

I.T.S. by Tecnodue

PT 315

Edition 1208

Operating Manual

The technical data and information contained on this manual can be changed without any notice

PT 315

The machine has been designed and constructed for the welding of PE, PP, PVDF and other thermoplastics pipes and fittings.

I.T.S. Ital Trade Services S.r.l.

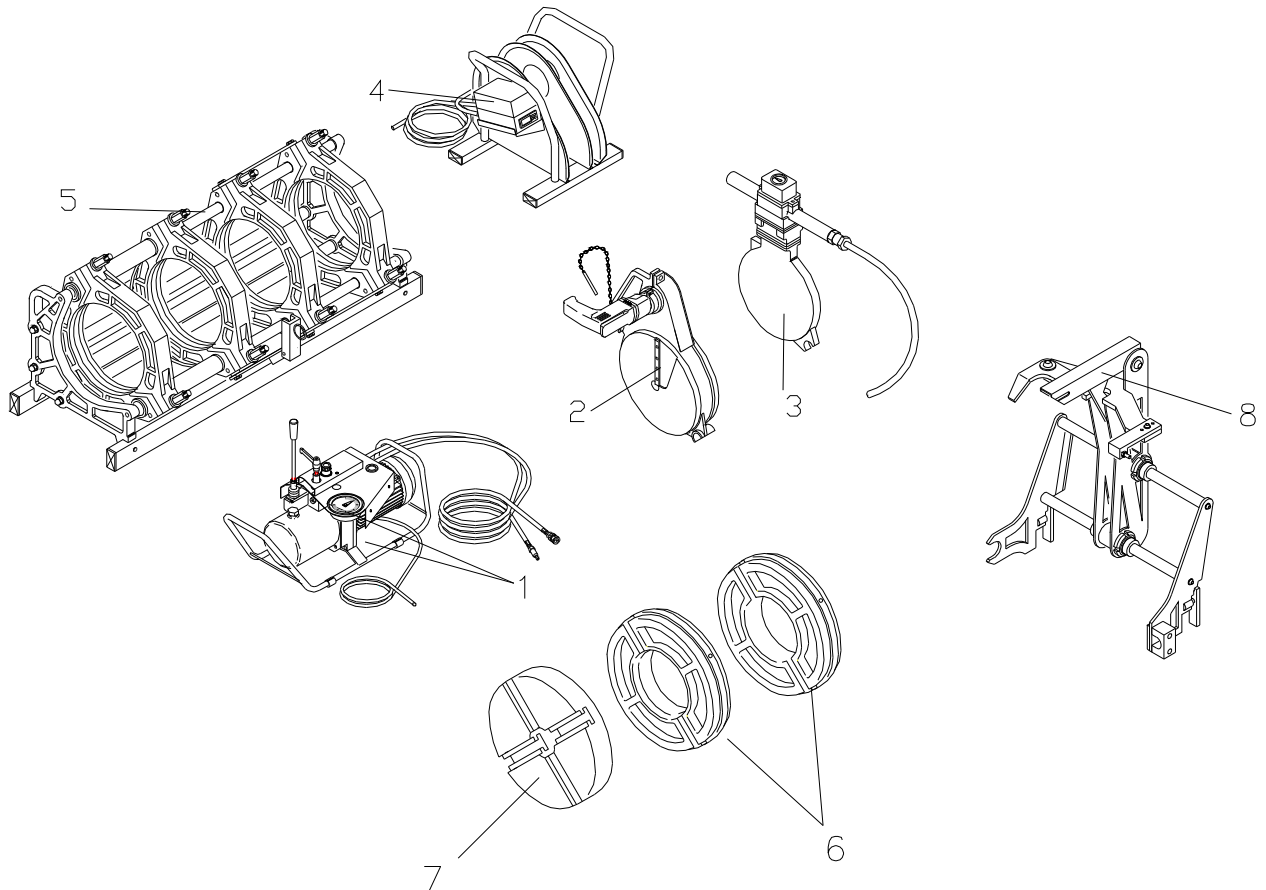
Via Scarsellini 77 , 16149 Genova Italy

Phone : +39-010-6423396

Fax : +39-010-6423513

E Mail : info@its-tecnodue.com

Web Site : www.its-tecnodue.com



Standard Components

1. Hydraulic Unit
2. Facing Tool
3. Heating Mirror
4. Support for facing tool and heating mirror
5. Basic machine

On request can be supplied:

6. Light weight alloy reducing rings for pipes and fittings d. 90,110,125,140,160,180,200,225,250,280mm
7. Stub End Device
8. MDD (PT automatic mirror device)
 - Short spigot fittings clamp d. 315mm
 - Wooden transport box according to ISPM 15
 - LDU (printing and storing data machine)
 - Electric board with automatic circuit breaker
 - Rollers

SAFETY RULES ACCORDING TO DIRECTIVES CEE

(To be read carefully and apply while utilizing the PT 315)

Due to the specific use, this machine cannot be supplied with all kind of fix and removable protections suitable to avoid any risk of accident. The machine, therefore, must be utilized, adjusted and keep in the perfect functioning conditions by skill operators.

Warning - Rules – Obligations

The use of machines composed by electrical components and movable parts, it's always a potential danger. In order to avoid any kind of accident caused by electrical or mechanical sources it' strongly suggested to read and follow carefully the following safety rules before operating the machine.

TRANSPORT

-Basic Machine , Keep the maximum care while moving and it's suggested to utilize mechanical aids.

-Facing Tool ,supplied with transport's hook.

Keep the maximum care while moving it and it's compulsory to utilize the handle also take care about the blades mounted in, it's compulsory use gloves.

-Heating Mirror ,supplied with transport's handles

Keep the maximum care while moving it also keep the maximum care while utilizing it due to the high temperature involved always more than 200°C , it's strongly suggested to use suitable gloves.

In order to move from one working place to the other , the facing tool and the mirror must located into the special support , this support is heavy therefore it's necessary to utilize the maximum care to move it

-Hydraulic unit, supplied with transport's frame.

Keep the maximum care while moving it and in case utilize two person.

Avoid to transport the components by holding from the cable and remember to use suitable gloves.

ELECTRIC CONNECTIONS

The machine is operated by 230 Volts therefore be sure that the power supply plug is supplied with the safety devices according to the standard requirements , also check that the power supply will be on the range of maximum 10% of the machine's nominal tension.

While the facing tool is connected to the power supply do not leave it into the basic machine but place it into the special support. In this position, even if the start bottom is pushed the engine does not start.

Check regularly the cables and the plug and in case substitute by qualify personnel.

In case the heating mirror cable must be substitute the cable must be H07RN-F

Before carry out a reparation or maintenance all the plugs must with plug out from the power supply

ENVIRONMENTAL CONDITIONS

The working area must be clean and duly lighted. It's very dangerous to utilize the machine in case of rain or in wheat conditions or close to flammable agents.

CLOTHES

Keep the maximum care while utilizing the machine due to the high temperature involved on the heating mirror always more than 200°C , it's strongly suggested to use suitable gloves. Avoid long clothes and avoid bracelets , necklaces that might be hooked into the machine.

CORRECT MACHINE'S OPERATION

Remember to check and read carefully the operating manual before utilizing the machine and the accessories.

KEEP ALWAYS THE MAXIMUM ATTENTION

After the heating mirror has been disconnected temperature will be hot for some minutes.

Keep the maximum care while utilizing the facing tool. Be careful to the blades , it's strongly suggested to use suitable gloves. During the facing operation (facing tool in movement) it's forbidden to take out the shavings

Avoid utilizing the machine after drinking or drugs use

Take care that all the people around the machine are at safety distance

While starting operating take care to avoid leave arms between the movable and fix trolleys.

SQUASHING DANGER

While starting operating take care to avoid leave legs or arms between the movable and fix trolleys. It's compulsory to be far from the basic machine

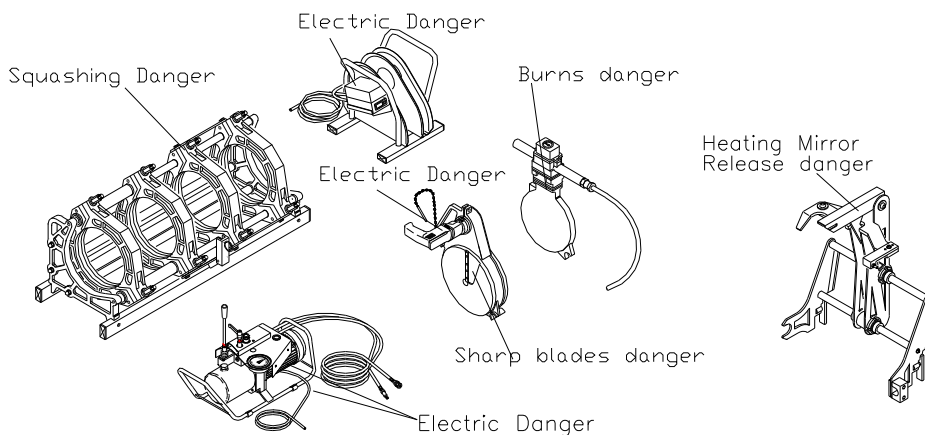
ACOUSTIC POLLUTION

The acoustic pollution of the drill engine is less than 85 dB (value measured at 1 meter distance from the operator)

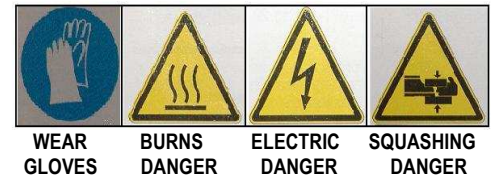
Due to some particular cases such as too much pressure during the facing the noise should be increased , therefore it's suggested to utilize some protections.

IMPORTANT !!!!

Keep the maximum care reading and following the above Warning - Rules - Obligations the Ital Trade Services S.r.l. decline all responsibilities if are not followed totally



Label on machine's components showing potential dangers



1. Technical data

Operating data	
Ambient temperature	0...50°C
Humidity (without condensation)	95 RH%
Transport and storing Temperature	-10...60°C
Electrical data	
Voltage	230 V
Frequency	50 Hz
Total power installed	5.13 KW 22.3 A
Heating mirror	IP 54 3.24 KW
Facing tool	IP 20 1.15 KW
Hydraulic unit	IP 44 0.74 KW
Hydraulic data	
Maximum working pressure	140 bar
Cylinder's section	8,46 cm ²
Pressure gauge	0 - 160 bar
Pressure gauge precision class	Cl. 1.0
Hydraulic unit engine revolutions	2800 rpm
Volumetric pump's capacity	1,2 cc/rev.
Pump's capacity	3.36 l/min
Hydraulic oil	ISO 46
Oil tank's capacity	1.5 liter
Mechanical Data	
Facing tool transmission system	Chain
Trolley maximum stroke	145 mm
Trolley slide bar diameter	35 mm
Distance between the cylinders centre	440 mm
Dimensions	
Basic machine	1050 x 509 x 600 mm
Facing tool	564 x 5000 x 395 mm
Heating mirror	580 x 65 x 350 mm
Hydraulic unit	480 x 320 x 270 mm
Support for facing tool and heating mirror	500 x 410 x 500 mm
Weights	
Basic machine	78 Kg
Facing tool	27 Kg
Heating mirror	13 Kg
Hydraulic unit	28 Kg
Support for facing tool and heating mirror	16 Kg
Wooden transport box	68 Kg
Stub end device	8 Kg
Reducing inserts complete set	77 Kg

2. General description and application field

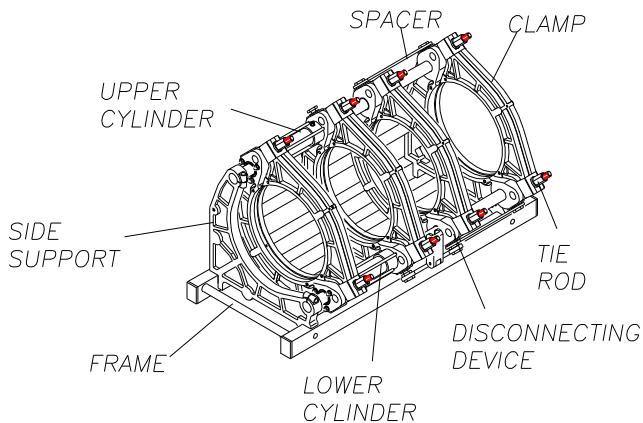
Hydraulic operated butt welding machines suitable for PE,PP,PVDF and other thermoplastics pipes and fittings.

