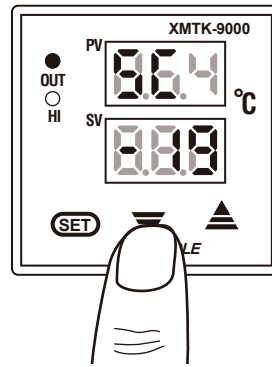


② Press “SET” until the value display shows “SC”

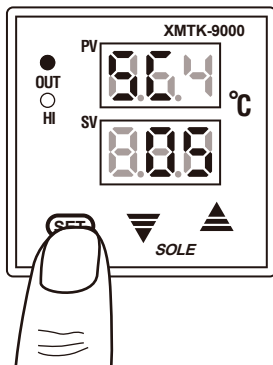


③ Press “▼” to modify the value. Set the value to be “-10”.

(if the actual temperature is 10 °C higher than temperature set, set the value to be “10”)



④ After setting, press “SET” again to back to original display. The value is memorized and the temperature controller rectifying automatically.



## Error Message

If one of the following messages appears, please ask your electrical technician to diagnose it and work out the solution. Please contact local authorized service center or contact Riyang company directly if problem still exist.

### ① “HH” Circuit broke

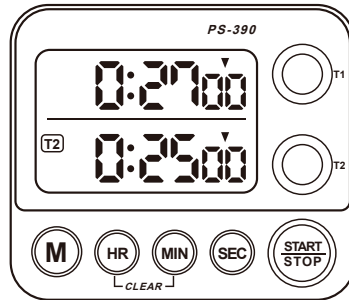
Please check if the heater cable connected well or not with heating plate and hydraulic power unit;  
Please detect if the heater sensor connected well or not;

### ② “LL” Short circuit

Please use the multimeter to detect where is shorted, if needed, please replace it with original Riyang parts.

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## 5.5 Set The Time



### Countdown

Choose the time mode by pressing “T1” and “T2”, which we could refer to the “T2” and “T5” time applied during the welding procedure.

Press the keys “HR”, “MIN” or “SEC” to set time in terms of hour, minutes or second. Keeping the key pressed to set the time quickly. Press the key “START/STOP” to start countdown. Countdown could be paused and re-started at anytime by press the key “START/STOP”.

Press the keys “HR”and ”MIN” to clear the time.

### When countdown is over

When the timer counts down to zero, the count-up symbol “▲” blinks, the timer will count up from zero, and it will alarm for a minute (if the alarm is turned on by fluctuation switch), and accordingly the indicating lamp will blink for a minute.

Press the key “START/STOP” to recall the countdown time previously set.

### Set the Memory Time

You can apply the memory time to welding cycles. Set as following:

When the time is paused, keep the key “M” pressed until the value blinks. Then you press the keys “HR”, “MIN” or “SEC” to set time in terms of hour, minutes or second.

Press the key “M” to confirm the time setting.

When timer is paused, you could recall the memory time by pressing the key “M”.

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## 5.6 Hydraulic Oil Checking

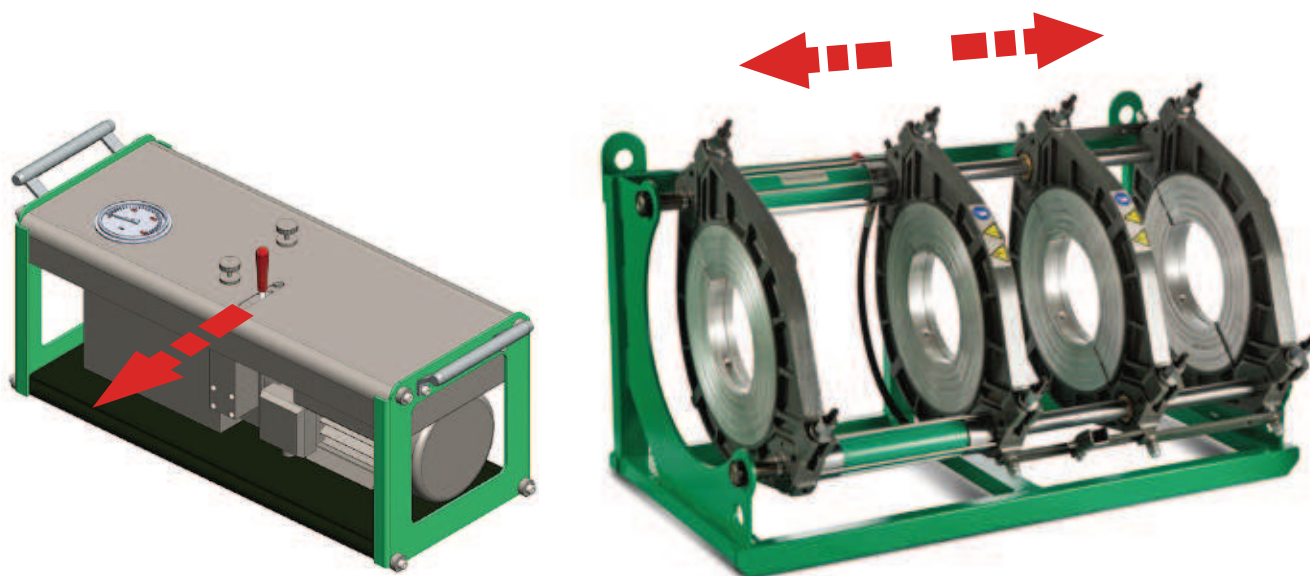
You should re-fill the oil tank if you took the machine by air flight. The oil tank is always empty out before delivery to comply with International Air Regulation.

And please check if the hydraulic oil is sufficient or not by oil probe. It should be 2/3 of the tank volume.

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## 5.7 Prepare The Machine Carriage

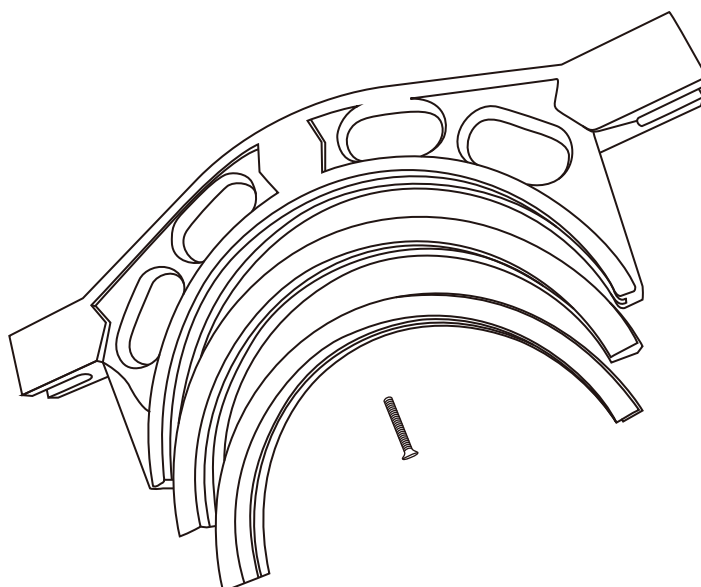
Pull the direction lever to the maximum and open the carriage completely.



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## 5.8 According to the pipe diameter, insert the reductions.

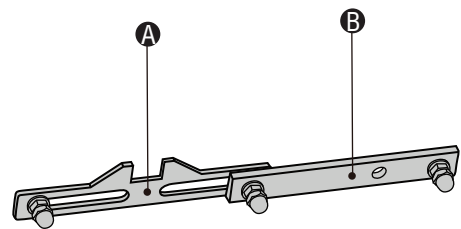
Select the requested reductions, and pick the suitable inserts screws in the plastic box, using the screwdriver to fasten the reductions with upper and bottom jaws. Repeat the operation with other jaws.



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## 5.9 Welding Between Jaws No.2 and No.3

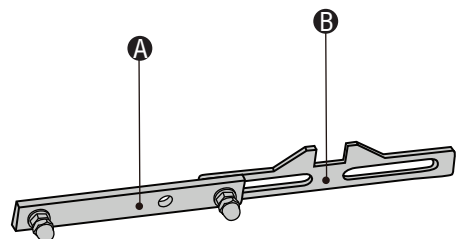
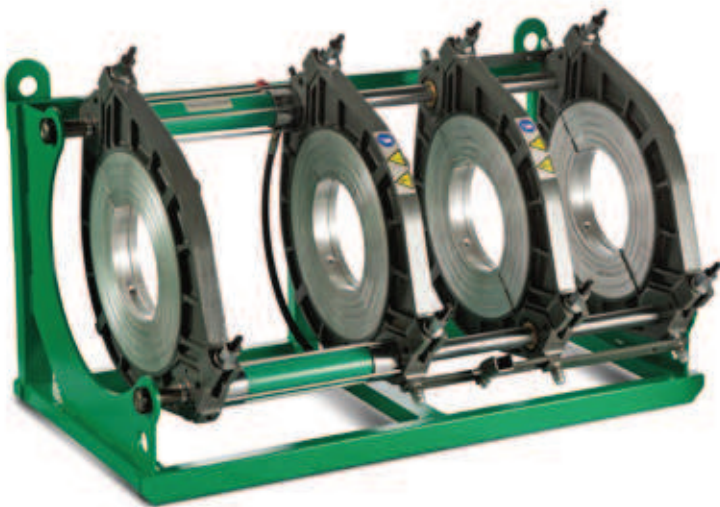
Assemble the dragging bar and heating plate detach device as show in the image below (standard composition after delivery).



## Welding Between Jaws No.3 and No.4

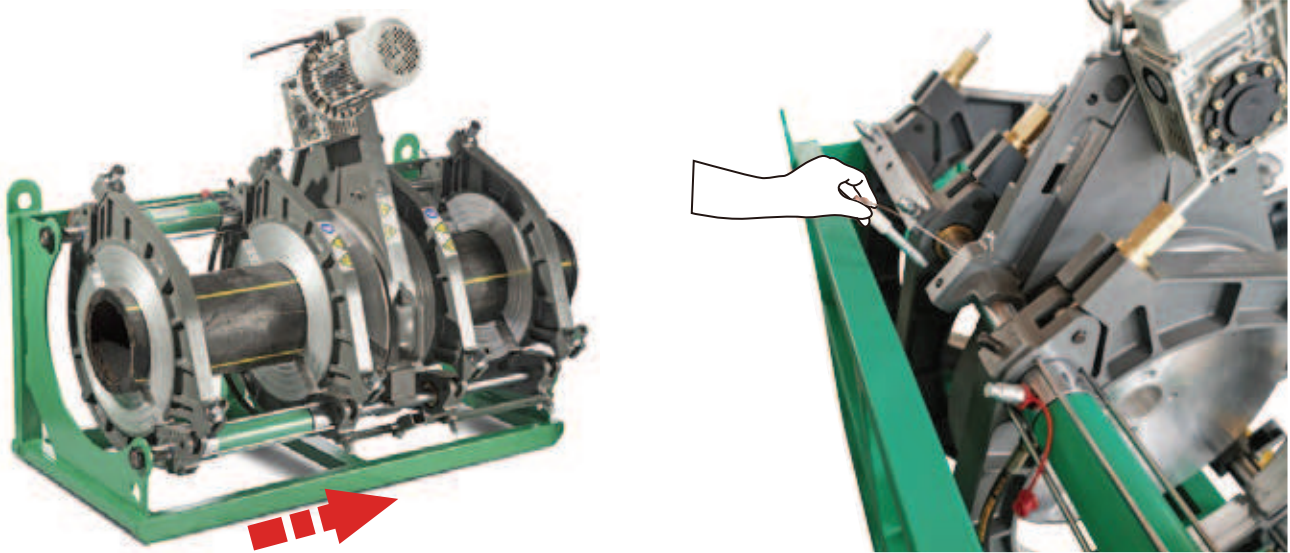
Assemble the dragging bar and heating plate detach device as show in the image below.

**Note:** The heating plate detach device is not featured in models V160, V200 and V250.



## 5.10 Trimming

Position the trimmer in between the pipe ends to be welded.

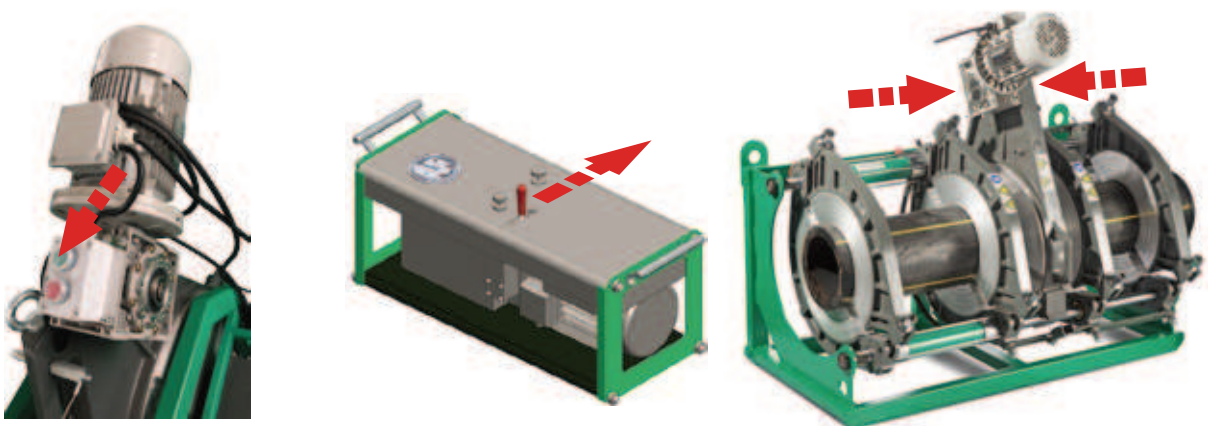


Rest the trimmer on the lower piston rod.

Keep the trimmer stand on the upper piston rod with the help of blocking bolt.

Turn on the trimmer by pressing the start button(Green one).

In order to not overstress the trimmer motor, you should increase the milling pressure gradually, to overcome the dragging pressure Pt. And the milling pressure could be up to maximum 10bar.



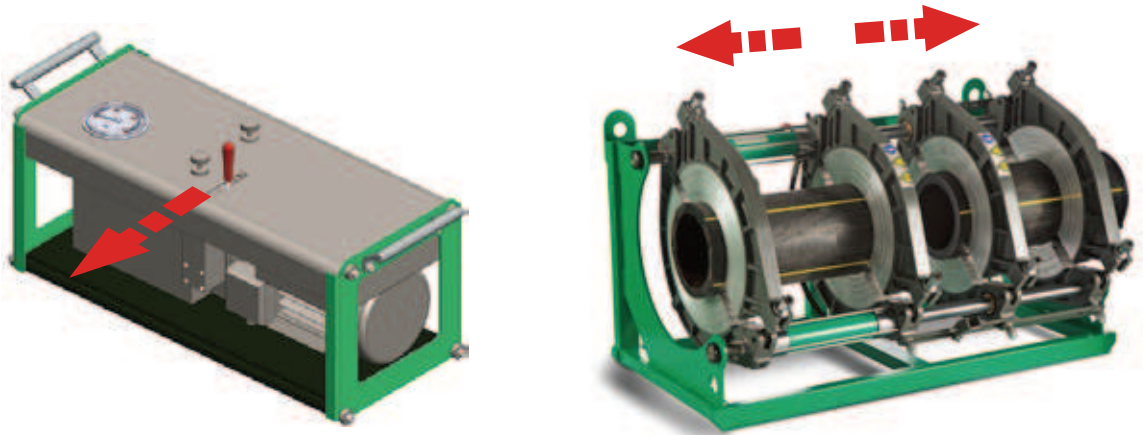
When the continuous and even chip comes out from both pipe ends, stop the motor by pressing the stop button(red button).

Open the machine carriage, remove the trimmer, and place it in its support. Please remove the chips without touching the trimmed ends. Please clean the pipe ends if some dust remains.



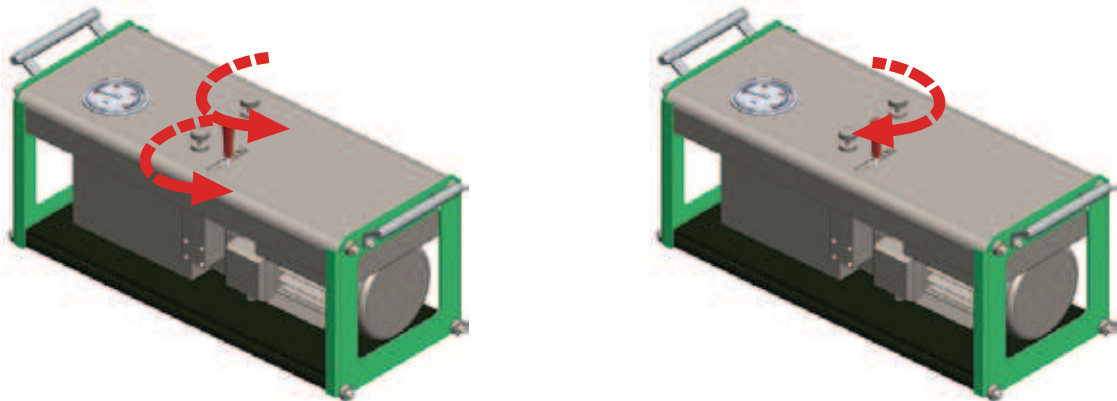
## 5.11 Measuring The Dragging Pressure $P_t$

Pull the direction lever maximum and open the machine carriage completely.