The self aligning frame and the compact dimensions make the machines highly suited for working in road constructions, ditches , aqueducts, gas ducts , sewers and irrigation systems.

The machine is supplied complete of:

- 1) Basic machine d. 315 mm complete with a tools blue bag
- 2) Removable electric facing tool with safety switch
- 3) Removable PTFE coated heating mirror with a temperature control box.
- 4) Electro-hydraulic motor with accumulator and flexible hoses with quick couplings.
- 5) Support for facing tool and heating mirror

2.1 Basic machine



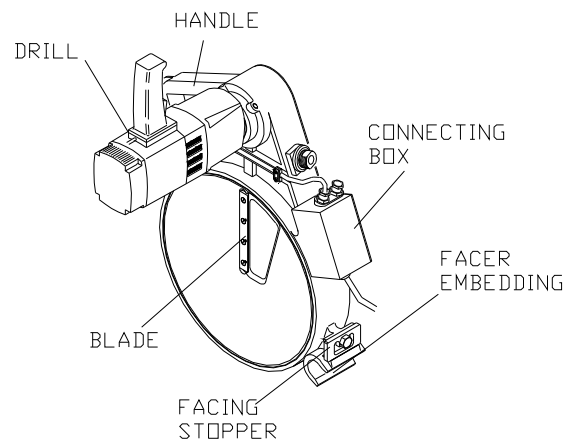
The basic machine is composed by:

- Two cylinders on which heads are mounted two complete clamps d. 315 mm
- One movable clamp d.315 mm sliding on cylinder's stem and fixable in different positions by means of using the clamps connecting rods.
- A stiffening bar
- One side support clamp d.315 mm
- A frame including the hydraulic circuit with the anti-drop quick couplings.
- A heating mirror disconnecting device

2.2 Facing Tool

The electric facing tool is composed by:

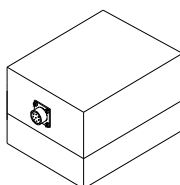
- The facing tool body
- Two disks where are mounted the blades
- A drill engine with a safety pin that , while connected keep the facing tool hooked to the machine.
- An handle with safety micro-switch allowing the engine starts only when the facing tool is fit into the machine ,avoiding the start of the engine out of this position.



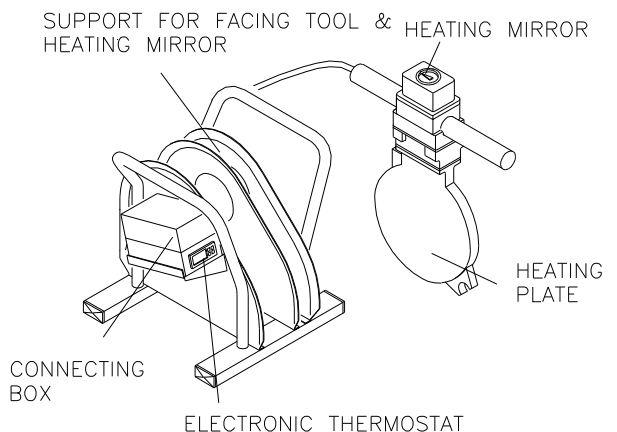
2.3 Heating Mirror

The heating mirror is composed by:

- The heating mirror coated with green color PTFE complete with thermometer (the thermometer does not depend upon the power supply and always survey the real temperature of the heating plate) and connecting box
- The support suitable for the heating mirror and the facing tool where is located the connecting box
- The electronic thermostat located on the connecting box .
- LDU connector. (The below figure shows where the LDU connector is located).

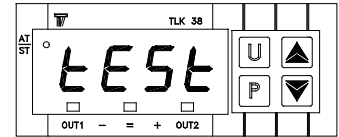


LDU Connector

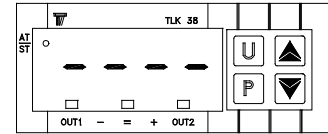


2.3.1 Electronic thermostat – different functions

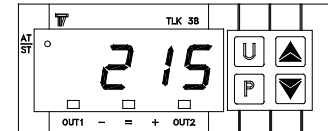
At each startup on the display will blink the writing 'TEST'. This means that the thermostat is testing the connection between the probe and the heating mirror.



If the test fails, the display will show 4 blinking upper scores (as per figure aside), in this case the probe or the connection between the thermostat and the heating mirror could be interrupted.



If the test success, the display will show the **real temperature of the heating mirror** and the heating mirror warms up (the OUT1 red led is switched on) until the set point value (the selected temperature) has been achieved (central green light led).



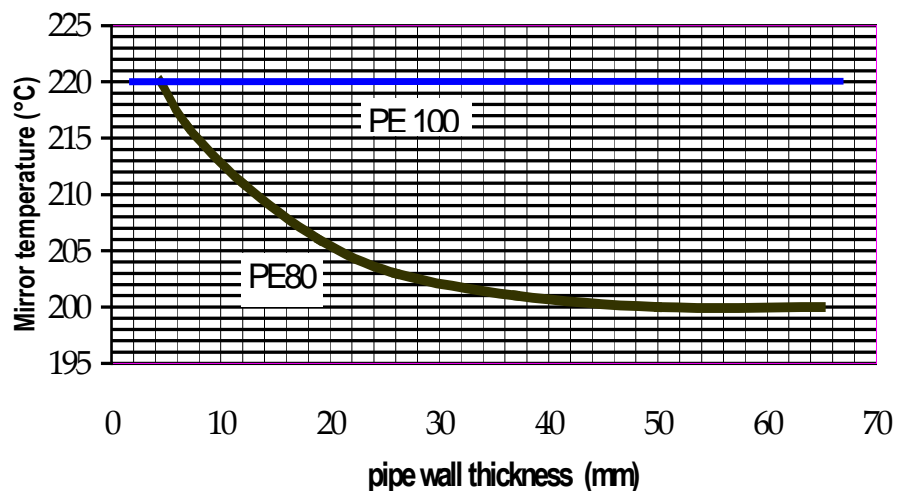
To display the actual set point value of the temperature stored by the thermostat, push the key P. The display will show alternately the writing 'SP1' and the **set point value of the temperature**. After 5 seconds the display will show again the real value of the heating mirror temperature

To select a new value for the thermostat set point value (**default value = 220°C**):

1. Push the key P (The display will show alternately the writing 'SP1' and the **set point value of the temperature**)
2. By acting on the arrow keys UP and DOWN it is possible to increase or decrease the set point value.
3. When you reach the desired value push the key P to confirm.
4. The display will show again the real value of the heating mirror temperature
5. When the heating mirror will reach the set point value on the display the central green light led will be switched on.

Warning: On the thermostat display is always shown the actual value of the heating mirror temperature (and never the set point value!)

Temperature of the welding mirror for welding PE DVS 2207-1 norm



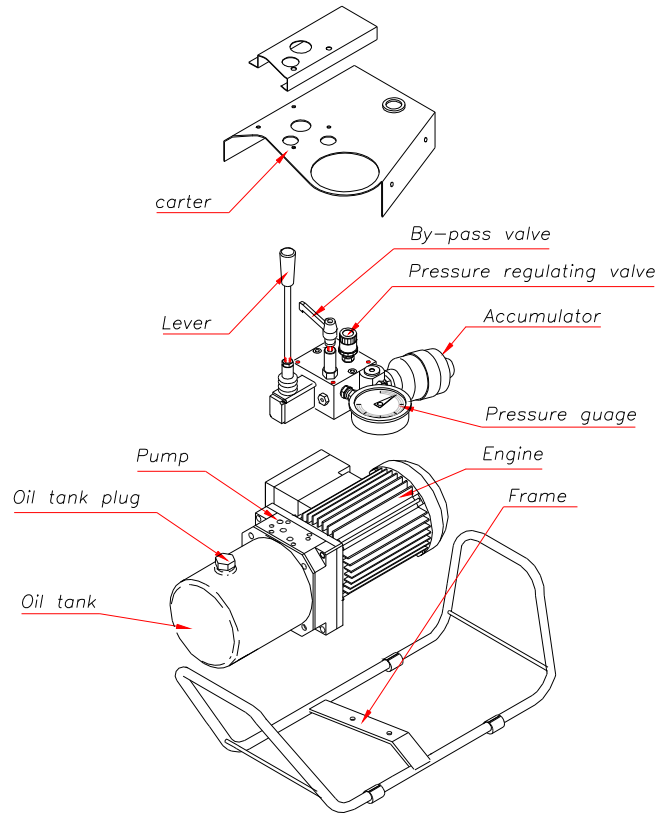
Remember

When welding **PVDF**, the temperature of the welding mirror should be adjusted for every wall thickness at 240°C +/- 8°C
 When welding **PP**, the temperature of the welding mirror should be adjusted for every wall thickness at 210°C +/- 10°C

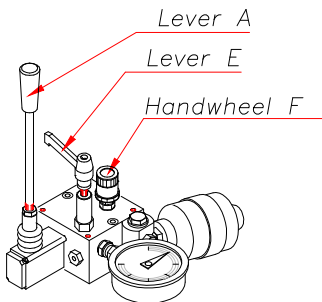
2.4 Hydraulic Unit

The basic components of the hydraulic unit are the following:

- Electric engine
- Hydraulic pump
- Oil tank
- Hydraulic unit controls
- Pressure accumulator
- Pressure gauge
- Metal frame



2.4.1 Hydraulic Unit Controls

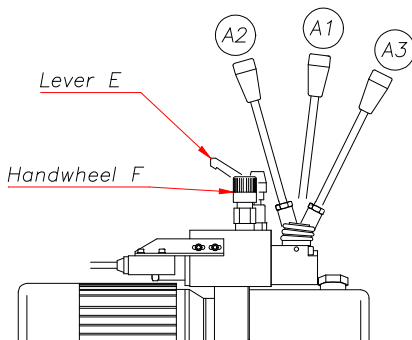


The control lever **A** open and close the machine's trolley according to the position selected.

Bring the lever **A** into position **A2** (position with automatic return) the trolley is opening with the maximum pressure set up into the hydraulic unit

In position **A1** the lever shut down automatically the engine (release position).

Bring the lever **A** into the position **A3** (position with hooking) the trolley is closing, the hooking of such position allow the operator handling.



The hand wheel **F** of the pressure control allow the setting up of the pressure at the requested values by turning anti clockwise the pressure release , while turning clockwise the pressure increase .

The pressure by pass lever **E** allow ,by turning anti clockwise the pressure releasing , while turning clockwise allow the pressure increasing by means of using the hand wheel **F** and fixing. If you completely clockwise turn the by pass valve, the pressure will be blocked and the hydraulic unit will maintain the same pressure in case of engine switched off.

2.4.2 How to use the hydraulic unit

Operating Instructions

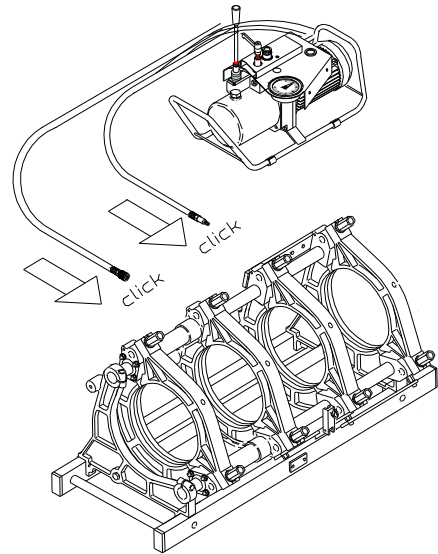
In order to make easy the learning we shall proceed to the description step by step of all operations need in order to complete a welding according to the following description:

Important !

Before begin the following operation be sure that:

- The lever **A** is fixed into the special housing
- Substitute the metal plug with the plastic black and red plug the plastic plug is supplied with the machine into a plastic bag.

01. Fit the two pipes to be weld (see relative instructions)
02. By turning the lever **E** anticlockwise bring the pressure to zero, checking the pressure gauge **D**
03. Turn clockwise the lever **E** until closing (please avoid using an excessive strength)
04. Bring the lever **A** into position **A3**
05. By turning clockwise the hand wheel **F** achieve the inertial pressure value (value of pressure need in order to allow the trolley moving) note the value of inertial pressure read into the pressure gauge **D**, then by still operating the hand wheel **F** , increase the inertial pressure value by the welding theoretical pressure value as per attached table.
06. Achieved the true welding pressure value (inertial pressure plus theoretical welding pressure) bring the lever **A** into position **A2**.
07. Fit the facing tool (see relative instructions)
08. By acting on lever **E** anticlockwise achieve a pressure value of approx 5 bar more than the inertial pressure value checked and then proceed to the facing tool operation (taking care that the engine's overloading).
09. At the end of the facing operation bring the lever **A** into position **A3** and remove the facing tool.
10. Fit the heating mirror taking care that the temperature of the surfaces is the one selected (see relative instructions)
11. Bring the lever **A** into **A3** in order to have the bead formation as per attached table, this operation must be done with the true welding pressure value.
12. After bead formation act on lever **E** anticlockwise in order to bring the pressure to zero and proceed to the heating time as per attached table.
13. Elapsed the heating time at pressure zero bring the lever **A** into position **A2** and remove the heating mirror and immediately bring the lever **A** into position **A3** and acting on lever **E** clockwise put in contact the two pipes until achieving the true welding pressure value by checking the pressure gauge **D**. These operations must be done according to the time indicated into the attached table.
14. Bring the lever **A** into position **A1** and keep such situation for all the cooling time indicated into the attached table, taking care that the pressure will not decrease too much, in case bring for a little while the lever **A** into position **A3** and put back into position **A1**
15. Elapsed the cooling time by acting on lever **E** anticlockwise bring the pressure to zero.
16. Take away the pipes welded



WE STRONGLY SUGGEST TO TRY MANY TIMES AND GET FAMILIAR TO THE UNIT BEFORE CARRYING ON WITH COMPLETE WELDING. A WRONG USE OF THE HYDRAULIC UNIT COULD COMPROMISE YOUR WELDINGS..

3. Heating mirror disconnecting device

You can configure the machine according to the kind of welding to be executed as per the following different ways:

- Two fixed clamps and two moveable clamps Fig. 1
- One fixed clamp and three moveable clamps Fig. 2

You can change from a configuration to another in a quick way by simply acting on the two spacers and on the disconnecting device.

In the first configuration of the machine the disconnecting devices is between the two moveable clamps and the two fixed clamps.

The spacers are between the two fixed clamps.

In the second configuration of the machine the disconnecting devices is between the three moveable clamps and the fixed clamp.

The spacers are between the second and third moveable clamps.

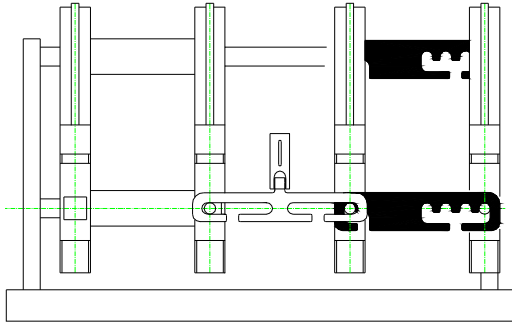


Figure 1. Configuration 2 moveable clamps + 2 fixed clamps

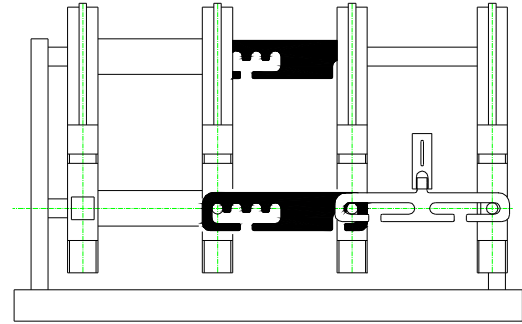


Figure 2. Configuration 3 moveable clamps + 1 fixed clamp

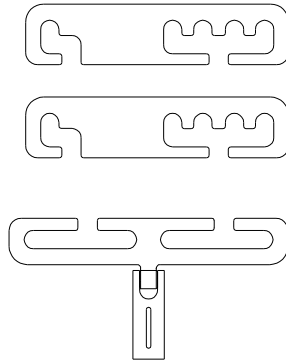
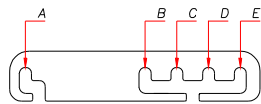


Figure 3.

On the left: The special shape of the spacers let a quick configuration of the machine.

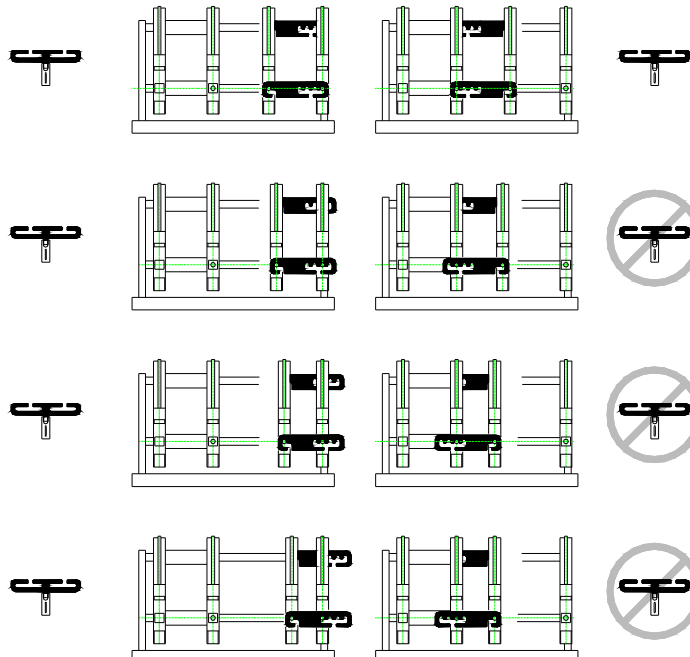
You can easily change the spacer position without using any kind of tool. You can modify the distance between the clamps connected by the spacers.

Fix the first clamp to the hole A and the second clamp in one of the holes B,C,D,E

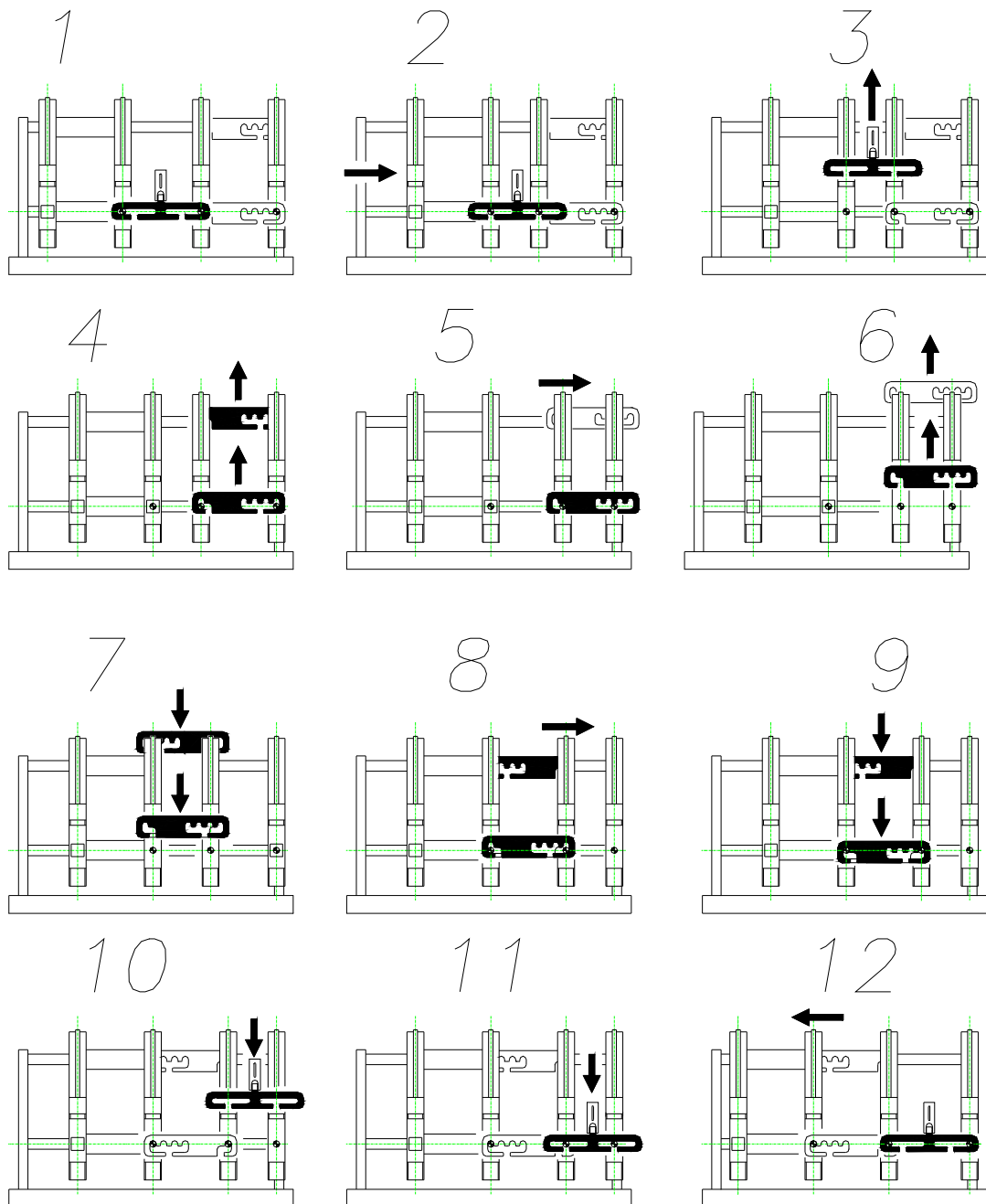
On the right (from above) Upper and lower spacer (interchangeable) and disconnecting device

WARNING !

Only in two configurations you can use the disconnecting device with spacer! In the other configuration use only the spacer to avoid serious damages to the basic machine!



How to change the configuration from two fixed clamps and two sliding clamps into one fixed clamp and three sliding clamps



WARNING!

You can only place the upper and lower spacers in the same clamps and using the same holes. It is strictly forbidden to put the spacer in different clamps and in different holes.

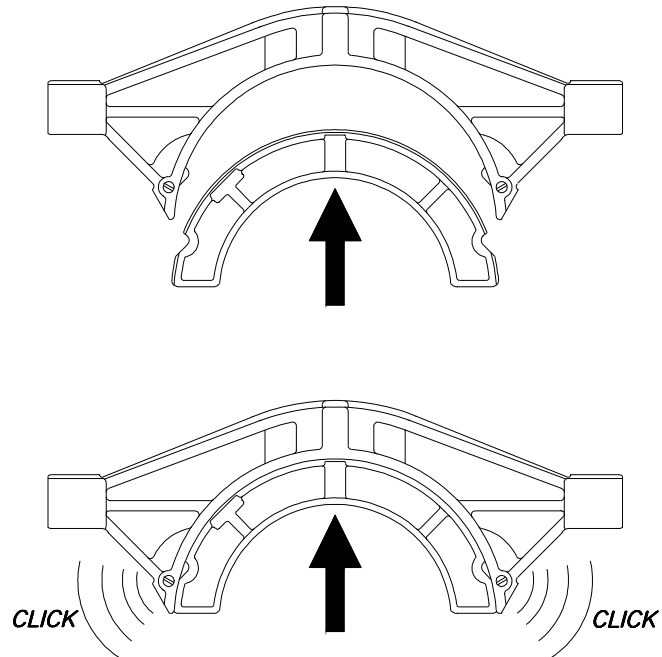
1. Configuration 2 moveable clamps + 2 fixed clamps
2. Not completely close the trolleys
3. Remove the heating mirror disconnecting device
4. Lift the spacers as shown in the figure above
5. By using your hands translate the third clamps as in the figure above
6. Remove the spacers
7. Place the spacers between the two central clamps
8. By using your hands translate the moveable clamps until the clamp reaches the limit stop.
9. Fix the spacers by pushing them down
10. Place the heating mirror disconnecting device
11. To fix the heating mirror disconnecting device open the trolleys
12. Configuration 3 moveable clamps + 1 fixed clamp

To configure the again the machine with 2 moveable clamps you must repeat the procedure above in a reverse sense.