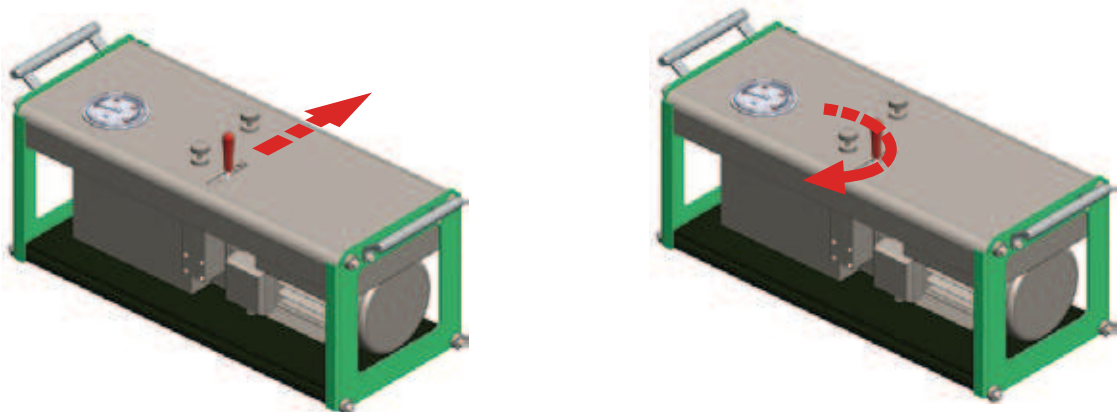


Zero the pressure in the hydraulic system by rotating the pressure relief valve and pressure regulated valve in counterclockwise way.

Then close the pressure relief valve by rotating it in clockwise way.



Then push the direction lever to maximum and gradually rotate the pressure regulated valve in a clockwise way, until the movable carriage gets in motion. Read the current pressure on the gauge and writ it down.

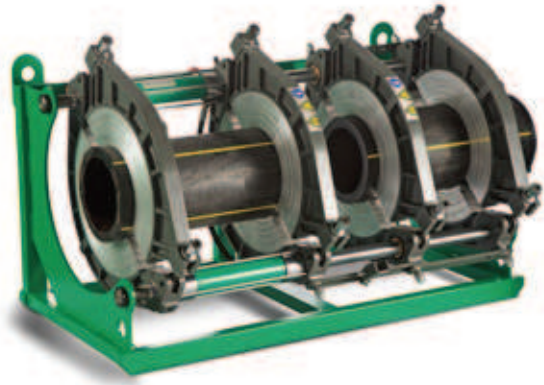
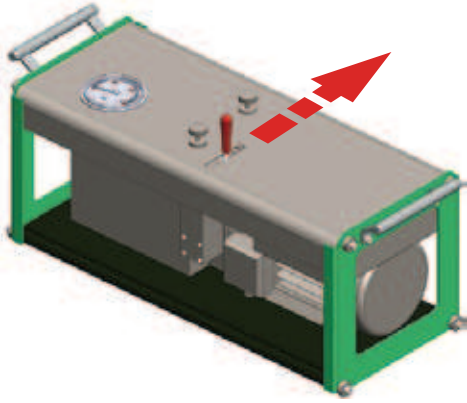


**Note:** You are requested to measure the dragging pressure before every welding.

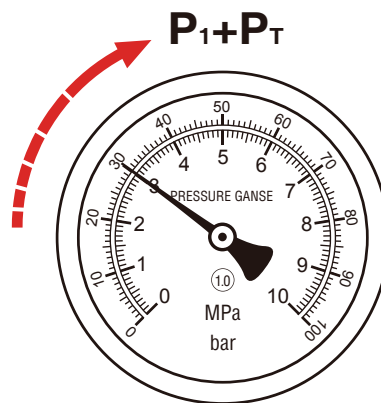
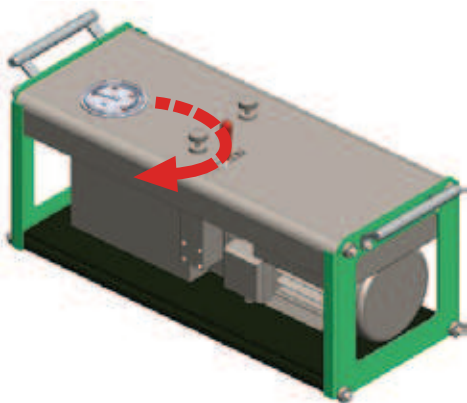
## 5.12 Single Pressure Welding Cycle

Set the Phase 1 pressure ( $P_1+P_t$ ) on the hydraulic power unit.

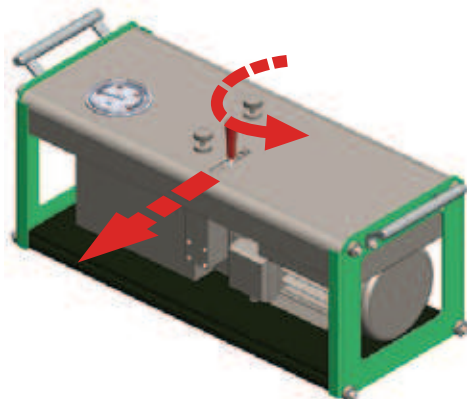
Close the machine carriage and push the direction lever to the maximum.



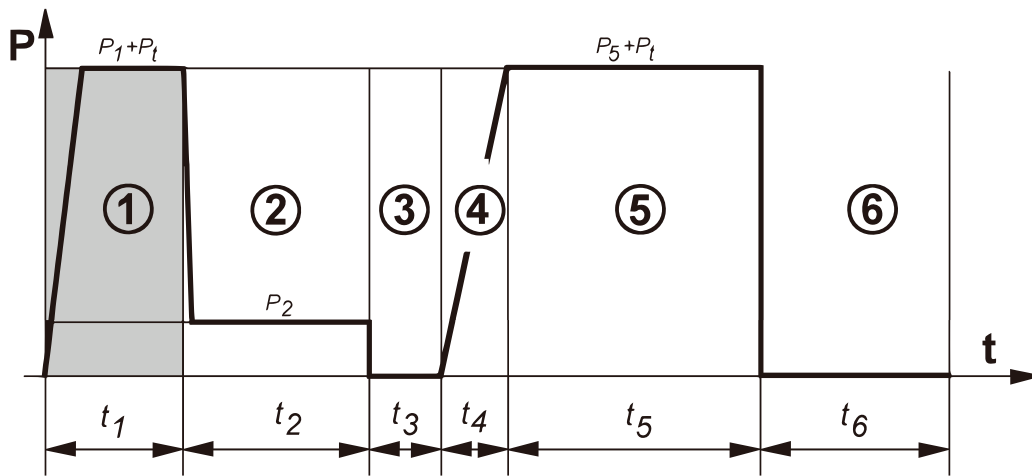
Gradually rotating the pressure regulated valve in a clockwise way until the pressure gauge show the pressure ( $P_1+P_t$ ).



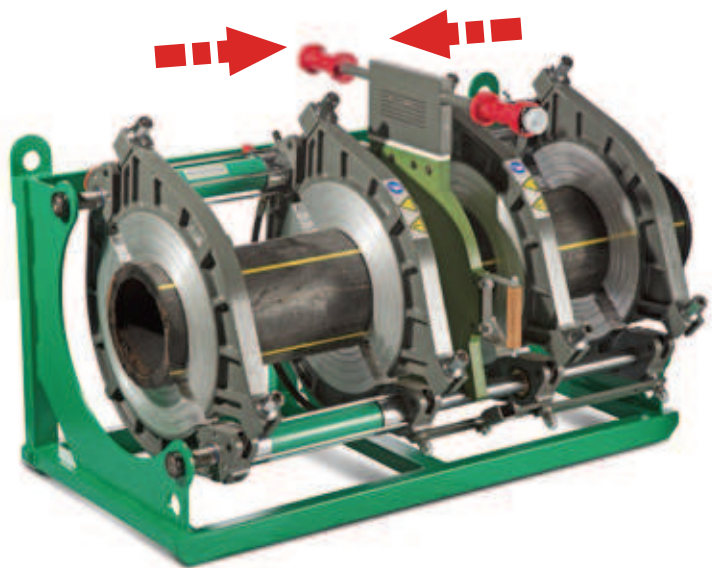
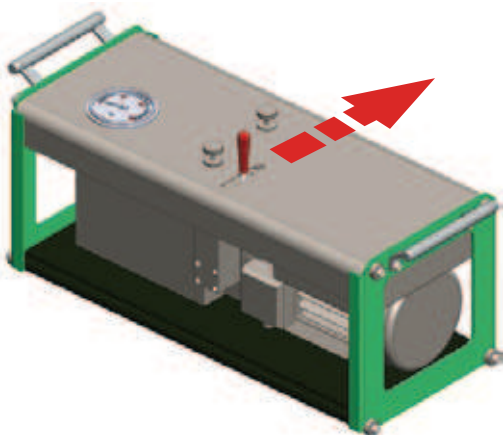
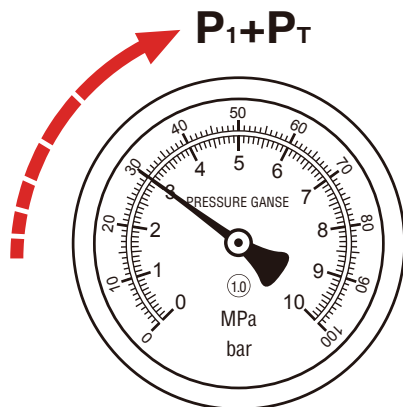
Then open the pressure relief valve by rotating it in a counterclockwise way, and pull the direction lever to open the machine carriage completely.



## Phase 1: Bead Up

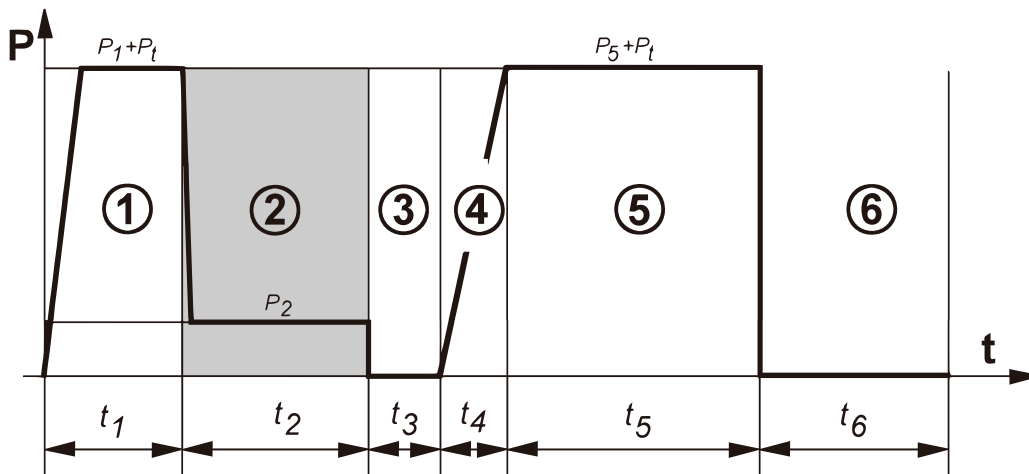


When the heating plate reaches the set temperature, insert it in between the two pipe ends. Close the pressure relief valve by rotating it in a clockwise way. And push the direction lever to close the carriage and keep the bead up pressure ( $P_1 + P_t$ ) until the bead height reaches the requested one. Then release the direction lever slowly.





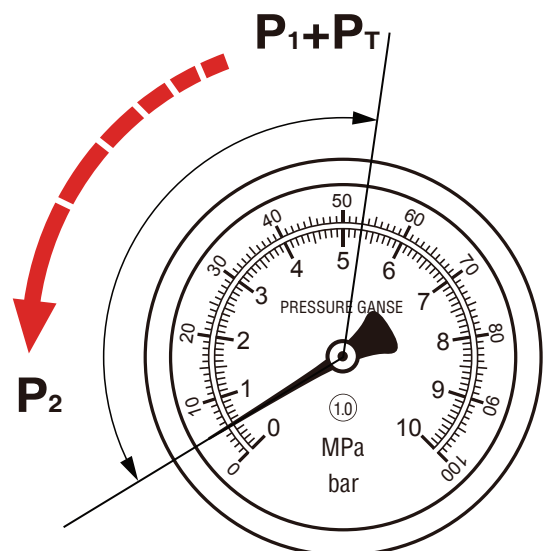
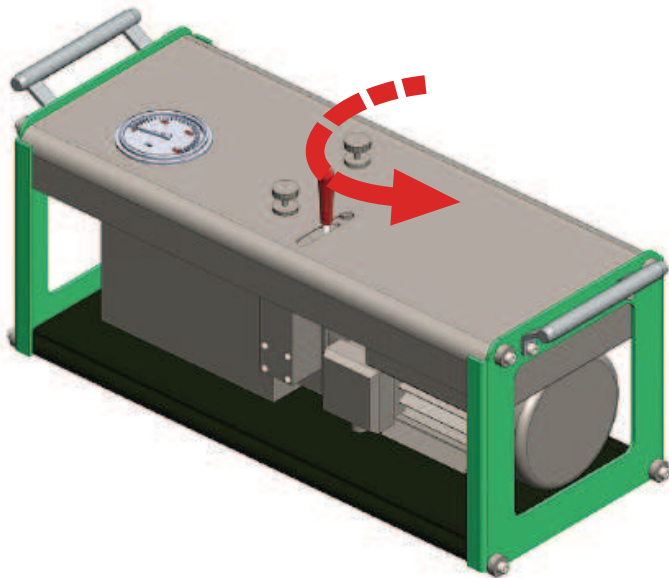
## Phase 2: Soaking



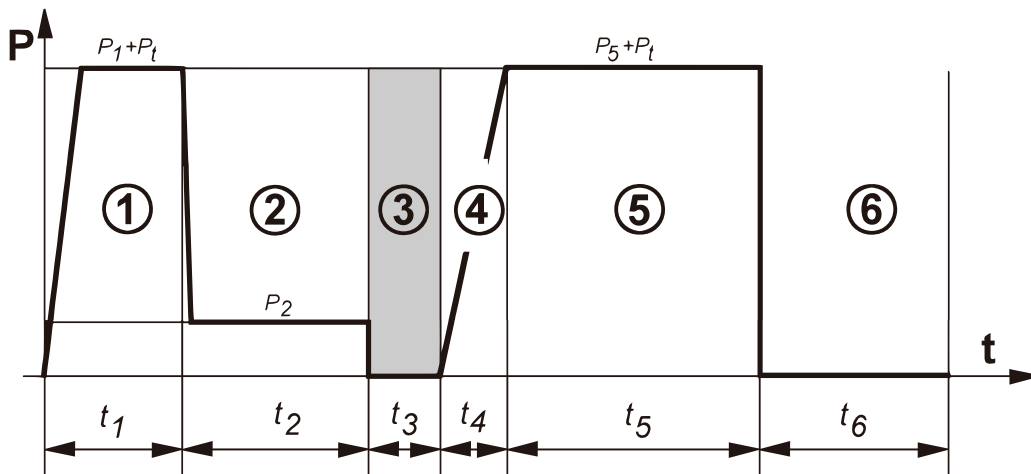
(Soaking pressure is needed to keep the two pipe ends in contact with the heating plate during this period.)

Slowly release the pressure relief valve in a counterclockwise way until the pressure gauge shows up the soaking pressure ( $P_2$ ), then close the pressure relief valve immediately in a clockwise way.

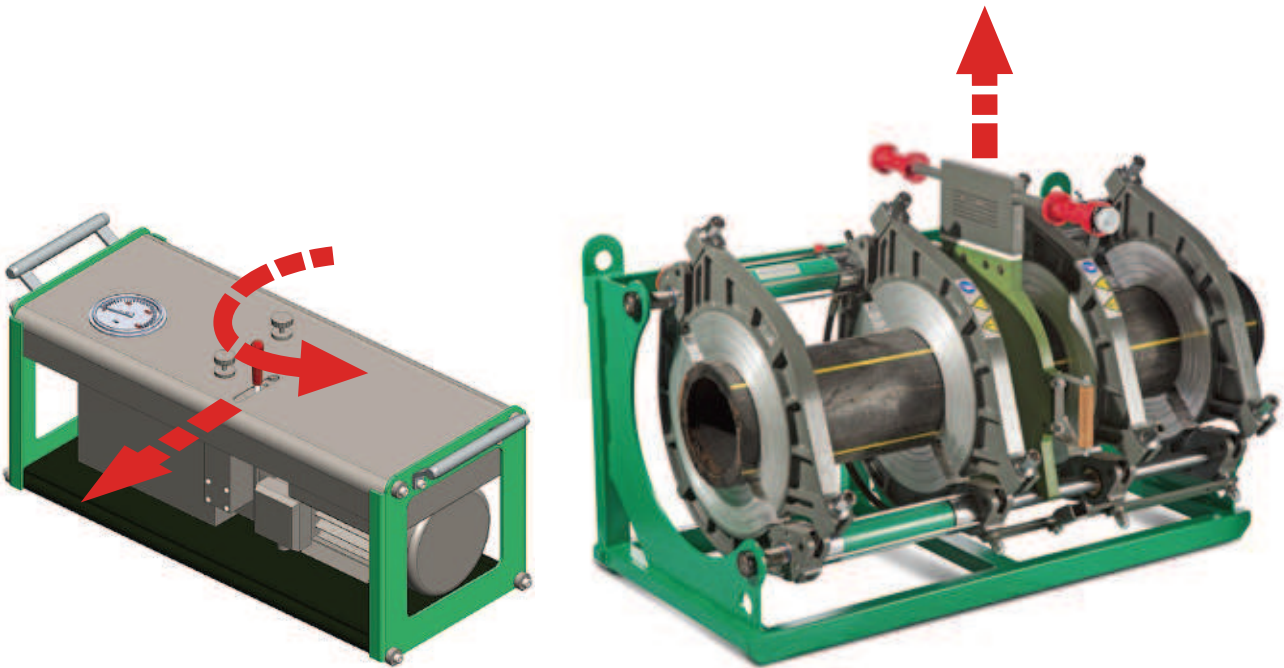
Wait for  $T_2$  time to end. But please be sure that the pipe ends never detach from the heating plate. If this happen, please repeat the welding.