3.1 Beep-beep inserts reductions

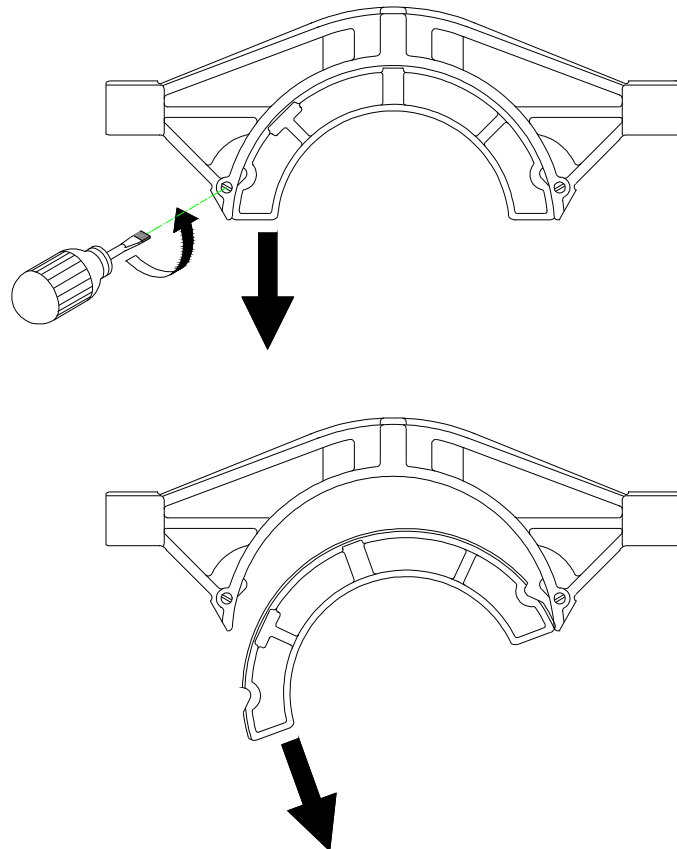
To use a beep-beep inserts reduction

To use a beep-beep reduction, fix it by lightly pushing the reduction in the direction shown as per figure aside. As you hear a 'click' sound the reduction is properly fixed.



To remove the beep-beep reduction

To safely remove the beep-beep reduction by means of a screwdriver turn to left the screw shown in the figure aside. As soon as the reduction is not anymore hooked to the clamp you can remove it.



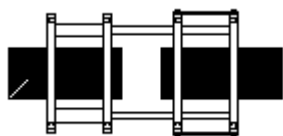
Attention: If you need to use reductions under d. 250mm you must before install the reductions d. 315x250mm

4. Butt welding in brief

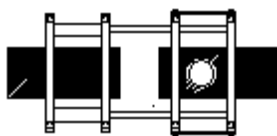
4.1 Introduction

Stated that the basic machine it's suitable for all kinds of pipe, fittings and stub end available on the nowadays market. Here follows all the different welding configurations of the machine:

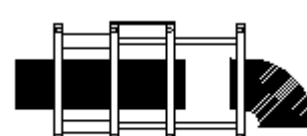
- 1) Pipe with Pipe, standard configuration of the machine
- 2) Pipe with long spigot fitting, standard configuration of the machine
- 3) Pipe with short spigot fitting, to achieve this kind of welding it is strongly suggested to configure the machine with three moveable clamps and 1 fixed clamp. Furthermore you must use the upper fittings clamp to fix better the fittings to the fixed clamp
- 4) Fitting with short spigot stub end, to achieve this kind of welding it is strongly suggested to configure the machine with three moveable clamps and 1 fixed clamp. To fix the stub end you must use a special accessory called stub end device. Place the 4 brackets at the appropriate size punched on the stub end device. Fix the stub end by tighten the bolt of each bracket. The stub end device is supplied with a fixing ring and you can install it on each clamp of the machine.
- 5) Pipe with short spigot stub end, to achieve this kind of welding you can use two different configuration of the machine (5 or 6)
- 6) Pipe with short spigot stub end, to achieve this kind of welding you can use two different configuration of the machine (5 or 6)



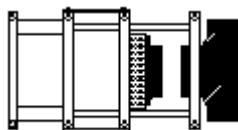
1. PIPE WITH PIPE



2. PIPE WITH LONG SPIGOT FITTING



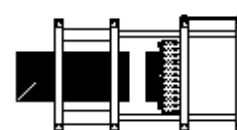
3. PIPE WITH SHORT SPIGOT FITTING



4. FITTING WITH SHORT SPIGOT STUB END



5. PIPE WITH SHORT SPIGOT STUB END

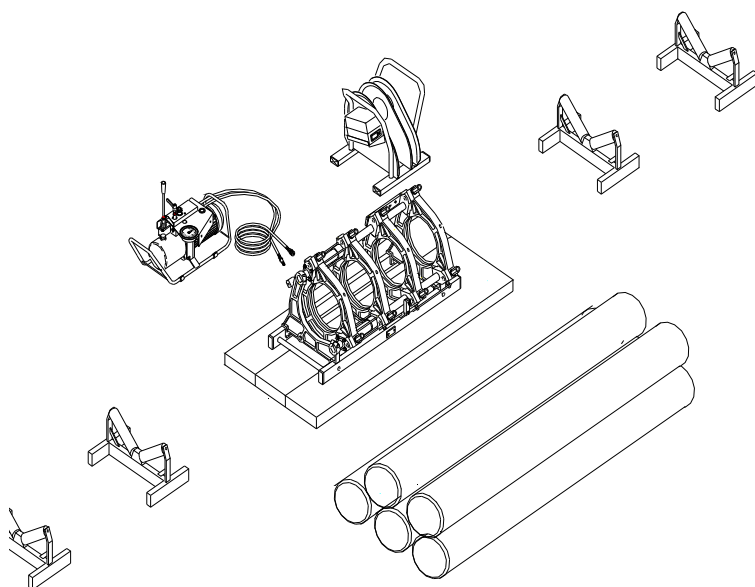


6. PIPE WITH SHORT SPIGOT STUB END

4.2 Machine's preparation

It's strongly suggested to use pipe rollers for the sliding of the pipes to be welded and if it's possible positioning the machine with wooden table below, such cares will avoid additional efforts to the machine.

- a) Set up the working area so that welding is protected from the weather. Position the machine's components as per following figure and eventually utilize wooden panels

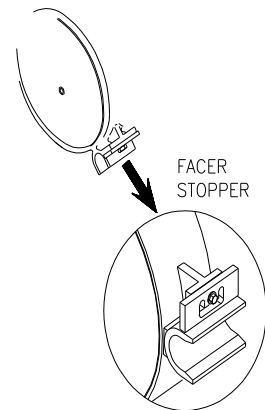


- b) Connect the flexible hoses of the hydraulic unit to the machine

- c) Connect the plugs to the power supply (Hydraulic unit, Facing tool and Heating mirror) after checking that the main power supply is within a 10% of the specified one “ **Warning Heating Mirror start to warm up !** “
- d) Select the correct temperature on the heating mirror
- e) In case fit the inserts of the diameter to be welded into the machine

4.3 Pipes positioning into the machine and facing operation

- a) Open the movable trolley of the machine by means of acting the lever **A (hyd. Unit)** and take it in position **A2**
- b) Position the pipes into the machine taking care to leave enough space for the facing tool inserting
- c) Check the pipes alignment, in case adjust it by means of tighten or loosening the clamps bolts. The maximum misalignment could be lesser than 10% of the pipe or fittings wall thickness. In any case the misalignment cannot be over than 2mm.
- d) Clean the pipe ends
- e) Fit in the facing tool between the two pipe's ends to be faced, by means of connecting the facing tool into the special supports. Connect the safety pin and start the facing tool engine
- f) On the facing tool there is a facer stopper (see the figure aside). In case of one of the pipe ends has a small projection; the facer stopper let you select the only pipe to face. Put the facer stopper in the left or in the right hole to prevent the right or left facing. To face all the pipes put the facer stopper in the central hole.



Warning!!!: Always check that the speed selector of the drill engine is in position 1 (lower speed)

- g) Slowly approach the pipes ends towards the facing tool by means of acting on the hydraulic control unit (lever **A Table V**) keeping a value of pressure allowing the facing of the surfaces and avoiding an overload of the drill engine (a too much high pressure could burnt out the drill engine). When shavings from both sides will appear continuous and homogeneous, the facing operation is completed.
- h) Put in contact the two pipes ends to be welded and check if the eventual disjunction is within the values of the following table:

Outside diameter mm	Port mm
< 400	0,5
> 400	1,0

In case the above values cannot be fulfilled the facing operation must be repeat.

4.4 Inertial pressure measurement

Before begin a welding cycle it is necessary to measure the inertial pressure. This value must be added to the pressure value shown in our welding tables. The inertial pressure value depends on welding operating conditions (ex.: length and weight of the pipe to drag, general condition of the machine, ambient temperature, etc.). To measure the inertial pressure follow these steps:

- a) Completely open the movable trolley of the machine by means of acting the lever **A** and take it in position **A2**
- b) By turning the lever **F (Hyd. Unit)** anticlockwise bring the pressure to zero, checking the pressure gauge
- c) Turn clockwise the lever **E (Hyd. Unit)** until closing
- d) Bring the lever **A (Hyd. Unit)** into position **A3** (the trolleys do not move because there is no pressure)
- e) By turning clockwise the hand wheel **F** note the inertial pressure value (value of pressure need in order to allow the trolley moving) by reading it into the pressure gauge

4.5 Welding cycle

To obtain the best result we strongly suggest allowing the use of the machine only to experienced operators

The welding phase is composed by 5 phases with 5 different times:

PHASE 1 = t_1 = Time requested for the bead formation with the specified wall thickness

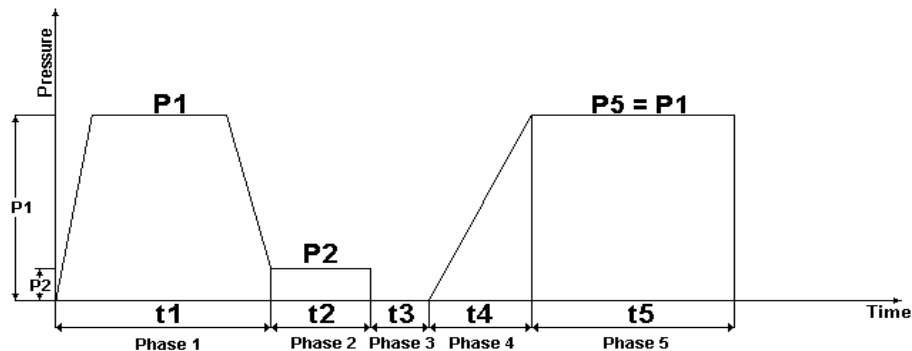
PHASE 2 = t_2 = Time requested for the continual heating

PHASE 3 = t_3 = Time requested for the change over

PHASE 4 = t_4 = Time requested for bringing up the pressure

PHASE 5 = t_5 = time requested for cooling down

Pressure-Time diagram for butt welding



PHASE 1 = Heating up t_1

- Fit the heating mirror taking care that the temperature of the surfaces is the one selected
- Bring the lever **A (Hyd. Unit)** into position **A3** in order to have the bead formation as per attached table, this operation must be done with the true welding pressure value: (Inertial pressure + P_1).
- Check the Bead formation wall thickness according to the attached welding table

PHASE 2 = Heating up t_2

- After bead formation act on lever **E (Hyd. Unit)** anticlockwise in order to bring the pressure nearly to zero and proceed to the heating time t_2 at pressure P_2

PHASE 3 = Change over t_3

- Elapsed the heating time at pressure P_2 bring the lever **A (Hyd. unit)** into position **A2** and remove the heating mirror and immediately bring the lever **A** into position **A3** and acting on lever **E** clockwise put in contact the two pipes

PHASE 4 = Bringing up pressure t_4

- Achieve the true welding pressure value: (Inertial pressure + $P_1 = P_5$) by checking the pressure gauge, This operation must be done according to the time indicated into the attached welding table.