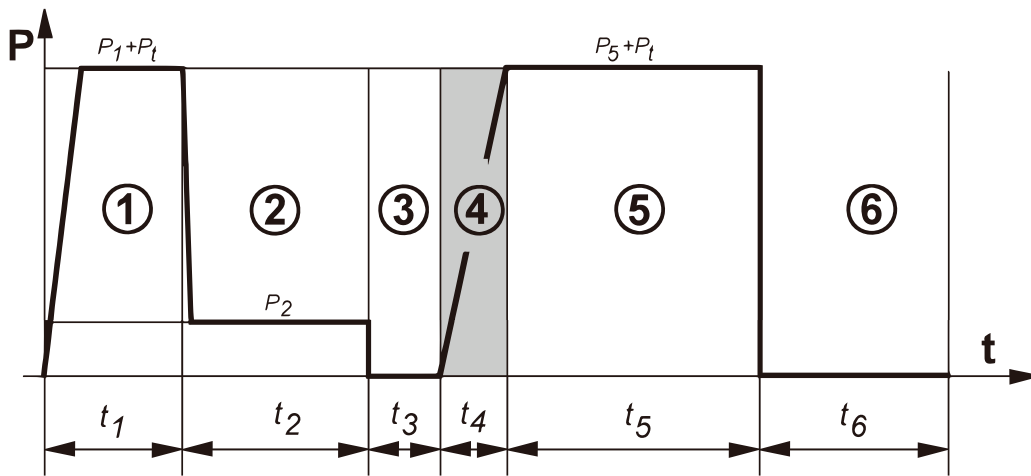
### Phase 3: Removal of Heating Plate



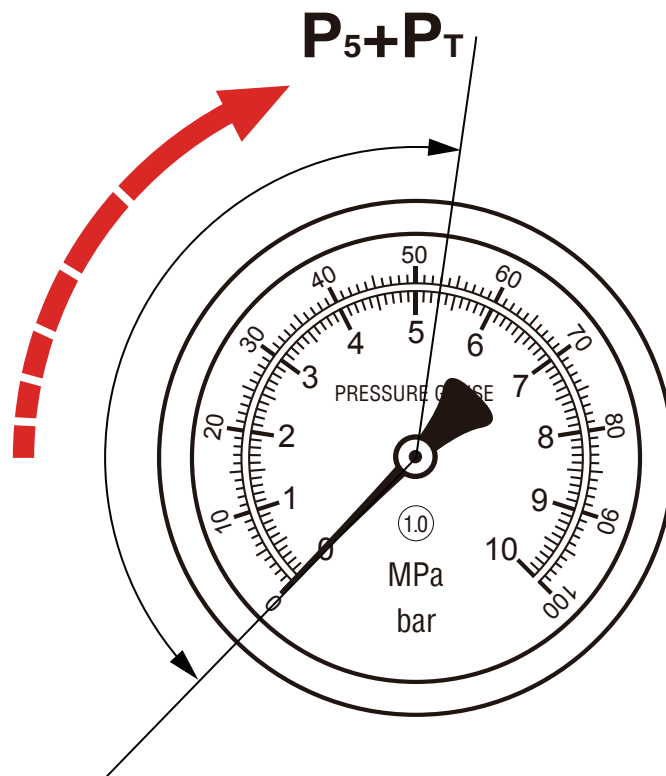
Once the T2 time ended,  
Open the pressure relief valve, and open the machine carriage by pulling the direction lever, and remove the heating plate within T3 time.



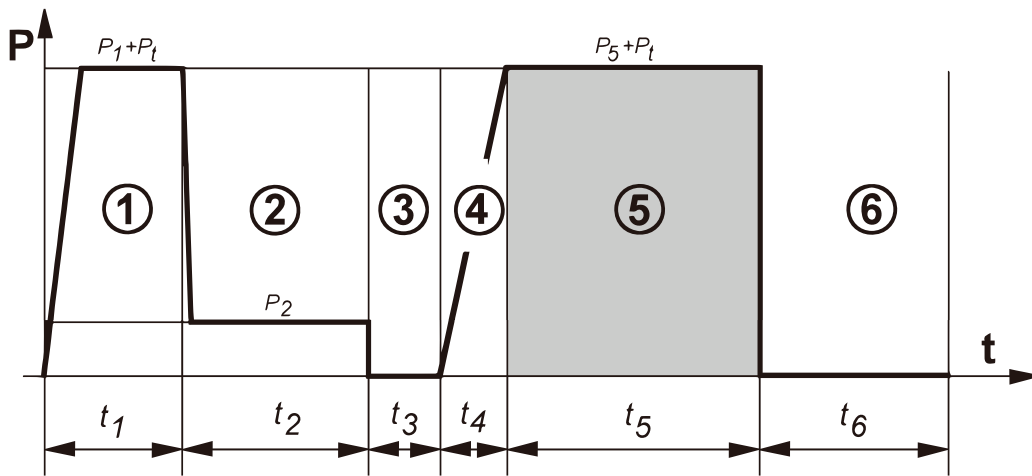
**Phase 4: Reach of Welding Pressure**



Close the pressure relief valve, and push the direction lever to maximum, meanwhile gradually increasing the pressure until the pressure gauge reaches the welding pressure ( $P_5 + P_t$ ), within  $T_4$  time.

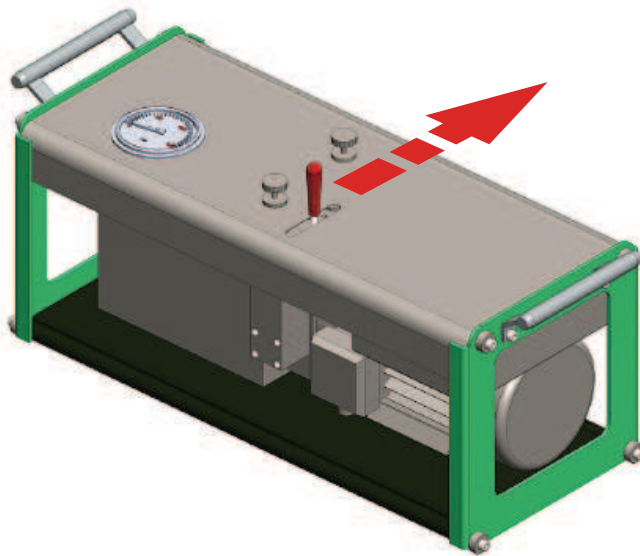


**Phase 5: Welding**

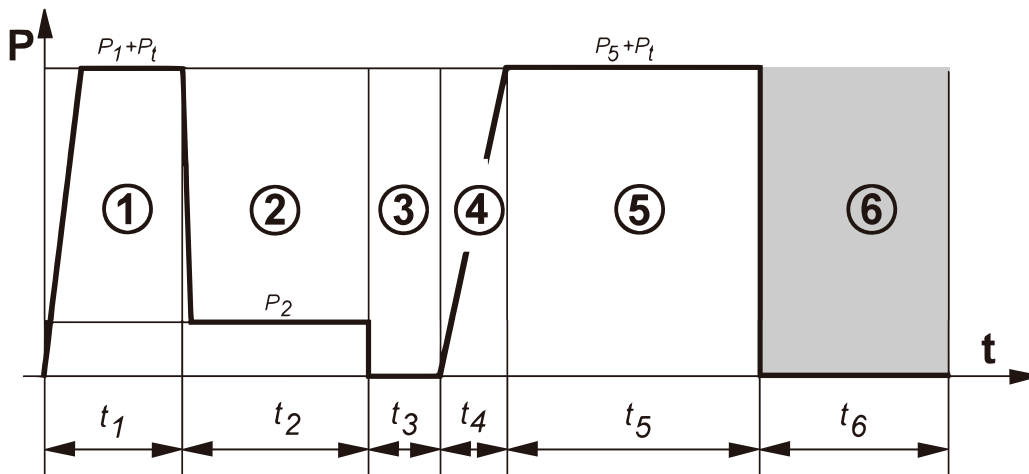


To stabilize the pressure ( $P_5+P_t$ ), please keep the direction lever pushed for around 10 seconds. Then release the direction lever slowly. Wait  $T_5$  time to end.

10 sec



## Phase 6: Cooling



After time  $T_5$ , release the pressure by rotating pressure relief valve in a counterclockwise way and remove the jointed pipe from the machine after time  $T_6$ .

### When you continue next joints:

1. You are suggested to measure the dragging pressure again.
2. You are suggested to measure the bead-up and welding pressure again.
3. You could use the memory time ( $T_2$  and  $T_5$ ) already set by timer if welding pipe with same specifications.
4. If weld other pipes with different specifications, please repeat above steps with the standard used.

### When you complete the welding:

1. Open the jaws and remove the welded pipe.
2. Unplug the machines from the main power and disconnect all cables.
3. Clean the machine accurately.

## 6. Maintenance

**Note:** Please use the recommended hydraulic oil to replace used oil (See technical specification chart).

Used oil is very pollutant, take it to the nearest hazardous waste collection site.

Item	Description	Check before use	First month	Every 6 months	Every year
<b>Trimmer</b>	<ul style="list-style-type: none"> <li>⊙ Replace both blades</li> <li>⊙ Replace the cable if it is broken</li> <li>⊙ Tighten mechanical connections</li> </ul>	●	●	●	●
<b>Heating plate</b>	<ul style="list-style-type: none"> <li>⊙ Clean the heating plate</li> <li>⊙ Re-coat heating plate with Teflon again if necessary or replace the heating plate</li> <li>⊙ Tighten mechanical connections</li> </ul>	●		●	●
<b>Hydraulic system</b>	<ul style="list-style-type: none"> <li>⊙ Check pressure gauge if works in normal or not</li> <li>⊙ Replace seals if the hydraulic unit is leaking</li> <li>⊙ Check the oil level</li> <li>⊙ Completely replace the hydraulic oil</li> <li>⊙ Replace if the oil hose is broken</li> <li>⊙ Keep the quick coupling and connectors clean</li> </ul>	●	●	●	●
<b>Basic Frame</b>	<ul style="list-style-type: none"> <li>⊙ Keep piston rod clear</li> <li>⊙ Keep the quick coupling connectors clean</li> <li>⊙ After use, cover the quick coupling connectors with plastic cap</li> <li>⊙ Tighten mechanical connections</li> </ul>	●		●	
<b>Power Supply</b>	<ul style="list-style-type: none"> <li>⊙ Press the testing button of circuit protector to make sure it works</li> <li>⊙ Replace the cable, plug and sockets if broken</li> </ul>	●			

## ◀ 7. Trouble shooting

If the malfunctions happened with your V series machines, please send the machine to Riyang`s authorized dealer or contact directly Riyang in China. We will assist you to resolve the problems. If your machine still under warranty period, Riyang dealer will totally cover the responsibility to fix your machine; if no Riyang dealer in your area, we will send you the replacement parts, and replace it by certified technical personnel.

**Note:** Please unplug the machine from main power before you working on the electrical problems.

### 7.1 Hydraulic Power Unit

❶ <b>Problem:</b> The pump motor does not work.	
Possible Cause	Solution
Power source not connected well	Check the power cable connected well with main power or not.
Sockets connection is loosen	Check the sockets connection, please restore it if necessary.
Failure on the electrical parts	Check the micro-switch, solid relay.

❷ <b>Problem:</b> The pump motor rotating slowly with abnormal noise.	
Possible Cause	Solution
The motor is overloaded	Make sure the working pressure is less than 120bar.
The oil filter is blocked	Check the oil filter and clean it.
Failure on the motor	Repair or replace the motor.
The input voltage is unstable	Check the power instability.

<b>③ Problem:</b> Oil leakage.	
Possible Cause	Solution
Quick coupling connectors loosen or worn out	Tighten the loosen connectors, or replace the worn-out connectors.
Hydraulic hoses worn out	Replace the hydraulic hoses.
Oil seal between oil tank and block not fitted well	Restore the oil seal, replace it if necessary.
The hydraulic block is not working well	Replace the hydraulic block.

<b>④ Problem:</b> Lack of pressure.	
Possible Cause	Solution
Hydraulic oil in the tank is not sufficient	Add the oil to requested level.
The pressure relief valve is not closed completely	Completely close the pressure relief valve by rotating in a clockwise way.
Air in the hydraulic system	Directly unite the quick coupling connectors-connections (hydraulic power unit), and activate the hydraulic motor for 30 seconds by pushing the direction lever.
The pressure relief valve is out of operation	Replace the pressure relief valve.
The quick coupling connector is blocked	Replace the quick coupling connectors.



## 7.2 Machine Carriage

<b>❶ Problem:</b> Oil leakage.	
Possible Cause	Solution
Quick coupling connectors loosen or worn out	Tighten the loosen connectors, or replace the worn-out connectors.
Hydraulic hoses worn out	Replace the hydraulic hoses.
Oil seal kit not fitted well or worn out	Please restore the kit if necessary or replace it.
Cylinder or piston scratched or worn out	Please replace it.

<b>❷ Problem:</b> Carriage is trembling when in motion.	
Possible Cause	Solution
Lack pressure caused by air in the hydraulic cylinders	Move the machine carriage back and forward by activating the direction lever, until the air is eliminated.

## 7.3 Heating Plate

<b>❶ Problem:</b> The temperature display shows up“HH”.	
Possible Cause	Solution
Circuit open	Check the heating sensor connected well or not. Check the sockets disconnected or not. Check the cable disconnected or not.

<b>❷ Problem:</b> The heating plate can not heat up, display indicated the environment temperature.	
Possible Cause	Solution
Signal interrupted	Replace the solid relay. Replace the temperature controller.

<b>③ Problem:</b> The heating plate can heat up, however the display not show the actual temperature.	
Possible Cause	Solution
Failure on the temperature controller	Replace the temperature controller.

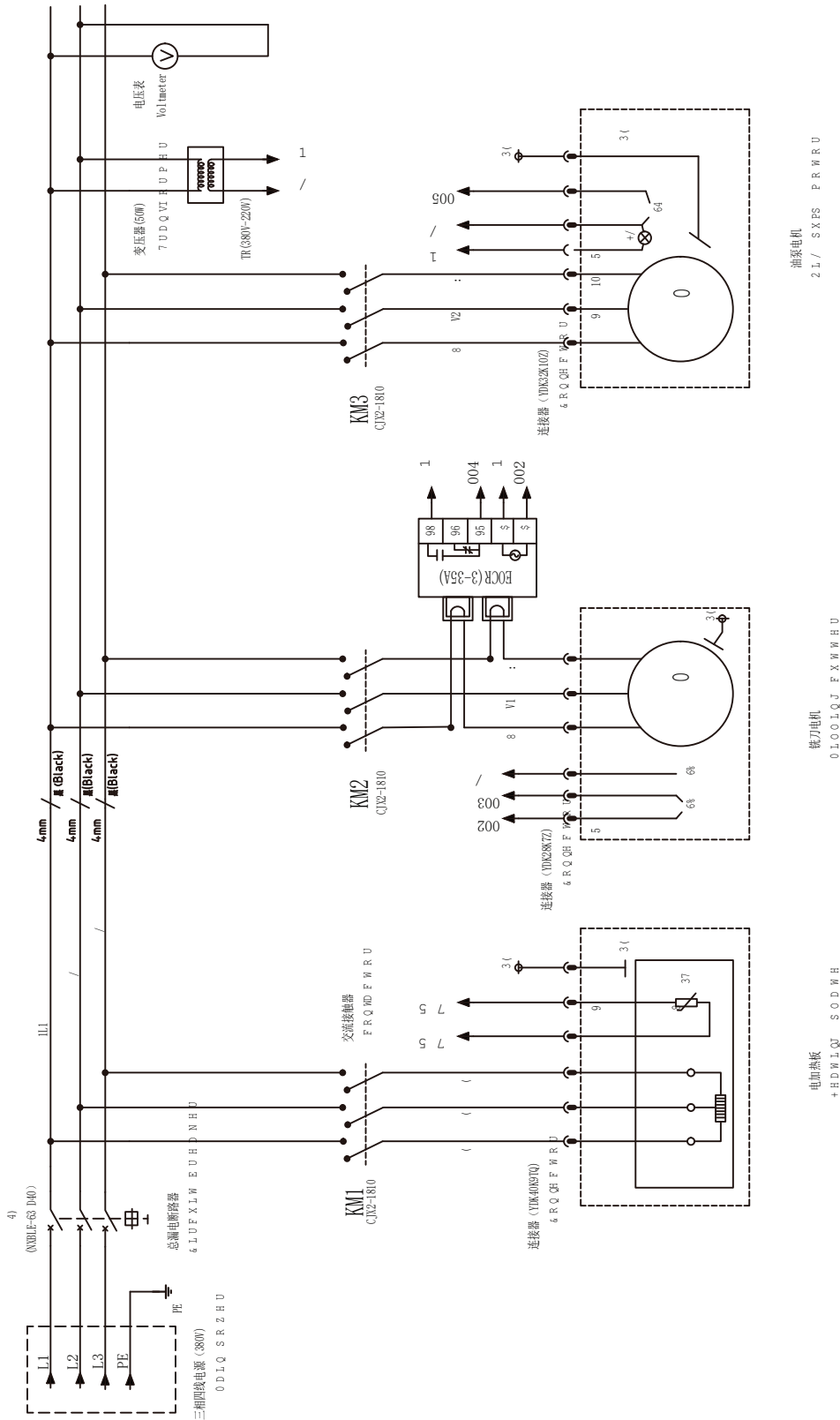
## 7.4 Trimmer

<b>① Problem:</b> The motor does not work.	
Possible Cause	Solution
Power source not connected well	Check the power cable connected well with main power or not.
Sockets connection is loosen	Check the sockets connection, please restore it if necessary.
Failure on motor	Repair it, if can not, replace it.

<b>② Problem:</b> It could not face the pipe ends with continuous chips.	
Possible Cause	Solution
Blade is blunt	Switch to another side, or replace it.
Blade surface lower than the trimmer plate	Using thin paper or copper to fill in between blade and trimmer plate.

# 8. Schematic Diagram

Please unplug the machine from main power before you working on the electrical components.  
All inspection and intervention on the electrical system should be under process of the certified electrical personnel.