PHASE 5 = Cooling Down t_5

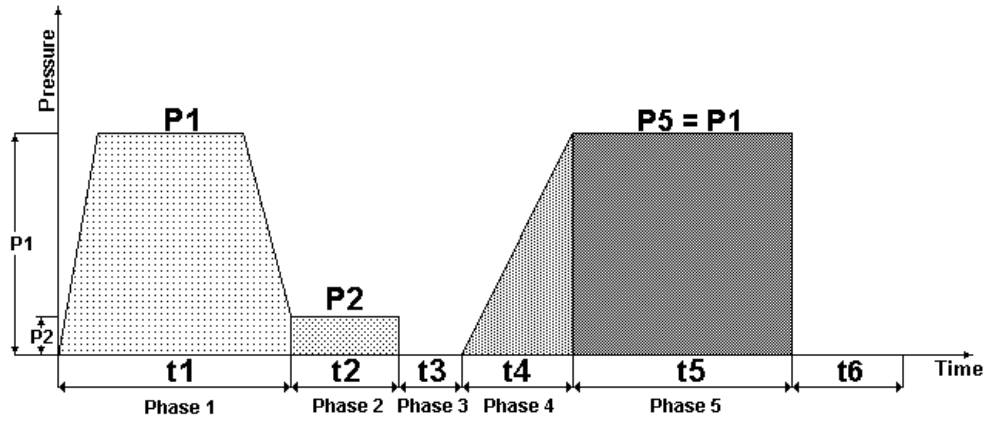
- Bring the lever **A** into position **A1** and keep such situation for all the cooling time indicated into the attached welding table, taking care that the pressure will not decrease too much
- Elapsed the cooling time by acting on lever **E** anticlockwise bring the pressure to zero.
- Take away the pipes welded

Important !!!

In case of any doubt please refer to the specific instructions

5. Welding Parameters for PE pipes & fittings DVS norm version 2207-1

Pressure-Time diagram for butt welding



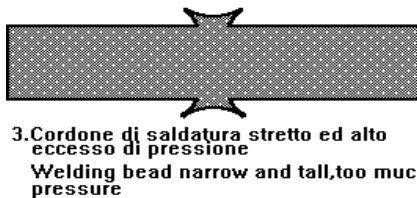
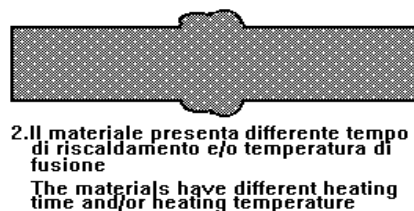
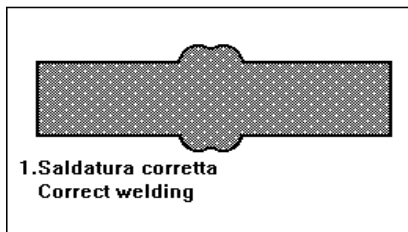
- t_1 = Time requested for the bead formation with the specified wall thickness
- t_2 = Time requested for the continual heating
- t_3 = Time requested for the change over
- t_4 = Time requested for bringing up the pressure
- t_5 = time requested for cooling down
- P_1 = Pressure during the bead formation and the cooling down, this value is the result of the formula:

$$\frac{\text{Pipe section (cm}^2\text{)} \times \text{Material thrust coefficient (Kg./cm}^2\text{)}}{\text{Total machine cylinders section (cm}^2\text{)}} = \text{bar}$$

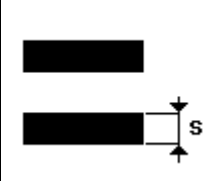
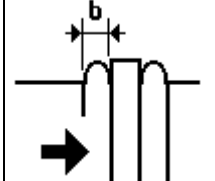
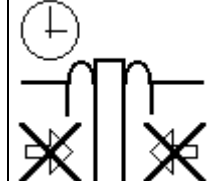
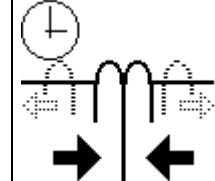
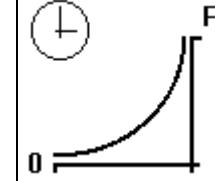
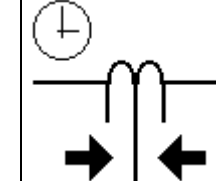
Material thrust coefficient for PE s 63	1,5 Kg./cm ²
Material thrust coefficient for PP	1,0 Kg./cm ²
Total PT 160 cylinders section	4,32 cm ²

P_2 = Pressure during the continual heating, this value either for HDPE and PP is 0,1 Kg./cm².

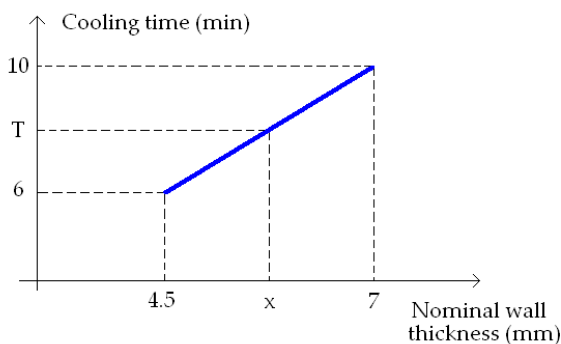
Optical checking of butt welding result



5.1 Welding Parameters for PE & PP sheets, pipes & fittings according to DVS 2207-1 – 2207-11

					
Nominal Wall thickness mm	Alignment Bead height on heater plate at the end of the alignment time (alignment under 0.15 N/mm ²) mm (minimum values)	Heating-up Heating-up time= 10 x wallthickness (heating-up 0.02 N/mm ²) s	Changeover time S (maximum time)	Joining pressure s	Cooling time under joining pressure p=0.15 N/mm ² 0.01 Min (minimum values)
MATERIAL PE					
Until 4.5	0.5	45	5	5	6
4.5 ... 7	1.0	45 ... 70	5 ... 6	5 ... 6	6 ... 10
7 ... 12	1.5	70 ... 120	6 ... 8	6 ... 8	10 ... 16
12 ... 19	2.0	120 ... 190	8 ... 10	8 ... 11	16 ... 24
19 ... 26	2.5	190 ... 260	10 ... 12	11 ... 14	24 ... 32
26 ... 37	3.0	260 ... 370	12 ... 16	14 ... 19	32 ... 45
37 ... 50	3.5	370 ... 500	16 ... 20	19 ... 25	45 ... 60
50 ... 70	4.0	500 ... 700	20 ... 25	25 ... 35	60 ... 80
MATERIAL PP					
Until 4.5	0.5	135	5	6	6
4.5 ... 7	0.5	135 ... 175	5 ... 6	6 ... 7	6 ... 12
7 ... 12	1.0	175 ... 245	6 ... 7	6 ... 11	12 ... 20
12 ... 19	1.0	245 ... 330	7 ... 9	11 ... 17	20 ... 30
19 ... 26	1.5	330 ... 400	9 ... 11	17 ... 22	30 ... 40
26 ... 37	2.0	400 ... 485	11 ... 14	22 ... 32	40 ... 55
37 ... 50	2.5	485 ... 560	14 ... 17	32 ... 43	55 ... 70

Example on how to calculate the cooling down (t5) time following the DVS NORM



As per drawing above the time T corresponds to wall thickness value X in mm. To calculate this time (t5 in minutes) please follow the formula below:

$$T = 6 + \frac{10 - 6}{7 - 4,5} \cdot (x - 4,5)$$

Example:

If you want to calculate the cooling down time for a 6mm wall thickness pipe, you must simply substitute the variable X with the value 6:

$$T = 6 + \frac{10 - 6}{7 - 4,5} \cdot (6 - 4,5) = 8,4 \text{ min}$$

To calculate the other times (t3 and t4) you must use the same principle of linear interpolation.

To obtain the t2 (in seconds) value use the formula below where the variable wt corresponds to the nominal wall thickness

$$T_2(\text{sec}) = 10 \cdot \text{wt}(\text{mm})$$

6. Welding Table for PE pipes DVS norm version 2207-1

The following tables show the values to be applied during the welding cycle as per previous instructions and graph.

However in order to clarify once again the meaning of these values please kindly note:

- t1** = Time requested for the bead formation to be done with pressure value = **P1** + inertial pressure
t2 = Time requested for the continual heating to be done with pressure value = **P2** + inertial pressure
t3 = Time requested for the change over
t4 = Time requested for bringing up the pressure at the value of pressure = **P1** + inertial pressure
t5 = time requested for cooling down to be done with pressure value = **P1** + inertial pressure

Important

Remember always to add the value checked of inertial pressure to the P1 and P2 values !!!!!!!

PT 315 - DVS 2207-1			Cyl. section cm ² 8,46				Welding range 90-315 mm				
material PE80-100			SDR 41								
D	S	T	P1	bead	P2	t 2	t 3	t 4	P5	t 5	
DIAMETER	WALL THICK.	TEMP.	BEAD FORMATION		HEATING UP		CHANGE OV.	RAMP	COOLING		
mm	mm	°C	bar	mm	bar	sec	sec	sec	bar	min	
90	2,2	220	1,1	0,5	0.. 0,1	22	0.. 5	5	1,1	6	
110	2,7	220	1,6	0,5	0.. 0,1	27	0.. 5	5	1,6	6	
125	3,0	220	2,1	0,5	0.. 0,1	30	0.. 5	5	2,1	6	
140	3,4	220	2,6	0,5	0.. 0,2	34	0.. 5	5	2,6	6	
160	3,9	220	3,4	0,5	0.. 0,2	39	0.. 5	5	3,4	6	
180	4,4	220	4,3	0,5	0.. 0,3	44	0.. 5	5	4,3	6	
200	4,9	219	5,3	1,0	0.. 0,4	49	0.. 5	5	5,3	7	
225	5,5	218	6,7	1,0	0.. 0,4	55	0.. 5	5	6,7	8	
250	6,1	217	8,3	1,0	0.. 0,6	61	0.. 6	6	8,3	9	
280	6,8	216	10,4	1,0	0.. 0,7	68	0.. 6	6	10,4	10	
315	7,7	215	13,1	1,5	0.. 0,9	77	0.. 6	6	13,1	11	