# WELDING PARAMETER CHARTS

## V450

RAM=22.27 cm<sup>2</sup>

HDPE

DVS2207-1-2016  
ISO21307-2017

PP

DVS2207-11 (2017)

TEMP: 220 ± 10C			PHASE 1				PHASE 2		PHASE 3	PHASE 4			PHASE 5			
Pipe Details (e <sub>n</sub> = Wall Thickness) Max e <sub>n</sub> = 130mm			Equalising				Preheating		Changeover Time	Joining (See Note a)			Minimum Cool Time Under Pressure (See Note b)			
			Equalising Pressure BAR			Bead Height (Minimum) mm				BAR	Time	Max	Buildup Time Max	Joining Pressure BAR		Up to 15°C
D <sub>n</sub>	SDR	e <sub>n</sub>	Min	Tgt	Max		BAR	Time	Max					Min	Tgt	
200	41	4.9	2	2	2	1.0	0.14	0m 45s	5s	5s	2	2	2	0h 4m	0h 5m	0h 7m
	33	6.1	2	3	3	1.0	0.17	1m 4s	5.8s	5.8s	2	3	3	0h 5m	0h 7m	0h 8m
	26	7.7	3	3	3	1.5	0.21	1m 16s	6.3s	6.3s	3	3	3	0h 6m	0h 8m	0h 10m
	21	9.5	4	4	4	1.5	0.26	1m 38s	7.2s	7.2s	4	4	4	0h 8m	0h 10m	0h 13m
	17	11.8	4	5	5	1.5	0.32	2m 0s	8s	8s	4	5	5	0h 9m	0h 12m	0h 15m
	13.6	14.7	5	6	6	2.0	0.39	2m 27s	8.8s	9.2s	5	6	6	0h 11m	0h 14m	0h 19m
	11	18.2	7	7	8	2.0	0.47	3m 5s	9.9s	10.8s	7	7	8	0h 13m	0h 17m	0h 23m
	9	22.2	8	8	9	2.5	0.56	3m 42s	11s	12.4s	8	8	9	0h 16m	0h 21m	0h 28m
225	7.4	27.0	9	10	11	3.0	0.66	4m 31s	12.4s	14.5s	9	10	11	0h 20m	0h 25m	0h 33m
	41	5.5	2	3	3	1.0	0.17	0m 51s	5.3s	5.3s	2	3	3	0h 4m	0h 6m	0h 7m
	33	6.8	3	3	3	1.0	0.21	1m 10s	6s	6s	3	3	3	0h 6m	0h 7m	0h 9m
	26	8.7	4	4	4	1.5	0.27	1m 27s	6.7s	6.7s	4	4	4	0h 7m	0h 9m	0h 11m
	21	10.7	5	5	5	1.5	0.33	1m 49s	7.6s	7.6s	5	5	5	0h 9m	0h 11m	0h 14m
	17	13.2	6	6	6	2.0	0.40	2m 11s	8.4s	8.5s	6	6	6	0h 10m	0h 13m	0h 17m
	13.6	16.5	7	7	8	2.0	0.49	2m 49s	9.4s	10.1s	7	7	8	0h 12m	0h 16m	0h 21m
	11	20.5	8	9	10	2.5	0.59	3m 21s	10.4s	11.5s	8	9	10	0h 15m	0h 19m	0h 25m
250	9	25.0	10	11	11	2.5	0.71	4m 15s	11.9s	13.8s	10	11	11	0h 18m	0h 23m	0h 31m
	7.4	30.4	12	13	13	3.0	0.84	5m 2s	13.6s	16s	12	13	13	0h 22m	0h 28m	0h 37m
	41	6.1	3	3	3	1.0	0.21	1m 4s	5.8s	5.8s	3	3	3	0h 5m	0h 7m	0h 8m
	33	7.6	4	4	4	1.5	0.26	1m 16s	6.3s	6.3s	4	4	4	0h 6m	0h 8m	0h 10m
	26	9.6	5	5	5	1.5	0.33	1m 38s	7.2s	7.2s	5	5	5	0h 8m	0h 10m	0h 13m
	21	11.9	6	6	6	1.5	0.40	2m 0s	8s	8s	6	6	6	0h 9m	0h 12m	0h 15m
	17	14.7	7	7	8	2.0	0.49	2m 27s	8.8s	9.2s	7	7	8	0h 11m	0h 14m	0h 19m
	13.6	18.4	8	9	10	2.0	0.60	3m 5s	9.9s	10.8s	8	9	10	0h 13m	0h 17m	0h 23m
280	11	22.7	10	11	12	2.5	0.73	3m 48s	11.1s	12.7s	10	11	12	0h 17m	0h 21m	0h 28m
	9	27.8	12	13	14	3.0	0.87	4m 36s	12.6s	14.8s	12	13	14	0h 20m	0h 25m	0h 34m
	7.4	33.8	14	15	17	3.0	1.03	5m 39s	14.9s	17.6s	14	15	17	0h 25m	0h 31m	0h 41m
	41	6.8	4	4	4	1.0	0.27	1m 10s	6s	6s	4	4	4	0h 6m	0h 7m	0h 9m
	33	8.5	5	5	5	1.5	0.33	1m 21s	6.5s	6.5s	5	5	5	0h 7m	0h 8m	0h 11m
	26	10.8	6	6	7	1.5	0.41	1m 49s	7.6s	7.6s	6	6	7	0h 9m	0h 11m	0h 14m
	21	13.3	7	8	8	2.0	0.50	2m 11s	8.4s	8.5s	7	8	8	0h 10m	0h 13m	0h 17m
	17	16.5	9	9	10	2.0	0.61	2m 43s	9.3s	9.9s	9	9	10	0h 12m	0h 16m	0h 20m
315	13.6	20.6	11	11	12	2.5	0.76	3m 26s	10.5s	11.7s	11	11	12	0h 15m	0h 19m	0h 26m
	11	25.5	13	14	15	2.5	0.91	4m 15s	11.9s	13.8s	13	14	15	0h 18m	0h 23m	0h 31m
	9	31.1	15	16	17	3.0	1.09	5m 12s	14s	16.4s	15	16	17	0h 23m	0h 29m	0h 38m
	7.4	37.8	18	19	21	3.5	1.29	6m 15s	16.2s	19.3s	18	19	21	0h 27m	0h 35m	0h 46m
	41	7.7	5	5	5	1.5	0.34	1m 16s	6.3s	6.3s	5	5	5	0h 6m	0h 8m	0h 10m
	33	9.5	6	6	7	1.5	0.41	1m 38s	7.2s	7.2s	6	6	7	0h 8m	0h 10m	0h 13m
	26	12.1	7	8	8	2.0	0.52	2m 0s	8s	8s	7	8	8	0h 10m	0h 12m	0h 16m
	21	15.0	9	10	10	2.0	0.64	2m 32s	9s	9.4s	9	10	10	0h 12m	0h 15m	0h 19m
355	17	18.5	11	12	12	2.0	0.78	3m 10s	10s	11s	11	12	12	0h 14m	0h 18m	0h 23m
	13.6	23.2	13	14	15	2.5	0.95	3m 53s	11.3s	12.9s	13	14	15	0h 17m	0h 22m	0h 29m
	11	28.6	16	17	19	3.0	1.16	4m 46s	13s	15.2s	16	17	19	0h 21m	0h 26m	0h 35m
	9	35.0	19	21	22	3.0	1.38	5m 54s	15.5s	18.3s	19	21	22	0h 26m	0h 32m	0h 43m
	7.4	42.6	23	25	26	3.5	1.63	7m 7s	17.8s	21.7s	23	25	26	0h 31m	0h 39m	0h 52m
	41	8.7	6	6	7	1.5	0.43	1m 27s	6.7s	6.7s	6	6	7	0h 7m	0h 9m	0h 11m
	33	10.8	7	8	8	1.5	0.53	1m 49s	7.6s	7.6s	7	8	8	0h 9m	0h 11m	0h 14m
	26	13.7	9	10	11	2.0	0.66	2m 16s	8.5s	8.7s	9	10	11	0h 11m	0h 13m	0h 17m
400	21	16.9	11	12	13	2.0	0.81	2m 49s	9.4s	10.1s	11	12	13	0h 12m	0h 16m	0h 21m
	17	20.9	14	15	16	2.5	0.98	3m 26s	10.5s	11.7s	14	15	16	0h 15m	0h 19m	0h 26m
	13.6	26.1	17	18	19	3.0	1.21	4m 20s	12s	14s	17	18	19	0h 19m	0h 24m	0h 32m
	11	32.3	21	22	24	3.0	1.47	5m 23s	14.3s	16.9s	21	22	24	0h 23m	0h 30m	0h 39m
	9	39.4	25	26	28	3.5	1.75	6m 31s	16.7s	20s	25	26	28	0h 28m	0h 36m	0h 48m
	7.4	48.0	29	31	33	3.5	2.07	7m 59s	19.4s	24.1s	29	31	33	0h 34m	0h 44m	0h 58m
	41	9.8	8	8	9	1.5	0.54	1m 38s	7.2s	7.2s	8	8	9	0h 8m	0h 10m	0h 13m
	33	12.1	9	10	11	2.0	0.67	2m 0s	8s	8s	9	10	11	0h 10m	0h 12m	0h 16m
450	26	15.4	12	13	13	2.0	0.84	2m 32s	9s	9.4s	12	13	13	0h 12m	0h 15m	0h 19m
	21	19.0	14	15	16	2.5	1.02	3m 10s	10s	11s	14	15	16	0h 14m	0h 18m	0h 24m
	17	23.5	18	19	20	2.5	1.25	3m 59s	11.4s	13.1s	18	19	20	0h 17m	0h 22m	0h 29m
	13.6	29.4	22	23	25	3.0	1.54	4m 52s	13.2s	15.5s	22	23	25	0h 21m	0h 27m	0h 36m
	11	36.4	26	28	30	3.0	1.86	6m 5s	15.9s	18.8s	26	28	30	0h 26m	0h 33m	0h 44m
	9	44.4	31	33	36	3.5	2.22	7m 23s	18.3s	22.4s	31	33	36	0h 32m	0h 41m	0h 54m
	7.4	54.1	37	39	42	4.0	2.63	9m 0s	21s	27s	37	39	42	0h 39m	0h 50m	1h 6m
	41	11.0	10	10	11	1.5	0.68	1m 49s	7.6s	7.6s	10	10	11	0h 9m	0h 11m	0h 14m
33	13.6	12	13	13	2.0	0.84	2m 16s	8.5s	8.7s	12	13	13	0h 11m	0h 13m	0h 17m	
26	17.3	15	16	17	2.0	1.06	2m 54s	9.6s	10.4s	15	16	17	0h 13m	0h 16m	0h 22m	
21	21.4	18	19	21	2.5	1.29	3m 32s	10.7s	12s	18	19	21	0h 16m	0h 20m	0h 26m	
17	26.5	22	24	25	3.0	1.58	4m 20s	12s	14s	22	24	25	0h 19m	0h 24m	0h 32m	
13.6	33.1	27	29	31	3.0	1.94	5m 33s	14.7s	17.4s	27	29	31	0h 24m	0h 30m	0h 40m	
11	40.9	33	35	38	3.5	2.36	6m 46s	17.2s	20.7s	33	35	38	0h 30m	0h 37m	0h 49m	
9	50.0	39	42	45	4.0	2.81	8m 20s	20s	25s	39	42	45	0h 36m	0h 46m	1h 1m	
7.4	60.8	47	50	53	4.0	3.33	10m 5s	22.7s	30.3s	47	50	53	0h 43m	0h 56m	1h 14m	





TEMP: 225 ± 10C			PHASE 1				PHASE 2			PHASE 3	PHASE 4			PHASE 5	PHASE 6		
Pipe Details (e <sub>n</sub> = Wall Thickness)			Bead Up Pressure (BAR)			Minimum Bead up Size	Heat Soak See Note b			Maximum Heater Removal Time	Maximum Pressure Up Time	Weld Pressure (BAR)			Minimum Cool Time Under Pressure (See Note c)	Additional Cool Time out of Machine (See Note d)	
			ADD DRAG (see note a)				0 - DRAG ONLY					ADD DRAG					
D <sub>n</sub>	SDR	e <sub>n</sub>	P1			t1 mm	P2 BAR	t2			t3	t4	P3			t5 / P3	
			Min	Tgt	Max			Min	Tgt	Max			Min	Tgt	Max		
200	41	4.9	2	2	3	1	0 - DRAG ONLY	0m 59s	1m 6s	1m 13s	6s	9s	2	2	3	0h 8m	d
	33	6.1	2	3	3	2		1m 13s	1m 22s	1m 31s	6s	9s	2	3	3	0h 9m	d
	26	7.7	3	4	4	2		1m 32s	1m 44s	1m 55s	8s	9s	3	4	4	0h 11m	d
	21	9.5	4	4	5	2		1m 54s	2m 9s	2m 23s	8s	9s	4	4	5	0h 13m	d
	17	11.8	5	5	6	2		2m 21s	2m 39s	2m 56s	8s	9s	5	5	6	0h 15m	d
	13.6	14.7	6	7	7	2		2m 56s	3m 19s	3m 41s	10s	9s	6	7	7	0h 18m	d
	11	18.2	7	8	9	3		3m 38s	4m 5s	4m 33s	10s	9s	7	8	9	0h 16m	d
	9	22.2	8	9	11	3		4m 27s	5m 0s	5m 33s	12s	9s	8	9	11	0h 17m	d
	7.4	27.0	10	11	12	4		5m 24s	6m 5s	6m 45s	16s	9s	10	11	12	0h 18m	d
225	41	5.5	3	3	3	2	0 - DRAG ONLY	1m 6s	1m 14s	1m 22s	6s	9.8s	3	3	3	0h 8m	d
	33	6.8	3	4	4	2		1m 22s	1m 32s	1m 42s	6s	9.8s	3	4	4	0h 10m	d
	26	8.7	4	4	5	2		1m 44s	1m 57s	2m 10s	8s	9.8s	4	4	5	0h 12m	d
	21	10.7	5	5	6	2		2m 9s	2m 25s	2m 41s	8s	9.8s	5	5	6	0h 14m	d
	17	13.2	6	7	7	2		2m 39s	2m 59s	3m 19s	10s	9.8s	6	7	7	0h 16m	d
	13.6	16.5	7	8	9	3		3m 19s	3m 43s	4m 8s	10s	9.8s	7	8	9	0h 20m	d
	11	20.5	9	10	11	3		4m 5s	4m 36s	5m 7s	12s	9.8s	9	10	11	0h 17m	d
	9	25.0	11	12	13	3		5m 0s	5m 38s	6m 15s	12s	9.8s	11	12	13	0h 18m	d
	7.4	30.4	12	14	16	4		6m 5s	6m 50s	7m 36s	16s	9.8s	12	14	16	0h 20m	d
250	41	6.1	3	4	4	2	0 - DRAG ONLY	1m 13s	1m 22s	1m 31s	6s	10.5s	3	4	4	0h 9m	d
	33	7.6	4	4	5	2		1m 31s	1m 42s	1m 54s	8s	10.5s	4	4	5	0h 11m	d
	26	9.6	5	6	6	2		1m 55s	2m 10s	2m 24s	8s	10.5s	5	6	6	0h 13m	d
	21	11.9	6	7	8	2		2m 23s	2m 41s	2m 59s	8s	10.5s	6	7	8	0h 15m	d
	17	14.7	7	8	9	2		2m 56s	3m 19s	3m 41s	10s	10.5s	7	8	9	0h 18m	d
	13.6	18.4	9	10	11	3		3m 41s	4m 8s	4m 36s	10s	10.5s	9	10	11	0h 16m	d
	11	22.7	11	12	14	3		4m 33s	5m 7s	5m 41s	12s	10.5s	11	12	14	0h 17m	d
	9	27.8	13	15	16	4		5m 33s	6m 15s	6m 57s	16s	10.5s	13	15	16	0h 19m	d
	7.4	33.8	15	17	19	4		6m 45s	7m 36s	8m 27s	16s	10.5s	15	17	19	0h 21m	d
280	41	6.8	4	4	5	2	0 - DRAG ONLY	1m 22s	1m 32s	1m 42s	6s	11.4s	4	4	5	0h 10m	d
	33	8.5	5	6	6	2		1m 42s	1m 55s	2m 7s	8s	11.4s	5	6	6	0h 11m	d
	26	10.8	6	7	8	2		2m 9s	2m 25s	2m 42s	8s	11.4s	6	7	8	0h 14m	d
	21	13.3	7	8	9	2		2m 40s	3m 0s	3m 20s	10s	11.4s	7	8	9	0h 16m	d
	17	16.5	9	10	12	3		3m 18s	3m 42s	4m 7s	10s	11.4s	9	10	12	0h 19m	d
	13.6	20.6	11	13	14	3		4m 7s	4m 38s	5m 9s	12s	11.4s	11	13	14	0h 17m	d
	11	25.5	14	15	17	4		5m 5s	5m 44s	6m 22s	12s	11.4s	14	15	17	0h 18m	d
	9	31.1	16	18	21	4		6m 13s	7m 0s	7m 47s	16s	11.4s	16	18	21	0h 20m	d
	7.4	37.8	19	22	24	5		7m 34s	8m 31s	9m 28s	20s	11.4s	19	22	24	0h 24m	d
315	41	7.7	5	6	6	2	0 - DRAG ONLY	1m 32s	1m 44s	1m 55s	8s	12.5s	5	6	6	0h 11m	d
	33	9.5	6	7	8	2		1m 55s	2m 9s	2m 23s	8s	12.5s	6	7	8	0h 13m	d
	26	12.1	8	9	10	2		2m 25s	2m 44s	3m 2s	10s	12.5s	8	9	10	0h 15m	d
	21	15.0	9	11	12	2		3m 0s	3m 23s	3m 45s	10s	12.5s	9	11	12	0h 18m	d
	17	18.5	12	13	15	3		3m 42s	4m 10s	4m 38s	10s	12.5s	12	13	15	0h 16m	d
	13.6	23.2	14	16	18	3		4m 38s	5m 13s	5m 47s	12s	12.5s	14	16	18	0h 17m	d
	11	28.6	17	20	22	4		5m 44s	6m 27s	7m 10s	16s	12.5s	17	20	22	0h 19m	d
	9	35.0	21	23	26	4		7m 0s	7m 53s	8m 45s	16s	12.5s	21	23	26	0h 22m	d
	7.4	42.6	24	28	31	5		8m 31s	9m 35s	10m 39s	20s	12.5s	24	28	31	0h 27m	d
355	41	8.7	6	7	8	2	0 - DRAG ONLY	1m 44s	1m 57s	2m 10s	8s	13.7s	6	7	8	0h 12m	d
	33	10.8	8	9	10	2		2m 9s	2m 25s	2m 41s	8s	13.7s	8	9	10	0h 14m	d
	26	13.7	10	11	12	2		2m 44s	3m 4s	3m 25s	10s	13.7s	10	11	12	0h 17m	d
	21	16.9	12	14	15	3		3m 23s	3m 48s	4m 14s	10s	13.7s	12	14	15	0h 20m	d
	17	20.9	15	17	19	3		4m 11s	4m 42s	5m 13s	12s	13.7s	15	17	19	0h 17m	d
	13.6	26.1	18	20	23	4		5m 13s	5m 52s	6m 32s	16s	13.7s	18	20	23	0h 18m	d
	11	32.3	22	25	28	4		6m 27s	7m 16s	8m 4s	16s	13.7s	22	25	28	0h 20m	d
	9	39.4	26	30	33	5		7m 53s	8m 53s	9m 52s	20s	13.7s	26	30	33	0h 25m	d
	7.4	48.0	31	35	39	6		9m 36s	10m 48s	11m 60s	20s	13.7s	31	35	39	0h 32m	d
400	41	9.8	8	9	10	2	0 - DRAG ONLY	1m 57s	2m 12s	2m 26s	8s	15s	8	9	10	0h 13m	d
	33	12.1	10	11	13	2		2m 25s	2m 44s	3m 2s	10s	15s	10	11	13	0h 15m	d
	26	15.4	12	14	16	3		3m 5s	3m 28s	3m 51s	10s	15s	12	14	16	0h 18m	d
	21	19.0	15	17	19	3		3m 49s	4m 17s	4m 46s	12s	15s	15	17	19	0h 16m	d
	17	23.5	19	21	24	3		4m 42s	5m 18s	5m 53s	12s	15s	19	21	24	0h 17m	d
	13.6	29.4	23	26	29	4		5m 53s	6m 37s	7m 21s	16s	15s	23	26	29	0h 19m	d
	11	36.4	28	32	35	5		7m 16s	8m 11s	9m 5s	16s	15s	28	32	35	0h 23m	d
	9	44.4	33	38	42	5		8m 53s	10m 0s	11m 7s	20s	15s	33	38	42	0h 29m	d
	7.4	54.1	39	45	50	6		10m 49s	12m 10s	13m 31s	25s	15s	39	45	50	0h 38m	d
450	41	11.0	10	12	13	2	0 - DRAG ONLY	2m 12s	2m 28s	2m 45s	8s	16.5s	10	12	13	0h 14m	d
	33	13.6	13	14	16	2		2m 44s	3m 4s	3m 25s	10s	16.5s	13	14	16	0h 17m	d
	26	17.3	16	18	20	3		3m 28s	3m 54s	4m 20s	10s	16.5s	16	18	20	0h 20m	d
	21	21.4	19	22	25	3		4m 17s	4m 49s	5m 21s	12s	16.5s	19	22	25	0h 17m	d
	17	26.5	24	27	30	4		5m 18s	5m 57s	6m 31s	16s	16.5s	24	27	30	0h 18m	d
	13.6	33.1	29	33	37	4		6m 37s	7m 27s	8m 16s	16s	16.5s	29	33	37	0h 21m	d
	11	40.9	35	40	45	5		8m 11s	9m 12s	10m 14s	20s	16.5s	35	40	45	0h 26m	d
	9	50.0	42	48	53	6		10m 0s	11m 15s	12m 30s	20s	16.5s	42	48	53	0h 34m	d
	7.4	60.8	50	57	63	7		12m 10s	13m 41s	15m 12s	25s	16.5s	50	57	63	0h 47m	d

TEMP: 210 ± 10C			PHASE 1				PHASE 2		PHASE 3	PHASE 4			PHASE 5			
Pipe Details (e <sub>n</sub> = Wall Thickness) Max e <sub>n</sub> = 70mm			Equalising				Preheating		Changeover Time	Joining (See Note a )			Minimum Cool Time Under Pressure (See Note b )			
			Equalising Pressure BAR			Bead Height (Minimum) mm				Buildup Time Max	Joining Pressure BAR			Up to 15°C	15°C to 25°C	25°C to 40°C
D <sub>n</sub>	SDR	e <sub>n</sub>	Min	Tgt	Max		BAR	Time	Max		Max	Min	Tgt			
200	41	4.9	1	1	2	0.5	0.14	0m 53s	5s	6s	1	1	2	0h 4m	0h 5m	0h 7m
	33	6.1	2	2	2	0.5	0.17	1m 10s	5.6s	6.6s	2	2	2	0h 5m	0h 7m	0h 8m
	26	7.7	2	2	2	1.0	0.21	1m 26s	6.1s	7.4s	2	2	2	0h 6m	0h 8m	0h 10m
	21	9.5	2	3	3	1.0	0.26	1m 48s	6.5s	9s	2	3	3	0h 8m	0h 10m	0h 13m
	17	11.8	3	3	4	1.0	0.32	2m 10s	6.9s	10.6s	3	3	4	0h 9m	0h 12m	0h 15m
	13.6	14.7	4	4	4	1.0	0.39	2m 40s	7.8s	13.2s	4	4	4	0h 11m	0h 14m	0h 19m
	11	18.2	4	5	5	1.0	0.47	3m 16s	8.8s	16.2s	4	5	5	0h 13m	0h 17m	0h 23m
	9	22.2	5	6	6	1.5	0.56	3m 54s	9.9s	19.2s	5	6	6	0h 16m	0h 21m	0h 28m
225	7.4	27.0	6	7	7	2.0	0.66	4m 39s	11.3s	23s	6	7	7	0h 20m	0h 25m	0h 33m
	41	5.5	2	2	2	0.5	0.17	0m 59s	5.2s	6.2s	2	2	2	0h 4m	0h 6m	0h 7m
	33	6.8	2	2	2	0.5	0.21	1m 15s	5.8s	6.8s	2	2	2	0h 6m	0h 7m	0h 9m
	26	8.7	2	3	3	1.0	0.27	1m 37s	6.3s	8.2s	2	3	3	0h 7m	0h 9m	0h 11m
	21	10.7	3	3	4	1.0	0.33	1m 59s	6.7s	9.8s	3	3	4	0h 9m	0h 11m	0h 14m
	17	13.2	4	4	4	1.0	0.40	2m 25s	7.3s	11.9s	4	4	4	0h 10m	0h 13m	0h 17m
	13.6	16.5	4	5	5	1.0	0.49	3m 1s	8.3s	14.9s	4	5	5	0h 12m	0h 16m	0h 21m
	11	20.5	5	6	7	1.5	0.59	3m 35s	9.3s	17.8s	5	6	7	0h 15m	0h 19m	0h 25m
250	9	25.0	6	7	8	1.5	0.71	4m 22s	10.8s	21.3s	6	7	8	0h 18m	0h 23m	0h 31m
	7.4	30.4	8	8	9	2.0	0.84	5m 4s	12.1s	25.7s	8	8	9	0h 22m	0h 28m	0h 37m
	41	6.1	2	2	2	0.5	0.21	1m 10s	5.6s	6.6s	2	2	2	0h 5m	0h 7m	0h 8m
	33	7.6	2	3	3	1.0	0.26	1m 26s	6.1s	7.4s	2	3	3	0h 6m	0h 8m	0h 10m
	26	9.6	3	3	4	1.0	0.33	1m 48s	6.5s	9s	3	3	4	0h 8m	0h 10m	0h 13m
	21	11.9	4	4	4	1.0	0.40	2m 10s	6.9s	10.6s	4	4	4	0h 9m	0h 12m	0h 15m
	17	14.7	4	5	5	1.0	0.49	2m 40s	7.8s	13.2s	4	5	5	0h 11m	0h 14m	0h 19m
	13.6	18.4	5	6	7	1.0	0.60	3m 16s	8.8s	16.2s	5	6	7	0h 13m	0h 17m	0h 23m
280	11	22.7	7	7	8	1.5	0.73	3m 59s	10s	19.5s	7	7	8	0h 17m	0h 21m	0h 28m
	9	27.8	8	9	10	2.0	0.87	4m 44s	11.5s	23.4s	8	9	10	0h 20m	0h 25m	0h 34m
	7.4	33.8	9	10	11	2.0	1.03	5m 33s	13.1s	28.9s	9	10	11	0h 25m	0h 31m	0h 41m
	41	6.8	2	3	3	0.5	0.27	1m 15s	5.8s	6.8s	2	3	3	0h 6m	0h 7m	0h 9m
	33	8.5	3	3	4	1.0	0.33	1m 32s	6.2s	7.8s	3	3	4	0h 7m	0h 8m	0h 11m
	26	10.8	4	4	5	1.0	0.41	1m 59s	6.7s	9.8s	4	4	5	0h 9m	0h 11m	0h 14m
	21	13.3	5	5	6	1.0	0.50	2m 25s	7.3s	11.9s	5	5	6	0h 10m	0h 13m	0h 17m
	17	16.5	6	6	7	1.0	0.61	2m 56s	8.2s	14.5s	6	6	7	0h 12m	0h 16m	0h 20m
315	13.6	20.6	7	8	8	1.5	0.76	3m 40s	9.5s	18.1s	7	8	8	0h 15m	0h 19m	0h 26m
	11	25.5	8	9	10	1.5	0.91	4m 22s	10.8s	21.3s	8	9	10	0h 18m	0h 23m	0h 31m
	9	31.1	10	11	12	2.0	1.09	5m 12s	12.4s	26.6s	10	11	12	0h 23m	0h 29m	0h 38m
	7.4	37.8	12	13	14	2.5	1.29	6m 5s	14.2s	32.5s	12	13	14	0h 27m	0h 35m	0h 46m
	41	7.7	3	3	4	1.0	0.34	1m 26s	6.1s	7.4s	3	3	4	0h 6m	0h 8m	0h 10m
	33	9.5	4	4	5	1.0	0.41	1m 48s	6.5s	9s	4	4	5	0h 8m	0h 10m	0h 13m
	26	12.1	5	5	6	1.0	0.52	2m 15s	7s	11s	5	5	6	0h 10m	0h 12m	0h 16m
	21	15.0	6	6	7	1.0	0.64	2m 46s	7.9s	13.6s	6	6	7	0h 12m	0h 15m	0h 19m
355	17	18.5	7	8	9	1.0	0.78	3m 21s	8.9s	16.6s	7	8	9	0h 14m	0h 18m	0h 23m
	13.6	23.2	9	10	11	1.5	0.95	4m 3s	10.2s	19.9s	9	10	11	0h 17m	0h 22m	0h 29m
	11	28.6	10	12	13	2.0	1.16	4m 52s	11.7s	24.3s	10	12	13	0h 21m	0h 26m	0h 35m
	9	35.0	12	14	15	2.0	1.38	5m 46s	13.5s	30.2s	12	14	15	0h 26m	0h 32m	0h 43m
	7.4	42.6	15	16	18	2.5	1.63	6m 39s	15.3s	36.7s	15	16	18	0h 31m	0h 39m	0h 52m
	41	8.7	4	4	5	1.0	0.43	1m 37s	6.3s	8.2s	4	4	5	0h 7m	0h 9m	0h 11m
	33	10.8	5	5	6	1.0	0.53	1m 59s	6.7s	9.8s	5	5	6	0h 9m	0h 11m	0h 14m
	26	13.7	6	7	7	1.0	0.66	2m 30s	7.5s	12.3s	6	7	7	0h 11m	0h 13m	0h 17m
400	21	16.9	7	8	9	1.0	0.81	3m 1s	8.3s	14.9s	7	8	9	0h 12m	0h 16m	0h 21m
	17	20.9	9	10	11	1.5	0.98	3m 40s	9.5s	18.1s	9	10	11	0h 15m	0h 19m	0h 26m
	13.6	26.1	11	12	13	2.0	1.21	4m 31s	11s	22s	11	12	13	0h 19m	0h 24m	0h 32m
	11	32.3	13	15	16	2.0	1.47	5m 21s	12.7s	27.5s	13	15	16	0h 23m	0h 30m	0h 39m
	9	39.4	16	18	19	2.5	1.75	6m 16s	14.5s	33.7s	16	18	19	0h 28m	0h 36m	0h 48m
	7.4	48.0	19	21	23	2.5	2.07	7m 13s	16.5s	40.9s	19	21	23	0h 34m	0h 44m	0h 58m
	41	9.8	5	5	6	1.0	0.54	1m 48s	6.5s	9s	5	5	6	0h 8m	0h 10m	0h 13m
	33	12.1	6	7	7	1.0	0.67	2m 15s	7s	11s	6	7	7	0h 10m	0h 12m	0h 16m
450	26	15.4	8	8	9	1.0	0.84	2m 46s	7.9s	13.6s	8	8	9	0h 12m	0h 15m	0h 19m
	21	19.0	9	10	11	1.5	1.02	3m 26s	9s	17s	9	10	11	0h 14m	0h 18m	0h 24m
	17	23.5	11	13	14	1.5	1.25	4m 8s	10.3s	20.3s	11	13	14	0h 17m	0h 22m	0h 29m
	13.6	29.4	14	15	17	2.0	1.54	4m 56s	11.9s	24.8s	14	15	17	0h 21m	0h 27m	0h 36m
	11	36.4	17	19	21	2.0	1.86	5m 54s	13.8s	31.1s	17	19	21	0h 26m	0h 33m	0h 44m
	9	44.4	20	22	25	2.5	2.22	6m 49s	15.7s	38s	20	22	25	0h 32m	0h 41m	0h 54m
	7.4	54.1	24	26	29	3.0	2.63	7m 49s	18s	43s	24	26	29	0h 39m	0h 50m	1h 6m
	41	11.0	6	7	8	1.0	0.68	1m 59s	6.7s	9.8s	6	7	8	0h 9m	0h 11m	0h 14m
450	33	13.6	8	8	9	1.0	0.84	2m 30s	7.5s	12.3s	8	8	9	0h 11m	0h 13m	0h 17m
	26	17.3	10	11	12	1.0	1.06	3m 6s	8.5s	15.3s	10	11	12	0h 13m	0h 16m	0h 22m
	21	21.4	12	13	14	1.5	1.29	3m 45s	9.6s	18.5s	12	13	14	0h 16m	0h 20m	0h 26m
	17	26.5	14	16	17	2.0	1.58	4m 31s	11s	22s	14	16	17	0h 19m	0h 24m	0h 32m
	13.6	33.1	18	19	21	2.0	1.94	5m 29s	13s	28.4s	18	19	21	0h 24m	0h 30m	0h 40m
	11	40.9	21	24	26	2.5	2.36	6m 26s	14.9s	35s	21	24	26	0h 30m	0h 37m	0h 49m
	9	50.0	25	28	31	3.0	2.81	7m 30s	17s	43s	25	28	31	0h 36m	0h 46m	1h 1m
	7.4	60.8	30	33	37	3.0	3.33	8m 20s	19.7s	43s	30	33	37	0h 43m	0h 56m	1h 14m



# WELDING PARAMETER CHARTS

## V500

RAM=23.06 cm<sup>2</sup>

HDPE

DVS2207-1-2016

ISO21307-2017

PP

DVS2207-11 (2017)