PT 315 - DVS 2207-1			Cyl. section cm ² 8,46				Welding range 90-315 mm				
material PE80-100			SDR 33								
D	S	T	P1	bead	P2	t 2	t 3	t 4	P5	t 5	
DIAMETER	WALL THICK.	TEMP.	BEAD FORMATION		HEATING UP		CHANGE OV.	RAMP	COOLING		
mm	mm	°C	bar	mm	bar	sec	sec	sec	bar	min	
90	2,7	220	1,3	0,5	0.. 0,1	27	0.. 5	5	1,3	6	
110	3,3	220	2,	0,5	0.. 0,1	33	0.. 5	5	2,	6	
125	3,8	220	2,6	0,5	0.. 0,2	38	0.. 5	5	2,6	6	
140	4,2	220	3,2	0,5	0.. 0,2	42	0.. 5	5	3,2	6	
160	4,8	219	4,2	1,0	0.. 0,3	48	0.. 5	5	4,2	7	
180	5,5	218	5,3	1,0	0.. 0,4	55	0.. 5	5	5,3	8	
200	6,1	218	6,5	1,0	0.. 0,4	61	0.. 6	6	6,5	8	
225	6,8	216	8,3	1,0	0.. 0,6	68	0.. 6	6	8,3	10	
250	7,6	215	10,2	1,5	0.. 0,7	76	0.. 6	6	10,2	11	
280	8,5	215	12,8	1,5	0.. 0,9	85	0.. 7	7	12,8	12	
315	9,5	213	16,2	1,5	0.. 1,1	95	0.. 7	7	16,2	13	

Warning!: in case of PE100 welding, temperature T must be increased to 220°C

PT 315 - DVS 2207-1			Cyl. section cm ² 8,46				Welding range 90-315 mm			
material PE80-100			SDR 27,6							
D	S	T	P1 bead		P2 t 2		t 3	t 4	P5 t 5	
DIAMETER	WALL THICK.	TEMP.	BEAD FORMATION		HEATING UP		CHANGE OV.	RAMP	COOLING	
mm	mm	°C	bar	mm	bar	sec	sec	sec	bar	min
90	3,3	220	1,6	0,5	0.. 0,1	33	0.. 5	5	1,6	6
110	4,0	220	2,4	0,5	0.. 0,2	40	0.. 5	5	2,4	6
125	4,5	220	3,	1,0	0.. 0,2	45	0.. 5	5	3,	6
140	5,1	219	3,8	1,0	0.. 0,3	51	0.. 5	5	3,8	7
160	5,8	218	5,	1,0	0.. 0,3	58	0.. 6	6	5,	8
180	6,5	217	6,3	1,0	0.. 0,4	65	0.. 6	6	6,3	9
200	7,2	216	7,8	1,5	0.. 0,5	72	0.. 6	6	7,8	10
225	8,2	215	9,8	1,5	0.. 0,7	82	0.. 6	6	9,8	11
250	9,1	214	12,2	1,5	0.. 0,8	91	0.. 7	7	12,2	12
280	10,1	213	15,2	1,5	0.. 1,0	101	0.. 7	7	15,2	14
315	11,4	212	19,3	1,5	0.. 1,3	114	0.. 8	8	19,3	15

PT 315 - DVS 2207-1			Cyl. section cm ² 8,46				Welding range 90-315 mm			
material PE80-100			SDR 26							
D	S	T	P1 bead		P2 t 2		t 3	t 4	P5 t 5	
DIAMETER	WALL THICK.	TEMP.	BEAD FORMATION		HEATING UP		CHANGE OV.	RAMP	COOLING	
mm	mm	°C	bar	mm	bar	sec	sec	sec	bar	min
90	3,5	220	1,7	0,5	0.. 0,1	35	0.. 5	5	1,7	6
110	4,2	220	2,5	0,5	0.. 0,2	42	0.. 5	5	2,5	6
125	4,8	220	3,2	1,0	0.. 0,2	48	0.. 5	5	3,2	6
140	5,4	219	4,	1,0	0.. 0,3	54	0.. 5	5	4,	7
160	6,2	217	5,3	1,0	0.. 0,4	62	0.. 6	6	5,3	9
180	6,9	216	6,7	1,0	0.. 0,4	69	0.. 6	6	6,7	10
200	7,7	215	8,2	1,5	0.. 0,5	77	0.. 6	6	8,2	11
225	8,7	214	10,4	1,5	0.. 0,7	87	0.. 7	7	10,4	12
250	9,6	213	12,9	1,5	0.. 0,9	96	0.. 7	7	12,9	13
280	10,8	212	16,1	1,5	0.. 1,1	108	0.. 8	8	16,1	15
315	12,1	211	20,4	2,0	0.. 1,4	121	0.. 8	8	20,4	16

PT 315 - DVS 2207-1			Cyl. section cm ² 8,46				Welding range 90-315 mm			
material PE80-100			SDR 22							
D	S	T	P1 bead		P2 t 2		t 3	t 4	P5 t 5	
DIAMETER	WALL THICK.	TEMP.	BEAD FORMATION		HEATING UP		CHANGE OV.	RAMP	COOLING	
mm	mm	°C	bar	mm	bar	sec	sec	sec	bar	min
90	4,1	220	2,	0,5	0.. 0,1	41	0.. 5	5	2,	6
110	5,0	219	2,9	1,0	0.. 0,2	50	0.. 5	5	2,9	7
125	5,7	218	3,8	1,0	0.. 0,3	57	0.. 5	5	3,8	8
140	6,4	217	4,7	1,0	0.. 0,3	64	0.. 6	6	4,7	9
160	7,3	216	6,2	1,5	0.. 0,4	73	0.. 6	6	6,2	10
180	8,2	215	7,8	1,5	0.. 0,5	82	0.. 6	6	7,8	11
200	9,1	214	9,7	1,5	0.. 0,6	91	0.. 7	7	9,7	13
225	10,2	213	12,2	1,5	0.. 0,8	102	0.. 7	7	12,2	14
250	11,4	212	15,1	1,5	0.. 1,0	114	0.. 8	8	15,1	15
280	12,7	210	18,9	2,0	0.. 1,3	127	0.. 8	8	18,9	17
315	14,3	209	24,	2,0	0.. 1,6	143	0.. 9	9	24,	19

Warning!: in case of PE100 welding, temperature T must be increased to 220°C

PT 315 - DVS 2207-1			Cyl. section cm ² 8,46				Welding range 90-315 mm				
material PE80-100			SDR 21								
D	S	T	P1 bead		P2 t 2		t 3	t 4	P5 t 5		
DIAMETER	WALL THICK.	TEMP.	BEAD FORMATION		HEATING UP		CHANGE OV.	RAMP	COOLING		
mm	mm	°C	bar	mm	bar	sec	sec	sec	bar	min	
90	4,3	220	2,	0,5	0.. 0,1	43	0.. 5	5	2,	6	
110	5,2	219	3,1	1,0	0.. 0,2	52	0.. 5	5	3,1	7	
125	6,0	218	3,9	1,0	0.. 0,3	60	0.. 6	6	3,9	8	
140	6,7	217	4,9	1,0	0.. 0,3	67	0.. 6	6	4,9	9	
160	7,6	215	6,5	1,5	0.. 0,4	76	0.. 6	6	6,5	11	
180	8,6	214	8,2	1,5	0.. 0,5	86	0.. 7	7	8,2	12	
200	9,5	213	10,1	1,5	0.. 0,7	95	0.. 7	7	10,1	13	
225	10,7	212	12,8	1,5	0.. 0,9	107	0.. 7	7	12,8	14	
250	11,9	211	15,8	1,5	0.. 1,1	119	0.. 8	8	15,8	16	
280	13,3	210	19,8	2,0	0.. 1,3	133	0.. 8	9	19,8	18	
315	15,0	209	25,1	2,0	0.. 1,7	150	0.. 9	9	25,1	19	

PT 315 - DVS 2207-1			Cyl. section cm ² 8,46				Welding range 90-315 mm				
material PE80-100			SDR 17,6								
D	S	T	P1 bead		P2 t 2		t 3	t 4	P5 t 5		
DIAMETER	WALL THICK.	TEMP.	BEAD FORMATION		HEATING UP		CHANGE OV.	RAMP	COOLING		
mm	mm	°C	bar	mm	bar	sec	sec	sec	bar	min	
90	5,1	219	2,4	1,0	0.. 0,2	51	0.. 5	5	2,4	7	
110	6,3	217	3,6	1,0	0.. 0,2	63	0.. 6	6	3,6	9	
125	7,1	216	4,7	1,5	0.. 0,3	71	0.. 6	6	4,7	10	
140	8,0	215	5,8	1,5	0.. 0,4	80	0.. 6	6	5,8	11	
160	9,1	214	7,6	1,5	0.. 0,5	91	0.. 7	7	7,6	13	
180	10,2	213	9,7	1,5	0.. 0,6	102	0.. 7	7	9,7	14	
200	11,4	212	11,9	1,5	0.. 0,8	114	0.. 8	8	11,9	15	
225	12,8	210	15,1	2,0	0.. 1,0	128	0.. 8	8	15,1	17	
250	14,2	209	18,6	2,0	0.. 1,2	142	0.. 9	9	18,6	19	
280	15,9	208	23,4	2,0	0.. 1,6	159	0.. 9	10	23,4	20	
315	17,9	207	29,6	2,0	0.. 2,0	179	0.. 10	11	29,6	23	

PT 315 - DVS 2207-1			Cyl. section cm ² 8,46				Welding range 90-315 mm				
material PE80-100			SDR 17								
D	S	T	P1 bead		P2 t 2		t 3	t 4	P5 t 5		
DIAMETER	WALL THICK.	TEMP.	BEAD FORMATION		HEATING UP		CHANGE OV.	RAMP	COOLING		
mm	mm	°C	bar	mm	bar	sec	sec	sec	bar	min	
90	5,3	219	2,5	1,0	0.. 0,2	53	0.. 5	5	2,5	7	
110	6,5	217	3,7	1,0	0.. 0,2	65	0.. 6	6	3,7	9	
125	7,4	216	4,8	1,5	0.. 0,3	74	0.. 6	6	4,8	10	
140	8,2	215	6,	1,5	0.. 0,4	82	0.. 6	6	6,	11	
160	9,4	214	7,9	1,5	0.. 0,5	94	0.. 7	7	7,9	13	
180	10,6	212	10,	1,5	0.. 0,7	106	0.. 7	7	10,	14	
200	11,8	211	12,3	1,5	0.. 0,8	118	0.. 8	8	12,3	16	
225	13,2	210	15,6	2,0	0.. 1,0	132	0.. 8	9	15,6	17	
250	14,7	209	19,3	2,0	0.. 1,3	147	0.. 9	9	19,3	19	
280	16,5	208	24,2	2,0	0.. 1,6	165	0.. 9	10	24,2	21	
315	18,5	206	30,6	2,0	0.. 2,0	185	0.. 10	11	30,6	23	

Warning!: in case of PE100 welding, temperature T must be increased to 220°C

PT 315 - DVS 2207-1			Cyl. section cm ² 8,46				Welding range 90-315 mm				
material PE80-100			SDR 13,6								
D	S	T	P1 bead		P2 t 2		t 3	t 4	P5 t 5		
DIAMETER	WALL THICK.	TEMP.	BEAD FORMATION		HEATING UP		CHANGE OV.	RAMP	COOLING		
mm	mm	°C	bar	mm	bar	sec	sec	sec	bar	min	
90	6,6	217	3,1	1,0	0.. 0,2	66	0.. 6	6	3,1	9	
110	8,1	215	4,6	1,5	0.. 0,3	81	0.. 6	6	4,6	11	
125	9,2	214	5,9	1,5	0.. 0,4	92	0.. 7	7	5,9	13	
140	10,3	213	7,4	1,5	0.. 0,5	103	0.. 7	7	7,4	14	
160	11,8	211	9,7	1,5	0.. 0,6	118	0.. 8	8	9,7	16	
180	13,2	210	12,3	2,0	0.. 0,8	132	0.. 8	9	12,3	17	
200	14,7	209	15,2	2,0	0.. 1,0	147	0.. 9	9	15,2	19	
225	16,5	208	19,2	2,0	0.. 1,3	165	0.. 9	10	19,2	21	
250	18,4	206	23,7	2,0	0.. 1,6	184	0.. 10	11	23,7	23	
280	20,6	205	29,7	2,5	0.. 2,0	206	0.. 10	12	29,7	26	
315	23,2	204	37,6	2,5	0.. 2,5	232	0.. 11	13	37,6	29	