TEMP: 220 ± 10C			PHASE 1				PHASE 2		PHASE 3	PHASE 4			PHASE 5			
Pipe Details (e <sub>n</sub> = Wall Thickness) Max e <sub>n</sub> = 130mm			Equalising			Preheating		Changeover Time	Joining (See Note a)			Minimum Cool Time Under Pressure (See Note b)				
			Equalising Pressure BAR						Bead Height (Minimum) mm	Buildup Time	Joining Pressure BAR			Up to 15°C	15°C to 25°C	25°C to 40°C
D <sub>n</sub>	SDR	e <sub>s</sub>	Min	Tgt	Max	BAR	Time	Max			Max	Min	Tgt			
200	41	4.9	2	2	2	1.0	0.13	0m 45s	5s	5s	2	2	2	0h 4m	0h 5m	0h 7m
	33	6.1	2	3	3	1.0	0.17	1m 4s	5.8s	5.8s	2	3	3	0h 5m	0h 7m	0h 8m
	26	7.7	3	3	3	1.5	0.21	1m 16s	6.3s	6.3s	3	3	3	0h 6m	0h 8m	0h 10m
	21	9.5	4	4	4	1.5	0.25	1m 38s	7.2s	7.2s	4	4	4	0h 8m	0h 10m	0h 13m
	17	11.8	4	5	5	1.5	0.31	2m 0s	8s	8s	4	5	5	0h 9m	0h 12m	0h 15m
	13.6	14.7	5	6	6	2.0	0.38	2m 27s	8.8s	9.2s	5	6	6	0h 11m	0h 14m	0h 19m
	11	18.2	6	7	7	2.0	0.46	3m 5s	9.9s	10.8s	6	7	7	0h 13m	0h 17m	0h 23m
	9	22.2	8	8	9	2.5	0.54	3m 42s	11s	12.4s	8	8	9	0h 16m	0h 21m	0h 28m
7.4	27.0	9	10	10	3.0	0.64	4m 31s	12.4s	14.5s	9	10	10	0h 20m	0h 25m	0h 33m	
225	41	5.5	2	3	3	1.0	0.17	0m 51s	5.3s	5.3s	2	3	3	0h 4m	0h 6m	0h 7m
	33	6.8	3	3	3	1.0	0.21	1m 10s	6s	6s	3	3	3	0h 6m	0h 7m	0h 9m
	26	8.7	4	4	4	1.5	0.26	1m 27s	6.7s	6.7s	4	4	4	0h 7m	0h 9m	0h 11m
	21	10.7	4	5	5	1.5	0.32	1m 49s	7.6s	7.6s	4	5	5	0h 9m	0h 11m	0h 14m
	17	13.2	5	6	6	2.0	0.39	2m 11s	8.4s	8.5s	5	6	6	0h 10m	0h 13m	0h 17m
	13.6	16.5	7	7	8	2.0	0.47	2m 49s	9.4s	10.1s	7	7	8	0h 12m	0h 16m	0h 21m
	11	20.5	8	9	9	2.5	0.57	3m 21s	10.4s	11.5s	8	9	9	0h 15m	0h 19m	0h 25m
	9	25.0	10	10	11	2.5	0.69	4m 15s	11.9s	13.8s	10	10	11	0h 18m	0h 23m	0h 31m
7.4	30.4	11	12	13	3.0	0.81	5m 2s	13.6s	16s	11	12	13	0h 22m	0h 28m	0h 37m	
250	41	6.1	3	3	3	1.0	0.21	1m 4s	5.8s	5.8s	3	3	3	0h 5m	0h 7m	0h 8m
	33	7.6	4	4	4	1.5	0.26	1m 16s	6.3s	6.3s	4	4	4	0h 6m	0h 8m	0h 10m
	26	9.6	5	5	5	1.5	0.32	1m 38s	7.2s	7.2s	5	5	5	0h 8m	0h 10m	0h 13m
	21	11.9	6	6	6	1.5	0.39	2m 0s	8s	8s	6	6	6	0h 9m	0h 12m	0h 15m
	17	14.7	7	7	8	2.0	0.48	2m 27s	8.8s	9.2s	7	7	8	0h 11m	0h 14m	0h 19m
	13.6	18.4	8	9	9	2.0	0.59	3m 5s	9.9s	10.8s	8	9	9	0h 13m	0h 17m	0h 23m
	11	22.7	10	11	11	2.5	0.71	3m 48s	11.1s	12.7s	10	11	11	0h 17m	0h 21m	0h 28m
	9	27.8	12	13	14	3.0	0.85	4m 36s	12.6s	14.8s	12	13	14	0h 20m	0h 25m	0h 34m
7.4	33.8	14	15	16	3.0	1.00	5m 39s	14.9s	17.6s	14	15	16	0h 25m	0h 31m	0h 41m	
280	41	6.8	4	4	4	1.0	0.26	1m 10s	6s	6s	4	4	4	0h 6m	0h 7m	0h 9m
	33	8.5	4	5	5	1.5	0.32	1m 21s	6.5s	6.5s	4	5	5	0h 7m	0h 8m	0h 11m
	26	10.8	6	6	6	1.5	0.40	1m 49s	7.6s	7.6s	6	6	6	0h 9m	0h 11m	0h 14m
	21	13.3	7	7	8	2.0	0.49	2m 11s	8.4s	8.5s	7	7	8	0h 10m	0h 13m	0h 17m
	17	16.5	8	9	10	2.0	0.60	2m 43s	9.3s	9.9s	8	9	10	0h 12m	0h 16m	0h 20m
	13.6	20.6	10	11	12	2.5	0.73	3m 26s	10.5s	11.7s	10	11	12	0h 15m	0h 19m	0h 26m
	11	25.5	12	13	14	2.5	0.89	4m 15s	11.9s	13.8s	12	13	14	0h 18m	0h 23m	0h 31m
	9	31.1	15	16	17	3.0	1.06	5m 12s	14s	16.4s	15	16	17	0h 23m	0h 29m	0h 38m
7.4	37.8	18	19	20	3.5	1.25	6m 15s	16.2s	19.3s	18	19	20	0h 27m	0h 35m	0h 46m	
315	41	7.7	5	5	5	1.5	0.33	1m 16s	6.3s	6.3s	5	5	5	0h 6m	0h 8m	0h 10m
	33	9.5	6	6	6	1.5	0.40	1m 38s	7.2s	7.2s	6	6	6	0h 8m	0h 10m	0h 13m
	26	12.1	7	8	8	2.0	0.50	2m 0s	8s	8s	7	8	8	0h 10m	0h 12m	0h 16m
	21	15.0	9	9	10	2.0	0.62	2m 32s	9s	9.4s	9	9	10	0h 12m	0h 15m	0h 19m
	17	18.5	11	11	12	2.0	0.75	3m 10s	10s	11s	11	11	12	0h 14m	0h 18m	0h 23m
	13.6	23.2	13	14	15	2.5	0.93	3m 53s	11.3s	12.9s	13	14	15	0h 17m	0h 22m	0h 29m
	11	28.6	16	17	18	3.0	1.12	4m 46s	13s	15.2s	16	17	18	0h 21m	0h 26m	0h 35m
	9	35.0	19	20	21	3.0	1.34	5m 54s	15.5s	18.3s	19	20	21	0h 26m	0h 32m	0h 43m
7.4	42.6	22	24	25	3.5	1.58	7m 7s	17.8s	21.7s	22	24	25	0h 31m	0h 39m	0h 52m	
355	41	8.7	6	6	7	1.5	0.41	1m 27s	6.7s	6.7s	6	6	7	0h 7m	0h 9m	0h 11m
	33	10.8	7	8	8	1.5	0.51	1m 49s	7.6s	7.6s	7	8	8	0h 9m	0h 11m	0h 14m
	26	13.7	9	10	10	2.0	0.64	2m 16s	8.5s	8.7s	9	10	10	0h 11m	0h 13m	0h 17m
	21	16.9	11	12	13	2.0	0.78	2m 49s	9.4s	10.1s	11	12	13	0h 12m	0h 16m	0h 21m
	17	20.9	13	14	15	2.5	0.96	3m 26s	10.5s	11.7s	13	14	15	0h 15m	0h 19m	0h 26m
	13.6	26.1	16	18	19	3.0	1.17	4m 20s	12s	14s	16	18	19	0h 19m	0h 24m	0h 32m
	11	32.3	20	21	23	3.0	1.42	5m 23s	14.3s	16.9s	20	21	23	0h 23m	0h 30m	0h 39m
	9	39.4	24	26	27	3.5	1.70	6m 31s	16.7s	20s	24	26	27	0h 28m	0h 36m	0h 48m
7.4	48.0	28	30	32	3.5	2.01	7m 59s	19.4s	24.1s	28	30	32	0h 34m	0h 44m	0h 58m	
400	41	9.8	7	8	8	1.5	0.52	1m 38s	7.2s	7.2s	7	8	8	0h 8m	0h 10m	0h 13m
	33	12.1	9	10	10	2.0	0.65	2m 0s	8s	8s	9	10	10	0h 10m	0h 12m	0h 16m
	26	15.4	11	12	13	2.0	0.81	2m 32s	9s	9.4s	11	12	13	0h 12m	0h 15m	0h 19m
	21	19.0	14	15	16	2.5	0.99	3m 10s	10s	11s	14	15	16	0h 14m	0h 18m	0h 24m
	17	23.5	17	18	19	2.5	1.21	3m 59s	11.4s	13.1s	17	18	19	0h 17m	0h 22m	0h 29m
	13.6	29.4	21	22	24	3.0	1.49	4m 52s	13.2s	15.5s	21	22	24	0h 21m	0h 27m	0h 36m
	11	36.4	25	27	29	3.0	1.81	6m 5s	15.9s	18.8s	25	27	29	0h 26m	0h 33m	0h 44m
	9	44.4	30	32	35	3.5	2.16	7m 23s	18.3s	22.4s	30	32	35	0h 32m	0h 41m	0h 54m
7.4	54.1	36	38	41	4.0	2.55	9m 0s	21s	27s	36	38	41	0h 39m	0h 50m	1h 6m	
450	41	11.0	9	10	11	1.5	0.66	1m 49s	7.6s	7.6s	9	10	11	0h 9m	0h 11m	0h 14m
	33	13.6	11	12	13	2.0	0.82	2m 16s	8.5s	8.7s	11	12	13	0h 11m	0h 13m	0h 17m
	26	17.3	14	15	16	2.0	1.03	2m 54s	9.6s	10.4s	14	15	16	0h 13m	0h 16m	0h 22m
	21	21.4	18	19	20	2.5	1.26	3m 32s	10.7s	12s	18	19	20	0h 16m	0h 20m	0h 26m
	17	26.5	21	23	25	3.0	1.53	4m 20s	12s	14s	21	23	25	0h 19m	0h 24m	0h 32m
	13.6	33.1	26	28	30	3.0	1.88	5m 33s	14.7s	17.4s	26	28	30	0h 24m	0h 30m	0h 40m
	11	40.9	32	34	37	3.5	2.28	6m 46s	17.2s	20.7s	32	34	37	0h 30m	0h 37m	0h 49m
	9	50.0	38	41	44	4.0	2.73	8m 20s	20s	25s	38	41	44	0h 36m	0h 46m	1h 1m
7.4	60.8	45	48	52	4.0	3.23	10m 5s	22.7s	30.3s	45	48	52	0h 43m	0h 56m	1h 14m	

TEMP: 220 ± 10C			PHASE 1				PHASE 2		PHASE 3	PHASE 4				PHASE 5		
Pipe Details (e <sub>n</sub> = Wall Thickness) Max e <sub>n</sub> = 130mm			Equalising				Preheating		Changeover Time	Joining (See Note a )				Minimim Cool Time Under Pressure (See Note b )		
			Equalising Pressure BAR			Bead Height (Minimum) mm				Buildup Time Max	Joining Pressure BAR			Up to 15°C	15°C to 25°C	25°C to 40°C
D <sub>n</sub>	SDR	e <sub>n</sub>	Min	Tgt	Max		BAR	Time	Max		Min	Tgt	Max			
005	41	12.2	11	12	13	2.0	0.82	2m 0s	8s	8s	11	12	13	0h 10m	0h 12m	0h 16m
	33	15.2	14	15	16	2.0	1.01	2m 32s	9s	9.4s	14	15	16	0h 12m	0h 15m	0h 19m
	26	19.2	18	19	20	2.5	1.26	3m 10s	10s	11s	18	19	20	0h 14m	0h 18m	0h 24m
	21	23.8	22	23	25	2.5	1.55	3m 59s	11.4s	13.1s	22	23	25	0h 17m	0h 22m	0h 29m
	17	29.4	26	28	30	3.0	1.89	4m 52s	13.2s	15.5s	26	28	30	0h 21m	0h 27m	0h 36m
	13.6	36.8	33	35	37	3.0	2.33	6m 10s	16s	19s	33	35	37	0h 27m	0h 34m	0h 45m
	11	45.5	40	42	45	3.5	2.82	7m 33s	18.6s	22.9s	40	42	45	0h 33m	0h 41m	0h 55m
	9	55.6	47	51	54	4.0	3.37	9m 15s	21.4s	27.8s	47	51	54	0h 40m	0h 51m	1h 8m
7.4	67.6	56	60	64	4.0	3.99	11m 15s	24.4s	33.8s	56	60	64	0h 48m	1h 2m	1h 22m	







Model V500 (200mm - 500mm)

Ram (mm<sup>2</sup>): 2306

Parameter: DVS 2207-11:2017 (PP)

TEMP: 210 ± 10C			PHASE 1				PHASE 2		PHASE 3	PHASE 4			PHASE 5			
Pipe Details (e <sub>n</sub> = Wall Thickness) Max e <sub>n</sub> = 70mm			Equalising				Preheating		Changeover Time	Joining (See Note a)			Minimum Cool Time Under Pressure (See Note b)			
			Equalising Pressure BAR			Bead Height (Minimum)				Buildup Time	Joining Pressure BAR		Up to 15°C	15°C to 25°C	25°C to 40°C	
D <sub>n</sub>	SDR	e <sub>n</sub>	Min	Tgt	Max		mm	BAR	Time		Max	Max				Min
200	41	4.9	1	1	2	0.5	0.13	0m 53s	5s	6s	1	1	2	0h 4m	0h 5m	0h 7m
	33	6.1	2	2	2	0.5	0.17	1m 10s	5.6s	6.6s	2	2	2	0h 5m	0h 7m	0h 8m
	26	7.7	2	2	2	1.0	0.21	1m 26s	6.1s	7.4s	2	2	2	0h 6m	0h 8m	0h 10m
	21	9.5	2	3	3	1.0	0.25	1m 48s	6.5s	9s	2	3	3	0h 8m	0h 10m	0h 13m
	17	11.8	3	3	3	1.0	0.31	2m 10s	6.9s	10.6s	3	3	3	0h 9m	0h 12m	0h 15m
	13.6	14.7	3	4	4	1.0	0.38	2m 40s	7.8s	13.2s	3	4	4	0h 11m	0h 14m	0h 19m
	11	18.2	4	5	5	1.0	0.46	3m 16s	8.8s	16.2s	4	5	5	0h 13m	0h 17m	0h 23m
	9	22.2	5	5	6	1.5	0.54	3m 54s	9.9s	19.2s	5	5	6	0h 16m	0h 21m	0h 28m
7.4	27.0	6	6	7	2.0	0.64	4m 39s	11.3s	23s	6	6	7	0h 20m	0h 25m	0h 33m	
225	41	5.5	2	2	2	0.5	0.17	0m 59s	5.2s	6.2s	2	2	2	0h 4m	0h 6m	0h 7m
	33	6.8	2	2	2	0.5	0.21	1m 15s	5.8s	6.8s	2	2	2	0h 6m	0h 7m	0h 9m
	26	8.7	2	3	3	1.0	0.26	1m 37s	6.3s	8.2s	2	3	3	0h 7m	0h 9m	0h 11m
	21	10.7	3	3	4	1.0	0.32	1m 59s	6.7s	9.8s	3	3	4	0h 9m	0h 11m	0h 14m
	17	13.2	4	4	4	1.0	0.39	2m 25s	7.3s	11.9s	4	4	4	0h 10m	0h 13m	0h 17m
	13.6	16.5	4	5	5	1.0	0.47	3m 1s	8.3s	14.9s	4	5	5	0h 12m	0h 16m	0h 21m
	11	20.5	5	6	6	1.5	0.57	3m 35s	9.3s	17.8s	5	6	6	0h 15m	0h 19m	0h 25m
	9	25.0	6	7	8	1.5	0.69	4m 22s	10.8s	21.3s	6	7	8	0h 18m	0h 23m	0h 31m
7.4	30.4	7	8	9	2.0	0.81	5m 4s	12.1s	25.7s	7	8	9	0h 22m	0h 28m	0h 37m	
250	41	6.1	2	2	2	0.5	0.21	1m 10s	5.6s	6.6s	2	2	2	0h 5m	0h 7m	0h 8m
	33	7.6	2	3	3	1.0	0.26	1m 26s	6.1s	7.4s	2	3	3	0h 6m	0h 8m	0h 10m
	26	9.6	3	3	4	1.0	0.32	1m 48s	6.5s	9s	3	3	4	0h 8m	0h 10m	0h 13m
	21	11.9	4	4	4	1.0	0.39	2m 10s	6.9s	10.6s	4	4	4	0h 9m	0h 12m	0h 15m
	17	14.7	4	5	5	1.0	0.48	2m 40s	7.8s	13.2s	4	5	5	0h 11m	0h 14m	0h 19m
	13.6	18.4	5	6	6	1.0	0.59	3m 16s	8.8s	16.2s	5	6	6	0h 13m	0h 17m	0h 23m
	11	22.7	6	7	8	1.5	0.71	3m 59s	10s	19.5s	6	7	8	0h 17m	0h 21m	0h 28m
	9	27.8	8	9	9	2.0	0.85	4m 44s	11.5s	23.4s	8	9	9	0h 20m	0h 25m	0h 34m
7.4	33.8	9	10	11	2.0	1.00	5m 33s	13.1s	28.9s	9	10	11	0h 25m	0h 31m	0h 41m	
280	41	6.8	2	3	3	0.5	0.26	1m 15s	5.8s	6.8s	2	3	3	0h 6m	0h 7m	0h 9m
	33	8.5	3	3	4	1.0	0.32	1m 32s	6.2s	7.8s	3	3	4	0h 7m	0h 8m	0h 11m
	26	10.8	4	4	4	1.0	0.40	1m 59s	6.7s	9.8s	4	4	4	0h 9m	0h 11m	0h 14m
	21	13.3	4	5	5	1.0	0.49	2m 25s	7.3s	11.9s	4	5	5	0h 10m	0h 13m	0h 17m
	17	16.5	5	6	7	1.0	0.60	2m 56s	8.2s	14.5s	5	6	7	0h 12m	0h 16m	0h 20m
	13.6	20.6	7	7	8	1.5	0.73	3m 40s	9.5s	18.1s	7	7	8	0h 15m	0h 19m	0h 26m
	11	25.5	8	9	10	1.5	0.89	4m 22s	10.8s	21.3s	8	9	10	0h 18m	0h 23m	0h 31m
	9	31.1	10	11	12	2.0	1.06	5m 12s	12.4s	26.6s	10	11	12	0h 23m	0h 29m	0h 38m
7.4	37.8	11	13	14	2.5	1.25	6m 5s	14.2s	32.5s	11	13	14	0h 27m	0h 35m	0h 46m	
315	41	7.7	3	3	4	1.0	0.33	1m 26s	6.1s	7.4s	3	3	4	0h 6m	0h 8m	0h 10m
	33	9.5	4	4	4	1.0	0.40	1m 48s	6.5s	9s	4	4	4	0h 8m	0h 10m	0h 13m
	26	12.1	5	5	6	1.0	0.50	2m 15s	7s	11s	5	5	6	0h 10m	0h 12m	0h 16m
	21	15.0	6	6	7	1.0	0.62	2m 46s	7.9s	13.6s	6	6	7	0h 12m	0h 15m	0h 19m
	17	18.5	7	8	8	1.0	0.75	3m 21s	8.9s	16.6s	7	8	8	0h 14m	0h 18m	0h 23m
	13.6	23.2	8	9	10	1.5	0.93	4m 3s	10.2s	19.9s	8	9	10	0h 17m	0h 22m	0h 29m
	11	28.6	10	11	12	2.0	1.12	4m 52s	11.7s	24.3s	10	11	12	0h 21m	0h 26m	0h 35m
	9	35.0	12	13	15	2.0	1.34	5m 46s	13.5s	30.2s	12	13	15	0h 26m	0h 32m	0h 43m
7.4	42.6	14	16	17	2.5	1.58	6m 39s	15.3s	36.7s	14	16	17	0h 31m	0h 39m	0h 52m	
355	41	8.7	4	4	5	1.0	0.41	1m 37s	6.3s	8.2s	4	4	5	0h 7m	0h 9m	0h 11m
	33	10.8	5	5	6	1.0	0.51	1m 59s	6.7s	9.8s	5	5	6	0h 9m	0h 11m	0h 14m
	26	13.7	6	6	7	1.0	0.64	2m 30s	7.5s	12.3s	6	6	7	0h 11m	0h 13m	0h 17m
	21	16.9	7	8	9	1.0	0.78	3m 1s	8.3s	14.9s	7	8	9	0h 12m	0h 16m	0h 21m
	17	20.9	9	10	11	1.5	0.96	3m 40s	9.5s	18.1s	9	10	11	0h 15m	0h 19m	0h 26m
	13.6	26.1	11	12	13	2.0	1.17	4m 31s	11s	22s	11	12	13	0h 19m	0h 24m	0h 32m
	11	32.3	13	14	16	2.0	1.42	5m 21s	12.7s	27.5s	13	14	16	0h 23m	0h 30m	0h 39m
	9	39.4	15	17	19	2.5	1.70	6m 16s	14.5s	33.7s	15	17	19	0h 28m	0h 36m	0h 48m
7.4	48.0	18	20	22	2.5	2.01	7m 13s	16.5s	40.9s	18	20	22	0h 34m	0h 44m	0h 58m	
400	41	9.8	5	5	6	1.0	0.52	1m 48s	6.5s	9s	5	5	6	0h 8m	0h 10m	0h 13m
	33	12.1	6	7	7	1.0	0.65	2m 15s	7s	11s	6	7	7	0h 10m	0h 12m	0h 16m
	26	15.4	7	8	9	1.0	0.81	2m 46s	7.9s	13.6s	7	8	9	0h 12m	0h 15m	0h 19m
	21	19.0	9	10	11	1.5	0.99	3m 26s	9s	17s	9	10	11	0h 14m	0h 18m	0h 24m
	17	23.5	11	12	13	1.5	1.21	4m 8s	10.3s	20.3s	11	12	13	0h 17m	0h 22m	0h 29m
	13.6	29.4	13	15	16	2.0	1.49	4m 56s	11.9s	24.8s	13	15	16	0h 21m	0h 27m	0h 36m
	11	36.4	16	18	20	2.0	1.81	5m 54s	13.8s	31.1s	16	18	20	0h 26m	0h 33m	0h 44m
	9	44.4	19	22	24	2.5	2.16	6m 49s	15.7s	38s	19	22	24	0h 32m	0h 41m	0h 54m
7.4	54.1	23	26	28	3.0	2.55	7m 49s	18s	43s	23	26	28	0h 39m	0h 50m	1h 6m	
450	41	11.0	6	7	7	1.0	0.66	1m 59s	6.7s	9.8s	6	7	7	0h 9m	0h 11m	0h 14m
	33	13.6	7	8	9	1.0	0.82	2m 30s	7.5s	12.3s	7	8	9	0h 11m	0h 13m	0h 17m
	26	17.3	9	10	11	1.0	1.03	3m 6s	8.5s	15.3s	9	10	11	0h 13m	0h 16m	0h 22m
	21	21.4	11	13	14	1.5	1.26	3m 45s	9.6s	18.5s	11	13	14	0h 16m	0h 20m	0h 26m
	17	26.5	14	15	17	2.0	1.53	4m 31s	11s	22s	14	15	17	0h 19m	0h 24m	0h 32m
	13.6	33.1	17	19	21	2.0	1.88	5m 29s	13s	28.4s	17	19	21	0h 24m	0h 30m	0h 40m
	11	40.9	21	23	25	2.5	2.28	6m 26s	14.9s	35s	21	23	25	0h 30m	0h 37m	0h 49m
	9	50.0	25	27	30	3.0	2.73	7m 30s	17s	43s	25	27	30	0h 36m	0h 46m	1h 1m
7.4	60.8	29	32	36	3.0	3.23	8m 20s	19.7s	43s	29	32	36	0h 43m	0h 56m	1h 14m	

TEMP: 210 ± 10C			PHASE 1					PHASE 2		PHASE 3	PHASE 4			PHASE 5		
Pipe Details (e <sub>n</sub> = Wall Thickness) Max e <sub>n</sub> = 70mm			Equalising					Preheating		Changeover Time	Joining (See Note a)			Minimum Cool Time Under Pressure (See Note b)		
			Equalising Pressure BAR			Bead Height (Minimum)					Buildup Time	Joining Pressure BAR			Up to 15°C	15°C to 25°C
D <sub>n</sub>	SDR	e <sub>n</sub>	Min	Tgt	Max	mm	BAR	Time	Max	Max		Min	Tgt	Max		
500	41	12.2	7	8	9	1.0	0.82	2m 15s	7s	11s	7	8	9	0h 10m	0h 12m	0h 16m
	33	15.2	9	10	11	1.0	1.01	2m 46s	7.9s	13.6s	9	10	11	0h 12m	0h 15m	0h 19m
	26	19.2	11	13	14	1.5	1.26	3m 26s	9s	17s	11	13	14	0h 14m	0h 18m	0h 24m
	21	23.8	14	16	17	1.5	1.55	4m 8s	10.3s	20.3s	14	16	17	0h 17m	0h 22m	0h 29m
	17	29.4	17	19	21	2.0	1.89	4m 56s	11.9s	24.8s	17	19	21	0h 21m	0h 27m	0h 36m
	13.6	36.8	21	23	26	2.0	2.33	5m 58s	13.9s	31.6s	21	23	26	0h 27m	0h 34m	0h 45m
	11	45.5	25	28	31	2.5	2.82	6m 56s	15.9s	38.8s	25	28	31	0h 33m	0h 41m	0h 55m
	9	55.6	30	34	37	3.0	3.37	7m 56s	18.4s	43s	30	34	37	0h 40m	0h 51m	1h 8m
7.4	67.6	36	40	44	3.0	3.99	8m 54s	21.4s	43s	36	40	44	0h 48m	1h 2m	1h 22m	

# **WELDING PARAMETER CHARTS**

## **V630**

**RAM=23.06 cm<sup>2</sup>**

**HDPE**

**DVS2207-1-2016**

**ISO21307-2017**

**PP**

**DVS2207-11 (2017)**



TEMP: 220 ± 10C			PHASE 1				PHASE 2		PHASE 3	PHASE 4				PHASE 5		
Pipe Details (e <sub>n</sub> = Wall Thickness) Max e <sub>n</sub> = 130mm			Equalising				Preheating		Changeover Time	Joining (See Note a)				Minimum Cool Time Under Pressure (See Note b)		
			Equalising Pressure BAR			Bead Height (Minimum) mm				BAR	Time	Max	Buildup Time Max	Joining Pressure BAR		
D <sub>n</sub>	SDR	e <sub>n</sub>	Min	Tgt	Max		mm	BAR	Time					Max	Max	Min
315	41	7.7	5	5	5	1.5	0.33	1m 16s	6.3s	6.3s	5	5	5	0h 6m	0h 8m	0h 10m
	33	9.5	6	6	6	1.5	0.40	1m 38s	7.2s	7.2s	6	6	6	0h 8m	0h 10m	0h 13m
	26	12.1	7	8	8	2.0	0.50	2m 0s	8s	8s	7	8	8	0h 10m	0h 12m	0h 16m
	21	15.0	9	9	10	2.0	0.62	2m 32s	9s	9.4s	9	9	10	0h 12m	0h 15m	0h 19m
	17	18.5	11	11	12	2.0	0.75	3m 10s	10s	11s	11	11	12	0h 14m	0h 18m	0h 23m
	13.6	23.2	13	14	15	2.5	0.93	3m 53s	11.3s	12.9s	13	14	15	0h 17m	0h 22m	0h 29m
	11	28.6	16	17	18	3.0	1.12	4m 46s	13s	15.2s	16	17	18	0h 21m	0h 26m	0h 35m
	9	35.0	19	20	21	3.0	1.34	5m 54s	15.5s	18.3s	19	20	21	0h 26m	0h 32m	0h 43m
7.4	42.6	22	24	25	3.5	1.58	7m 7s	17.8s	21.7s	22	24	25	0h 31m	0h 39m	0h 52m	
355	41	8.7	6	6	7	1.5	0.41	1m 27s	6.7s	6.7s	6	6	7	0h 7m	0h 9m	0h 11m
	33	10.8	7	8	8	1.5	0.51	1m 49s	7.6s	7.6s	7	8	8	0h 9m	0h 11m	0h 14m
	26	13.7	9	10	10	2.0	0.64	2m 16s	8.5s	8.7s	9	10	10	0h 11m	0h 13m	0h 17m
	21	16.9	11	12	13	2.0	0.78	2m 49s	9.4s	10.1s	11	12	13	0h 12m	0h 16m	0h 21m
	17	20.9	13	14	15	2.5	0.96	3m 26s	10.5s	11.7s	13	14	15	0h 15m	0h 19m	0h 26m
	13.6	26.1	16	18	19	3.0	1.17	4m 20s	12s	14s	16	18	19	0h 19m	0h 24m	0h 32m
	11	32.3	20	21	23	3.0	1.42	5m 23s	14.3s	16.9s	20	21	23	0h 23m	0h 30m	0h 39m
	9	39.4	24	26	27	3.5	1.70	6m 31s	16.7s	20s	24	26	27	0h 28m	0h 36m	0h 48m
7.4	48.0	28	30	32	3.5	2.01	7m 59s	19.4s	24.1s	28	30	32	0h 34m	0h 44m	0h 58m	
41	9.8	7	8	8	1.5	0.52	1m 38s	7.2s	7.2s	7	8	8	0h 8m	0h 10m	0h 13m	
400	33	12.1	9	10	10	2.0	0.65	2m 0s	8s	8s	9	10	10	0h 10m	0h 12m	0h 16m
	26	15.4	11	12	13	2.0	0.81	2m 32s	9s	9.4s	11	12	13	0h 12m	0h 15m	0h 19m
	21	19.0	14	15	16	2.5	0.99	3m 10s	10s	11s	14	15	16	0h 14m	0h 18m	0h 24m
	17	23.5	17	18	19	2.5	1.21	3m 59s	11.4s	13.1s	17	18	19	0h 17m	0h 22m	0h 29m
	13.6	29.4	21	22	24	3.0	1.49	4m 52s	13.2s	15.5s	21	22	24	0h 21m	0h 27m	0h 36m
	11	36.4	25	27	29	3.0	1.81	6m 5s	15.9s	18.8s	25	27	29	0h 26m	0h 33m	0h 44m
	9	44.4	30	32	35	3.5	2.16	7m 23s	18.3s	22.4s	30	32	35	0h 32m	0h 41m	0h 54m
	7.4	54.1	36	38	41	4.0	2.55	9m 0s	21s	27s	36	38	41	0h 39m	0h 50m	1h 6m
450	41	11.0	9	10	11	1.5	0.66	1m 49s	7.6s	7.6s	9	10	11	0h 9m	0h 11m	0h 14m
	33	13.6	11	12	13	2.0	0.82	2m 16s	8.5s	8.7s	11	12	13	0h 11m	0h 13m	0h 17m
	26	17.3	14	15	16	2.0	1.03	2m 54s	9.6s	10.4s	14	15	16	0h 13m	0h 16m	0h 22m
	21	21.4	18	19	20	2.5	1.26	3m 32s	10.7s	12s	18	19	20	0h 16m	0h 20m	0h 26m
	17	26.5	21	23	25	3.0	1.53	4m 20s	12s	14s	21	23	25	0h 19m	0h 24m	0h 32m
	13.6	33.1	26	28	30	3.0	1.88	5m 33s	14.7s	17.4s	26	28	30	0h 24m	0h 30m	0h 40m
	11	40.9	32	34	37	3.5	2.28	6m 46s	17.2s	20.7s	32	34	37	0h 30m	0h 37m	0h 49m
	9	50.0	38	41	44	4.0	2.73	8m 20s	20s	25s	38	41	44	0h 36m	0h 46m	1h 1m
7.4	60.8	45	48	52	4.0	3.23	10m 5s	22.7s	30.3s	45	48	52	0h 43m	0h 56m	1h 14m	
500	41	12.2	11	12	13	2.0	0.82	2m 0s	8s	8s	11	12	13	0h 10m	0h 12m	0h 16m
	33	15.2	14	15	16	2.0	1.01	2m 32s	9s	9.4s	14	15	16	0h 12m	0h 15m	0h 19m
	26	19.2	18	19	20	2.5	1.26	3m 10s	10s	11s	18	19	20	0h 14m	0h 18m	0h 24m
	21	23.8	22	23	25	2.5	1.55	3m 59s	11.4s	13.1s	22	23	25	0h 17m	0h 22m	0h 29m
	17	29.4	26	28	30	3.0	1.89	4m 52s	13.2s	15.5s	26	28	30	0h 21m	0h 27m	0h 36m
	13.6	36.8	33	35	37	3.0	2.33	6m 10s	16s	19s	33	35	37	0h 27m	0h 34m	0h 45m
	11	45.5	40	42	45	3.5	2.82	7m 33s	18.6s	22.9s	40	42	45	0h 33m	0h 41m	0h 55m
	9	55.6	47	51	54	4.0	3.37	9m 15s	21.4s	27.8s	47	51	54	0h 40m	0h 51m	1h 8m
7.4	67.6	56	60	64	4.0	3.99	11m 15s	24.4s	33.8s	56	60	64	0h 48m	1h 2m	1h 22m	
560	41	13.7	14	15	16	2.0	1.02	2m 16s	8.5s	8.7s	14	15	16	0h 11m	0h 13m	0h 17m
	33	17.0	18	19	20	2.0	1.26	2m 49s	9.4s	10.1s	18	19	20	0h 12m	0h 16m	0h 21m
	26	21.5	22	24	25	2.5	1.59	3m 37s	10.8s	12.2s	22	24	25	0h 16m	0h 20m	0h 27m
	21	26.7	27	29	31	3.0	1.94	4m 25s	12.2s	14.3s	27	29	31	0h 19m	0h 25m	0h 33m
	17	32.9	33	36	38	3.0	2.37	5m 28s	14.5s	17.1s	33	36	38	0h 24m	0h 30m	0h 40m
	13.6	41.2	41	44	47	3.5	2.92	6m 52s	17.3s	21s	41	44	47	0h 30m	0h 38m	0h 50m
	11	50.9	50	53	57	4.0	3.54	8m 25s	20.2s	25.3s	50	53	57	0h 36m	0h 47m	1h 2m
	9	62.2	59	63	68	4.0	4.22	10m 20s	23s	31s	59	63	68	0h 44m	0h 57m	1h 15m
7.4	75.7	70	75	80	4.5	5.00	12m 35s	26.4s	35s	70	75	80	0h 54m	1h 9m	1h 32m	
630	41	15.4	18	19	21	2.0	1.29	2m 32s	9s	9.4s	18	19	21	0h 12m	0h 15m	0h 19m
	33	19.1	22	24	26	2.5	1.59	3m 10s	10s	11s	22	24	26	0h 14m	0h 18m	0h 24m
	26	24.2	28	30	32	2.5	2.00	4m 4s	11.6s	13.4s	28	30	32	0h 18m	0h 22m	0h 30m
	21	30.0	34	37	39	3.0	2.46	5m 2s	13.6s	16s	34	37	39	0h 22m	0h 28m	0h 37m
	17	37.1	42	45	48	3.5	3.00	6m 10s	16s	19s	42	45	48	0h 27m	0h 34m	0h 45m
	13.6	46.3	52	55	59	3.5	3.69	7m 44s	18.9s	23.4s	52	55	59	0h 33m	0h 42m	0h 56m
	11	57.3	63	67	72	4.0	4.47	9m 30s	21.8s	28.5s	63	67	72	0h 41m	0h 52m	1h 9m
	9	70.0	75	80	86	4.0	5.35	11m 40s	25s	35s	75	80	86	0h 50m	1h 4m	1h 25m
7.4	85.1	89	95	101	4.5	6.32	14m 10s	28.8s	35s	89	95	101	1h 1m	1h 18m	1h 43m	