PT 315 - DVS 2207-1			Cyl. section cm ² 8,46				Welding range 90-315 mm				
material PE80-100			SDR 11								
D	S	T	P1 bead		P2 t 2		t 3	t 4	P5 t 5		
DIAMETER	WALL THICK.	TEMP.	BEAD FORMATION		HEATING UP		CHANGE OV.	RAMP	COOLING		
mm	mm	°C	bar	mm	bar	sec	sec	sec	bar	min	
90	8,2	215	3,7	1,5	0.. 0,2	82	0.. 6	6	3,7	11	
110	10,0	213	5,6	1,5	0.. 0,4	100	0.. 7	7	5,6	14	
125	11,4	212	7,2	1,5	0.. 0,5	114	0.. 8	8	7,2	15	
140	12,7	210	9,	2,0	0.. 0,6	127	0.. 8	8	9,	17	
160	14,5	209	11,8	2,0	0.. 0,8	145	0.. 9	9	11,8	19	
180	16,4	208	14,9	2,0	0.. 1,0	164	0.. 9	10	14,9	21	
200	18,2	207	18,4	2,0	0.. 1,2	182	0.. 10	11	18,4	23	
225	20,5	205	23,3	2,5	0.. 1,6	205	0.. 10	12	23,3	26	
250	22,7	204	28,8	2,5	0.. 1,9	227	0.. 11	13	28,8	28	
280	25,5	203	36,1	2,5	0.. 2,4	255	0.. 12	14	36,1	31	
315	28,6	203	45,7	3,0	0.. 3,0	286	0.. 13	15	45,7	35	

PT 315 - DVS 2207-1			Cyl. section cm ² 8,46				Welding range 90-315 mm				
material PE80-100			SDR 9								
D	S	T	P1 bead		P2 t 2		t 3	t 4	P5 t 5		
DIAMETER	WALL THICK.	TEMP.	BEAD FORMATION		HEATING UP		CHANGE OV.	RAMP	COOLING		
mm	mm	°C	bar	mm	bar	sec	sec	sec	bar	min	
90	10,0	213	4,5	1,5	0.. 0,3	100	0.. 7	7	4,5	14	
110	12,2	211	6,7	2,0	0.. 0,4	122	0.. 8	8	6,7	16	
125	13,9	210	8,6	2,0	0.. 0,6	139	0.. 9	9	8,6	18	
140	15,6	208	10,8	2,0	0.. 0,7	156	0.. 9	10	10,8	20	
160	17,8	207	14,1	2,0	0.. 0,9	178	0.. 10	10	14,1	23	
180	20,0	206	17,8	2,5	0.. 1,2	200	0.. 10	11	17,8	25	
200	22,2	205	22,	2,5	0.. 1,5	222	0.. 11	12	22,	28	
225	25,0	203	27,8	2,5	0.. 1,9	250	0.. 12	14	27,8	31	
250	27,8	203	34,4	3,0	0.. 2,3	278	0.. 13	15	34,4	34	
280	31,1	202	43,1	3,0	0.. 2,9	311	0.. 14	16	43,1	38	
315	35,0	201	54,6	3,0	0.. 3,6	350	0.. 15	18	54,6	43	

Warning!: in case of PE100 welding, temperature T must be increased to 220°C

PT 315 - DVS 2207-1			Cyl. section cm ² 8,46				Welding range 90-315 mm				
material PE80-100			SDR 7,4								
D	S	T	P1 bead		P2 t 2		t 3	t 4	P5 t 5		
DIAMETER	WALL THICK.	TEMP.	BEAD FORMATION		HEATING UP		CHANGE OV.	RAMP	COOLING		
mm	mm	°C	bar	mm	bar	sec	sec	sec	bar	min	
90	12,2	211	5,3	2,0	0.. 0,4	122	0.. 8	8	5,3	16	
110	14,9	209	7,9	2,0	0.. 0,5	149	0.. 9	9	7,9	19	
125	16,9	208	10,2	2,0	0.. 0,7	169	0.. 9	10	10,2	22	
140	18,9	206	12,8	2,0	0.. 0,9	189	0.. 10	11	12,8	24	
160	21,6	205	16,7	2,5	0.. 1,1	216	0.. 11	12	16,7	27	
180	24,3	204	21,1	2,5	0.. 1,4	243	0.. 11	13	21,1	30	
200	27,0	203	26,	3,0	0.. 1,7	270	0.. 12	14	26,	33	
225	30,4	202	32,9	3,0	0.. 2,2	304	0.. 14	16	32,9	37	
250	33,8	202	40,7	3,0	0.. 2,7	338	0.. 15	18	40,7	41	
280	37,8	201	51,	3,5	0.. 3,4	378	0.. 16	19	51,	46	
315	42,6	201	64,6	3,5	0.. 4,3	426	0.. 18	22	64,6	51	

Warning!: in case of PE100 welding, temperature T must be increased to 220°C

7. Welding Parameters for PP pipes & fittings DVS norm version 2207-11

material PP		SDR 41	PP		Cylinder section cm ² 8,46					
D	S	Temp.	P1	bead	P2	t 2	t 3	t 4	P5	t 5
mm	mm	° C	bar	mm	bar	sec	sec	sec	bar	sec
90	2,2	210°	0,7	0,5	0,1	135	5	6	0,7	360
110	2,7	210°	1,1	0,5	0,1	135	5	6	1,1	360
125	3,1	210°	1,4	0,5	0,1	135	5	6	1,4	360
140	3,5	210°	1,8	0,5	0,2	135	5	6	1,8	360
160	3,9	210°	2,3	0,5	0,2	135	5	6	2,3	360
180	4,4	210°	2,9	0,5	0,3	135	5	6	2,9	360
200	4,9	210°	3,5	0,5	0,4	141	5	6	3,5	418
225	5,5	210°	4,5	0,5	0,4	151	5	6	4,5	504
250	6,1	210°	5,5	0,5	0,6	161	6	7	5,5	590
280	6,9	210°	7,0	0,5	0,7	173	6	7	7,0	706
315	7,7	210°	8,8	1	0,9	185	6	8	8,8	787
material PP		SDR 33	PP		Cylinder section cm ² 8,46					
D	S	Temp.	P1	bead	P2	t 2	t 3	t 4	P5	t 5
mm	mm	° C	bar	mm	bar	sec	sec	sec	bar	sec
90	2,8	210°	0,9	0,5	0,1	135	5	6	0,9	360
110	3,5	210°	1,4	0,5	0,1	135	5	6	1,4	360
125	3,9	210°	1,8	0,5	0,2	135	5	6	1,8	360
140	4,4	210°	2,2	0,5	0,2	135	5	6	2,2	360
160	5	210°	2,9	0,5	0,3	143	5	6	2,9	432
180	5,6	210°	3,6	0,5	0,4	153	5	6	3,6	518
200	6,2	210°	4,5	0,5	0,4	162	6	7	4,5	605
225	7	210°	5,7	0,5	0,6	175	6	7	5,7	720
250	7,8	210°	7,0	1	0,7	186	6	8	7,0	797
280	8,7	210°	8,8	1	0,9	199	6	8	8,8	883
315	9,8	210°	11,1	1	1,1	214	7	9	11,1	989
material PP		SDR 26	PP		Cylinder section cm ² 8,46					
D	S	Temp.	P1	bead	P2	t 2	t 3	t 4	P5	t 5
mm	mm	° C	bar	mm	bar	sec	sec	sec	bar	sec
90	3,5	210°	1,1	0,5	0,1	135	5	6	1,1	360
110	4,3	210°	1,7	0,5	0,2	135	5	6	1,7	360
125	4,9	210°	2,2	0,5	0,2	141	5	6	2,2	418
140	5,4	210°	2,7	0,5	0,3	149	5	6	2,7	490
160	6,2	210°	3,5	0,5	0,4	162	6	7	3,5	605
180	7	210°	4,5	0,5	0,4	175	6	7	4,5	720
200	7,7	210°	5,5	1	0,5	185	6	8	5,5	787
225	8,7	210°	7,0	1	0,7	199	6	8	7,0	883
250	9,7	210°	8,7	1	0,9	213	7	9	8,7	979
280	10,8	210°	10,8	1	1,1	228	7	10	10,8	1085
315	12,2	210°	13,7	1	1,4	247	7	11	13,7	1217

material PP		SDR	17.6		PP		Cylinder section cm ² 8,46				
D	S	Temp.	P1	bead	P2	t 2	t 3	t 4	P5	t 5	
mm	mm	° C	bar	mm	bar	sec	sec	sec	bar	sec	
90	5,1	210°	1,6	0,5	0,2	145	5	6	1,6	446	
110	6,3	210°	2,4	0,5	0,2	164	6	7	2,4	619	
125	7,1	210°	3,1	1	0,3	176	6	7	3,1	730	
140	8	210°	3,9	1	0,4	189	6	8	3,9	816	
160	9,1	210°	5,1	1	0,5	204	6	9	5,1	922	
180	10,2	210°	6,4	1	0,6	220	7	10	6,4	1027	
200	11,4	210°	8,0	1	0,8	237	7	11	8,0	1142	
225	12,8	210°	10,1	1	1,0	255	7	12	10,1	1269	
250	14,2	210°	12,4	1	1,2	271	8	13	12,4	1389	
280	15,9	210°	15,6	1	1,6	292	8	14	15,6	1534	
315	17,9	210°	19,7	1	2,0	316	9	16	19,7	1706	
material PP		SDR	11		PP		Cylinder section cm ² 8,46				
D	S	Temp.	P1	bead	P2	t 2	t 3	t 4	P5	t 5	
mm	mm	° C	bar	mm	bar	sec	sec	sec	bar	sec	
90	8,2	210°	2,5	1	0,2	192	6	8	2,5	835	
110	10	210°	3,7	1	0,4	217	7	9	3,7	1008	
125	11,4	210°	4,8	1	0,5	237	7	11	4,8	1142	
140	12,8	210°	6,0	1	0,6	255	7	12	6,0	1269	
160	14,6	210°	7,9	1	0,8	276	8	13	7,9	1423	
180	16,4	210°	10,0	1	1,0	298	8	15	10,0	1577	
200	18,2	210°	12,3	1	1,2	319	9	16	12,3	1731	
225	20,5	210°	15,6	1,5	1,6	345	9	18	15,6	1929	
250	22,8	210°	19,2	1,5	1,9	368	10	20	19,2	2126	
280	25,5	210°	24,1	1,5	2,4	395	11	22	24,1	2357	
315	28,7	210°	30,5	2	3,0	422	12	24	30,5	2621	

8. Maintenance

8.1 Basic machine

It's strongly suggested to keep always the machine clean with particular care of the bolts and the cylinder's heads .
Keep attention while insert the electric facing tool and the PTFE coated heating mirror avoiding to damage the machine's slide bars.

8.2 Facing tool

It's strongly suggested to keep always clean the blades and wash the pulleys by using a detergent.
At regular intervals carry out a complete cleaning operation with a internal lubrication as well , as per following instructions:

- Remove the carter by enlighten the screws
- Take out the shavings might be present
- Enlighten the screws and remove the pulley and carry out the cleaning and the lubrication of the bearing .