TEMP: 225 ± 10C			PHASE 1				PHASE 2			PHASE 3	PHASE 4			PHASE 5	PHASE 6		
Pipe Details (e <sub>n</sub> = Wall Thickness)			Bead Up Pressure (BAR)			Minimum Bead up Size	Heat Soak See Note b			Maximum Heater Removal Time	Maximum Pressure Up Time	Weld Pressure (BAR)			Minimum Cool Time Under Pressure (See Note c)	Additional Cool Time out of Machine (See Note d)	
ADD DRAG (see note a)			P1				0 - DRAG ONLY					P3					
D <sub>n</sub>	SDR	e <sub>n</sub>	Min	Tgt	Max	t1 mm	P2 BAR	Min	Tgt	Max	t3	t4	Min	Tgt	Max	t5 / P3	
315	41	7.7	5	5	6	2	0 - DRAG ONLY	1m 32s	1m 44s	1m 55s	8s	12.5s	5	5	6	0h 11m	d
	33	9.5	6	7	8	2		1m 55s	2m 9s	2m 23s	8s	12.5s	6	7	8	0h 13m	d
	26	12.1	7	8	9	2		2m 25s	2m 44s	3m 2s	10s	12.5s	7	8	9	0h 15m	d
	21	15.0	9	10	12	2		3m 0s	3m 23s	3m 45s	10s	12.5s	9	10	12	0h 18m	d
	17	18.5	11	13	14	3		3m 42s	4m 10s	4m 38s	10s	12.5s	11	13	14	0h 16m	d
	13.6	23.2	14	16	17	3		4m 38s	5m 13s	5m 47s	12s	12.5s	14	16	17	0h 17m	d
	11	28.6	17	19	21	4		5m 44s	6m 27s	7m 10s	16s	12.5s	17	19	21	0h 19m	d
	9	35.0	20	23	25	4		7m 0s	7m 53s	8m 45s	16s	12.5s	20	23	25	0h 22m	d
	7.4	42.6	24	27	30	5		8m 31s	9m 35s	10m 39s	20s	12.5s	24	27	30	0h 27m	d
355	41	8.7	6	7	8	2	0 - DRAG ONLY	1m 44s	1m 57s	2m 10s	8s	13.7s	6	7	8	0h 12m	d
	33	10.8	8	9	10	2		2m 9s	2m 25s	2m 41s	8s	13.7s	8	9	10	0h 14m	d
	26	13.7	10	11	12	2		2m 44s	3m 4s	3m 25s	10s	13.7s	10	11	12	0h 17m	d
	21	16.9	12	13	15	3		3m 23s	3m 48s	4m 14s	10s	13.7s	12	13	15	0h 20m	d
	17	20.9	14	16	18	3		4m 11s	4m 42s	5m 13s	12s	13.7s	14	16	18	0h 17m	d
	13.6	26.1	18	20	22	4		5m 13s	5m 52s	6m 32s	16s	13.7s	18	20	22	0h 18m	d
	11	32.3	21	24	27	4		6m 27s	7m 16s	8m 4s	16s	13.7s	21	24	27	0h 20m	d
	9	39.4	25	29	32	5		7m 53s	8m 53s	9m 52s	20s	13.7s	25	29	32	0h 25m	d
	7.4	48.0	30	34	38	6		9m 36s	10m 48s	11m 60s	20s	13.7s	30	34	38	0h 32m	d
400	41	9.8	8	9	10	2	0 - DRAG ONLY	1m 57s	2m 12s	2m 26s	8s	15s	8	9	10	0h 13m	d
	33	12.1	10	11	12	2		2m 25s	2m 44s	3m 2s	10s	15s	10	11	12	0h 15m	d
	26	15.4	12	14	15	3		3m 5s	3m 28s	3m 51s	10s	15s	12	14	15	0h 18m	d
	21	19.0	15	17	19	3		3m 49s	4m 17s	4m 46s	12s	15s	15	17	19	0h 16m	d
	17	23.5	18	21	23	3		4m 42s	5m 18s	5m 53s	12s	15s	18	21	23	0h 17m	d
	13.6	29.4	22	25	28	4		5m 53s	6m 37s	7m 21s	16s	15s	22	25	28	0h 19m	d
	11	36.4	27	31	34	5		7m 16s	8m 11s	9m 5s	16s	15s	27	31	34	0h 23m	d
	9	44.4	32	37	41	5		8m 53s	10m 0s	11m 7s	20s	15s	32	37	41	0h 29m	d
	7.4	54.1	38	43	48	6		10m 49s	12m 10s	13m 31s	25s	15s	38	43	48	0h 38m	d
450	41	11.0	10	11	12	2	0 - DRAG ONLY	2m 12s	2m 28s	2m 45s	8s	16.5s	10	11	12	0h 14m	d
	33	13.6	12	14	15	2		2m 44s	3m 4s	3m 25s	10s	16.5s	12	14	15	0h 17m	d
	26	17.3	15	17	19	3		3m 28s	3m 54s	4m 20s	10s	16.5s	15	17	19	0h 20m	d
	21	21.4	19	21	24	3		4m 17s	4m 49s	5m 21s	12s	16.5s	19	21	24	0h 17m	d
	17	26.5	23	26	29	4		5m 18s	5m 57s	6m 37s	16s	16.5s	23	26	29	0h 18m	d
	13.6	33.1	28	32	36	4		6m 37s	7m 27s	8m 16s	16s	16.5s	28	32	36	0h 21m	d
	11	40.9	34	39	43	5		8m 11s	9m 12s	10m 14s	20s	16.5s	34	39	43	0h 26m	d
	9	50.0	41	46	52	6		10m 0s	11m 15s	12m 30s	20s	16.5s	41	46	52	0h 34m	d
	7.4	60.8	48	55	61	7		12m 10s	13m 41s	15m 12s	25s	16.5s	48	55	61	0h 47m	d
500	41	12.2	12	14	15	2	0 - DRAG ONLY	2m 26s	2m 45s	3m 3s	10s	18s	12	14	15	0h 15m	d
	33	15.2	15	17	19	3		3m 2s	3m 25s	3m 47s	10s	18s	15	17	19	0h 18m	d
	26	19.2	19	21	24	3		3m 51s	4m 20s	4m 48s	12s	18s	19	21	24	0h 17m	d
	21	23.8	23	26	29	3		4m 46s	5m 21s	5m 57s	12s	18s	23	26	29	0h 17m	d
	17	29.4	28	32	36	4		5m 53s	6m 37s	7m 21s	16s	18s	28	32	36	0h 19m	d
	13.6	36.8	35	39	44	5		7m 21s	8m 16s	9m 11s	16s	18s	35	39	44	0h 23m	d
	11	45.5	42	48	53	6		9m 5s	10m 14s	11m 22s	20s	18s	42	48	53	0h 30m	d
	9	55.6	50	57	64	7		11m 7s	12m 30s	13m 53s	25s	18s	50	57	64	0h 40m	d
	7.4	67.6	60	68	76	8		13m 31s	15m 12s	16m 54s	25s	18s	60	68	76	0h 57m	d
560	41	13.7	15	17	19	2	0 - DRAG ONLY	2m 44s	3m 4s	3m 25s	10s	19.8s	15	17	19	0h 17m	d
	33	17.0	19	21	24	3		3m 24s	3m 49s	4m 15s	10s	19.8s	19	21	24	0h 20m	d
	26	21.5	24	27	30	3		4m 18s	4m 51s	5m 23s	12s	19.8s	24	27	30	0h 17m	d
	21	26.7	29	33	37	4		5m 20s	6m 0s	6m 40s	16s	19.8s	29	33	37	0h 18m	d
	17	32.9	35	40	45	4		6m 35s	7m 25s	8m 14s	16s	19.8s	35	40	45	0h 21m	d
	13.6	41.2	44	49	55	5		8m 14s	9m 16s	10m 18s	20s	19.8s	44	49	55	0h 26m	d
	11	50.9	53	60	67	6		10m 11s	11m 27s	12m 44s	25s	19.8s	53	60	67	0h 35m	d
	9	62.2	63	72	80	7		12m 27s	14m 0s	15m 33s	25s	19.8s	63	72	80	0h 49m	d
	7.4	75.7	75	85	95	9		15m 8s	17m 2s	18m 55s	30s	19.8s	75	85	95	1h 10m	d
630	41	15.4	19	22	24	3	0 - DRAG ONLY	3m 4s	3m 27s	3m 50s	10s	21.9s	19	22	24	0h 18m	d
	33	19.1	24	27	30	3		3m 49s	4m 18s	4m 46s	12s	21.9s	24	27	30	0h 16m	d
	26	24.2	30	34	38	3		4m 51s	5m 27s	6m 3s	12s	21.9s	30	34	38	0h 17m	d
	21	30.0	37	42	47	4		6m 0s	6m 45s	7m 30s	16s	21.9s	37	42	47	0h 19m	d
	17	37.1	45	51	57	5		7m 25s	8m 20s	9m 16s	20s	21.9s	45	51	57	0h 23m	d
	13.6	46.3	55	63	70	6		9m 16s	10m 25s	11m 35s	20s	21.9s	55	63	70	0h 30m	d
	11	57.3	67	76	85	7		11m 27s	12m 53s	14m 19s	25s	21.9s	67	76	85	0h 42m	d
	9	70.0	80	91	101	8		14m 0s	15m 45s	17m 30s	25s	21.9s	80	91	101	1h 1m	d
	7.4	85.1	95	107	120	10		17m 2s	19m 9s	21m 17s	30s	21.9s	95	107	120	1h 29m	d

TEMP: 210 ± 10C			PHASE 1				PHASE 2		PHASE 3	PHASE 4				PHASE 5		
Pipe Details (e <sub>n</sub> = Wall Thickness) Max e <sub>n</sub> = 70mm			Equalising			Preheating		Changeover Time	Joining (See Note a)				Minimum Cool Time Under Pressure (See Note b)			
			Equalising Pressure BAR						Bead Height (Minimum) mm	Buildup Time Max	Joining Pressure BAR			Up to 15°C	15°C to 25°C	25°C to 40°C
D <sub>n</sub>	SDR	e <sub>n</sub>	Min	Tgt	Max	BAR	Time	Max			Max	Min	Tgt			
315	41	7.7	3	3	4	1.0	0.33	1m 26s	6.1s	7.4s	3	3	4	0h 6m	0h 8m	0h 10m
	33	9.5	4	4	4	1.0	0.40	1m 48s	6.5s	9s	4	4	4	0h 8m	0h 10m	0h 13m
	26	12.1	5	5	6	1.0	0.50	2m 15s	7s	11s	5	5	6	0h 10m	0h 12m	0h 16m
	21	15.0	6	6	7	1.0	0.62	2m 46s	7.9s	13.6s	6	6	7	0h 12m	0h 15m	0h 19m
	17	18.5	7	8	8	1.0	0.75	3m 21s	8.9s	16.6s	7	8	8	0h 14m	0h 18m	0h 23m
	13.6	23.2	8	9	10	1.5	0.93	4m 3s	10.2s	19.9s	8	9	10	0h 17m	0h 22m	0h 29m
	11	28.6	10	11	12	2.0	1.12	4m 52s	11.7s	24.3s	10	11	12	0h 21m	0h 26m	0h 35m
	9	35.0	12	13	15	2.0	1.34	5m 46s	13.5s	30.2s	12	13	15	0h 26m	0h 32m	0h 43m
	7.4	42.6	14	16	17	2.5	1.58	6m 39s	15.3s	36.7s	14	16	17	0h 31m	0h 39m	0h 52m
355	41	8.7	4	4	5	1.0	0.41	1m 37s	6.3s	8.2s	4	4	5	0h 7m	0h 9m	0h 11m
	33	10.8	5	5	6	1.0	0.51	1m 59s	6.7s	9.8s	5	5	6	0h 9m	0h 11m	0h 14m
	26	13.7	6	6	7	1.0	0.64	2m 30s	7.5s	12.3s	6	6	7	0h 11m	0h 13m	0h 17m
	21	16.9	7	8	9	1.0	0.78	3m 1s	8.3s	14.9s	7	8	9	0h 12m	0h 16m	0h 21m
	17	20.9	9	10	11	1.5	0.96	3m 40s	9.5s	18.1s	9	10	11	0h 15m	0h 19m	0h 26m
	13.6	26.1	11	12	13	2.0	1.17	4m 31s	11s	22s	11	12	13	0h 19m	0h 24m	0h 32m
	11	32.3	13	14	16	2.0	1.42	5m 21s	12.7s	27.5s	13	14	16	0h 23m	0h 30m	0h 39m
	9	39.4	15	17	19	2.5	1.70	6m 16s	14.5s	33.7s	15	17	19	0h 28m	0h 36m	0h 48m
	7.4	48.0	18	20	22	2.5	2.01	7m 13s	16.5s	40.9s	18	20	22	0h 34m	0h 44m	0h 58m
400	41	9.8	5	5	6	1.0	0.52	1m 48s	6.5s	9s	5	5	6	0h 8m	0h 10m	0h 13m
	33	12.1	6	7	7	1.0	0.65	2m 15s	7s	11s	6	7	7	0h 10m	0h 12m	0h 16m
	26	15.4	7	8	9	1.0	0.81	2m 46s	7.9s	13.6s	7	8	9	0h 12m	0h 15m	0h 19m
	21	19.0	9	10	11	1.5	0.99	3m 26s	9s	17s	9	10	11	0h 14m	0h 18m	0h 24m
	17	23.5	11	12	13	1.5	1.21	4m 8s	10.3s	20.3s	11	12	13	0h 17m	0h 22m	0h 29m
	13.6	29.4	13	15	16	2.0	1.49	4m 56s	11.9s	24.8s	13	15	16	0h 21m	0h 27m	0h 36m
	11	36.4	16	18	20	2.0	1.81	5m 54s	13.8s	31.1s	16	18	20	0h 26m	0h 33m	0h 44m
	9	44.4	19	22	24	2.5	2.16	6m 49s	15.7s	38s	19	22	24	0h 32m	0h 41m	0h 54m
	7.4	54.1	23	26	28	3.0	2.55	7m 49s	18s	43s	23	26	28	0h 39m	0h 50m	1h 6m
450	41	11.0	6	7	7	1.0	0.66	1m 59s	6.7s	9.8s	6	7	7	0h 9m	0h 11m	0h 14m
	33	13.6	7	8	9	1.0	0.82	2m 30s	7.5s	12.3s	7	8	9	0h 11m	0h 13m	0h 17m
	26	17.3	9	10	11	1.0	1.03	3m 6s	8.5s	15.3s	9	10	11	0h 13m	0h 16m	0h 22m
	21	21.4	11	13	14	1.5	1.26	3m 45s	9.6s	18.5s	11	13	14	0h 16m	0h 20m	0h 26m
	17	26.5	14	15	17	2.0	1.53	4m 31s	11s	22s	14	15	17	0h 19m	0h 24m	0h 32m
	13.6	33.1	17	19	21	2.0	1.88	5m 29s	13s	28.4s	17	19	21	0h 24m	0h 30m	0h 40m
	11	40.9	21	23	25	2.5	2.28	6m 26s	14.9s	35s	21	23	25	0h 30m	0h 37m	0h 49m
	9	50.0	25	27	30	3.0	2.73	7m 30s	17s	43s	25	27	30	0h 36m	0h 46m	1h 1m
	7.4	60.8	29	32	36	3.0	3.23	8m 20s	19.7s	43s	29	32	36	0h 43m	0h 56m	1h 14m
500	41	12.2	7	8	9	1.0	0.82	2m 15s	7s	11s	7	8	9	0h 10m	0h 12m	0h 16m
	33	15.2	9	10	11	1.0	1.01	2m 46s	7.9s	13.6s	9	10	11	0h 12m	0h 15m	0h 19m
	26	19.2	11	13	14	1.5	1.26	3m 26s	9s	17s	11	13	14	0h 14m	0h 18m	0h 24m
	21	23.8	14	16	17	1.5	1.55	4m 8s	10.3s	20.3s	14	16	17	0h 17m	0h 22m	0h 29m
	17	29.4	17	19	21	2.0	1.89	4m 56s	11.9s	24.8s	17	19	21	0h 21m	0h 27m	0h 36m
	13.6	36.8	21	23	26	2.0	2.33	5m 58s	13.9s	31.6s	21	23	26	0h 27m	0h 34m	0h 45m
	11	45.5	25	28	31	2.5	2.82	6m 56s	15.9s	38.8s	25	28	31	0h 33m	0h 41m	0h 55m
	9	55.6	30	34	37	3.0	3.37	7m 56s	18.4s	43s	30	34	37	0h 40m	0h 51m	1h 8m
	7.4	67.6	36	40	44	3.0	3.99	8m 54s	21.4s	43s	36	40	44	0h 48m	1h 2m	1h 22m
560	41	13.7	9	10	11	1.0	1.02	2m 30s	7.5s	12.3s	9	10	11	0h 11m	0h 13m	0h 17m
	33	17.0	11	13	14	1.0	1.26	3m 1s	8.3s	14.9s	11	13	14	0h 12m	0h 16m	0h 21m
	26	21.5	14	16	17	1.5	1.59	3m 49s	9.8s	18.8s	14	16	17	0h 16m	0h 20m	0h 27m
	21	26.7	18	19	21	2.0	1.94	4m 35s	11.2s	22.5s	18	19	21	0h 19m	0h 25m	0h 33m
	17	32.9	21	24	26	2.0	2.37	5m 25s	12.8s	28s	21	24	26	0h 24m	0h 30m	0h 40m
	13.6	41.2	26	29	32	2.5	2.92	6m 29s	15s	35.4s	26	29	32	0h 30m	0h 38m	0h 50m
	11	50.9	32	35	39	3.0	3.54	7m 32s	17.2s	43s	32	35	39	0h 36m	0h 47m	1h 2m
	9	62.2	38	42	47	3.0	4.22	8m 28s	20s	43s	38	42	47	0h 44m	0h 57m	1h 15m
	7.4	76.2	45	50	55	3.0	5.05	9m 28s	23.2s	43s	45	50	55	0h 52m	1h 7m	1h 25m
630	41	15.4	12	13	14	1.0	1.29	2m 46s	7.9s	13.6s	12	13	14	0h 12m	0h 15m	0h 19m
	33	19.1	14	16	18	1.5	1.59	3m 26s	9s	17s	14	16	18	0h 14m	0h 18m	0h 24m
	26	24.2	18	20	22	1.5	2.00	4m 13s	10.5s	20.6s	18	20	22	0h 18m	0h 22m	0h 30m
	21	30.0	22	25	27	2.0	2.46	5m 4s	12.1s	25.7s	22	25	27	0h 22m	0h 28m	0h 37m
	17	37.1	27	30	33	2.5	3.00	6m 2s	14s	32s	27	30	33	0h 27m	0h 34m	0h 45m
	13.6	46.3	33	37	41	2.5	3.69	7m 3s	16.1s	39.7s	33	37	41	0h 33m	0h 42m	0h 56m
	11	57.3	40	45	49	3.0	4.47	8m 4s	18.8s	43s	40	45	49	0h 41m	0h 52m	1h 9m
	9	70.0	48	54	59	3.0	5.35	9m 6s	22s	43s	48	54	59	0h 50m	1h 4m	1h 25m



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