8.3 Heating mirror

Please take care on handling the heating mirror in order to avoid damages to the PTFE coating.
Keep always clean the PTFE coated surfaces, cleaning must be done with surface still warm by using a soft cloth or paper, avoiding abrasive materials in that might damage the PTFE coated surfaces. To achieve this operation you must wear protective gloves
At regular intervals we suggest you to:

- Clean the surfaces by a quick evaporation detergent (alcohol)
- Check the tightening of the screws and the cable and plug condition
- Verify the temperature differences on the heating mirror surfaces according to the following table DVS norm 2208-1 here following table:

WELDING SURFACE OF THE MIRROR	ΔT_1	ΔT_2	ΔT_{TOT}
< 250 cm ²	5 °C	3 °C	8 °C
250 2000 cm ²	7 °C	3 °C	10 °C
2000 5000 cm ²	11 °C	3 °C	14 °C
5000 12000 cm ²	13 °C	3 °C	16 °C
> 12000	14 °C	3 °C	17 °C

ΔT_1 Maximum temperature difference on the mirror surface

ΔT_2 Temperature deviation for the adjustment

ΔT_{TOT} Maximum accepted difference on the mirror surface

8.4 Hydraulic unit

The hydraulic unit does not need particular maintenance nevertheless the following instructions must be followed:

1. Check periodically the oil level and in case add with oil type:
ESSO NUTO H 68,SHELL TELLUS 68,MOBIL DTE 26,AGIP OSO 46
The level should not be lower than 5 cm from the tank maximum level.
A checking every 15 working days it's strongly suggested.
2. Replace totally the oil every 6 months or after 500 working hours.
3. Keep clean the hydraulic unit with particular care on the tank and quick couplings.
4. Avoid to operate with rain or high humidity (95 RH %) value and temperatures below 0°C or above + 50°C.
5. During the transport it's suggested to put the metal plug instead of the plastic one.

9. Troubleshooting and relative solutions

9.1 Basic machine

a) The quick couplings can't be connected:

Check if there's pressure on the hoses in case bring the pressure to zero (see relative instructions)
Check if the quick couplings are clean

b) The machine does not move in linear way:

The above mentioned situation could happen in case of clash or in case the machine with the pipe assembled in has been fiercely moved. If the damaged part can be located proceed to the substitution, however if the trouble still remain, kindly contact the Customer Service

c) The nut/s is/are seizure:

Replace the complete tie rod bolt

d) Oil leakage in the cylinders:

Consult the **Customer Service Dept.** verify if it's necessary to replace the cylinders or just the gasket

9.2 Facing tool

a) The engine does not start:

Unplug the facing tool and check the electric connections and the safety micro-switch (shown by the arrow)

b) The engine is burnt out:

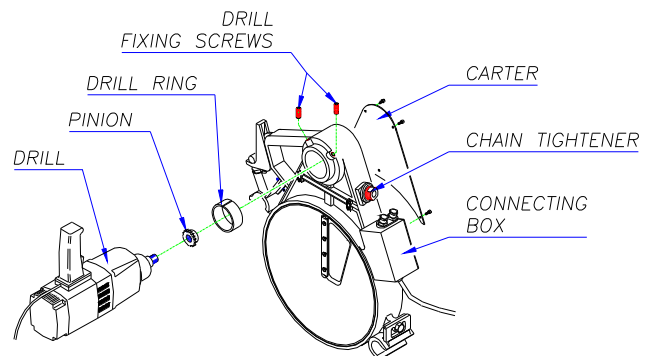
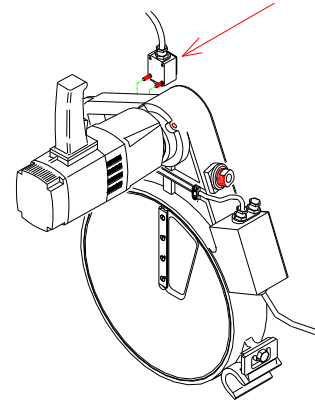
In case it's need to replace the engine the following operations must be done:

- Unplug the facing tool
- Disconnect the drill from the connecting box
- Remove the carter
- By acting on the appropriate screw slack the chain tightener
- Carefully remove the chain from the pinion avoiding to remove it from the crown gear
- Slack the drill fixing screws
- Remove the drill
- Remove the drill ring
- Remove the pinion from the drill engine
- Mount the new drill engine following the above procedure in a reverse way

c) The blades do not remove material:

Wear and tear of one cutting side enlighten the screws and turn the blades using the other side.

Wear and tear of both cutting side of the blades replace with original spare parts.



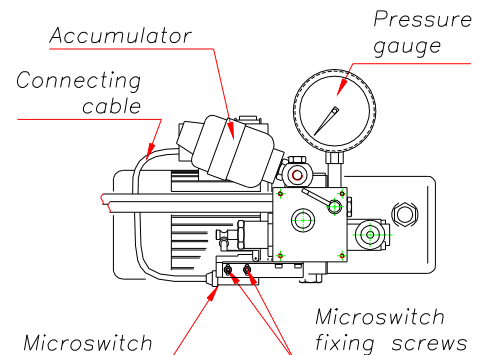
9.3 Hydraulic unit

a) The engine does not start:

Check that the hydraulic unit engine is switched on

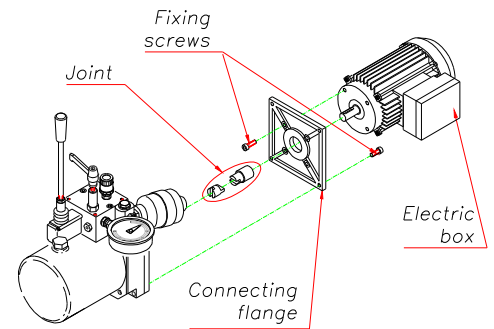
The microswitch is damaged or wrongly adjusted

- To adjust the microswitch you must enlighten the screws show in the figure below and bring the lever A to position A3.
- Move the microswitch towards the internal of the hydraulic until the engine start and tighten the fixing screw.
- Check that in position A1 the engine is switched off.
- In different case adjust the microswitch position again.



b) The engine replacement:

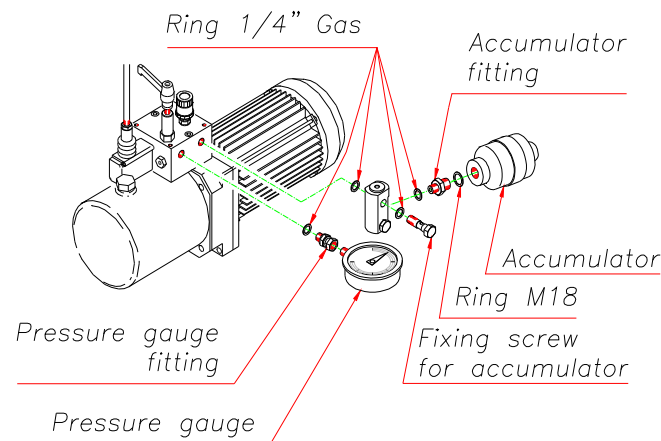
- Check that the electric plug is disconnected
- Open the electric connections box and disconnect the micro-switch cable
- Enlighten the screws and take out the engine
- Take out the joints and insert them on the new engine
- Reassemble the engine taking care that the joints are perfectly located on the own housings
- Check the anti clockwise rotation of the electric fan

**c) If the hydraulic unit cannot increase the pressure reasons could be :**

- Check the oil level
- The lever **E** is not closed.
- Check if they are some leakage on hydraulic circuit.

d) If the hydraulic unit cannot maintain a constant pressure reasons could be :

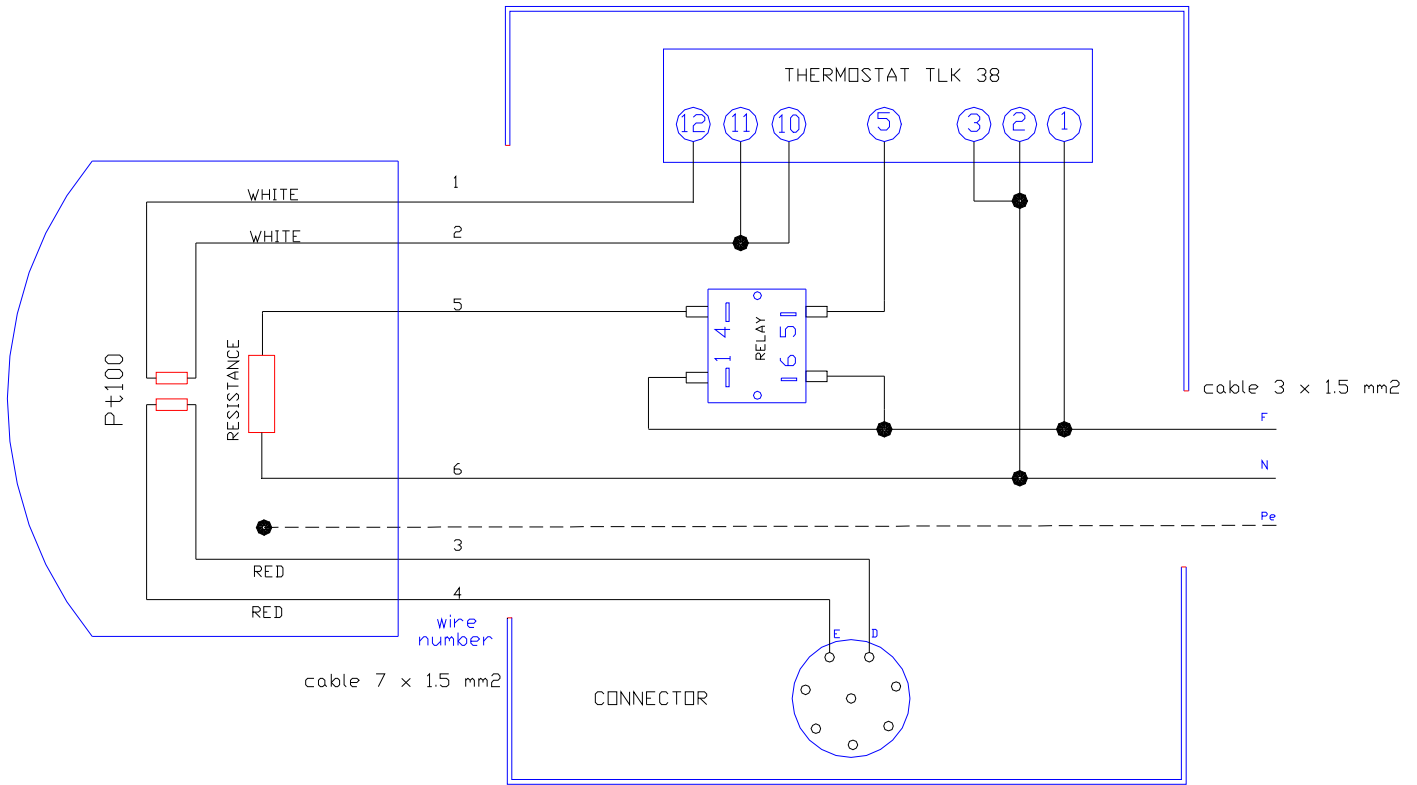
- The lever **E** is not closed.
- The accumulator is down or damaged. To replace the pressure gauge follows the below steps:
 1. Bring the pressure to zero and enlighten the bolt
 2. Take out the fitting and replace the damaged accumulator with the new one
 3. Tighten the bolt

**9.4 Heating mirror****a) The heating mirror does not warm up:**

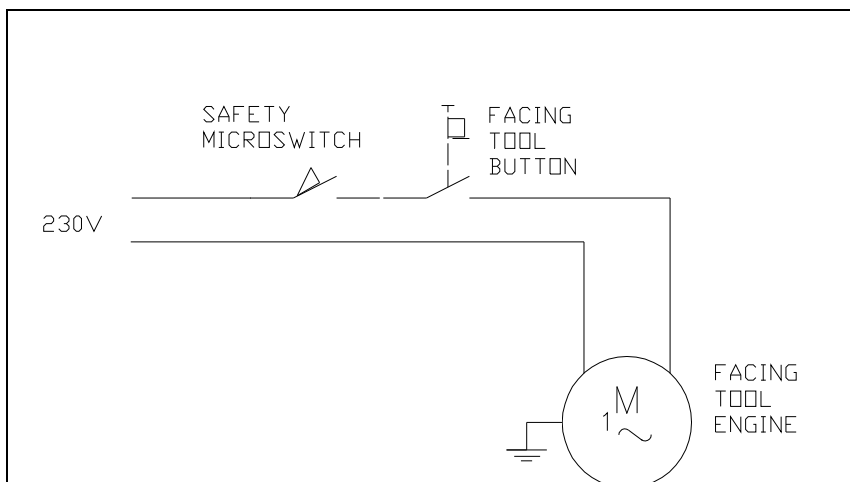
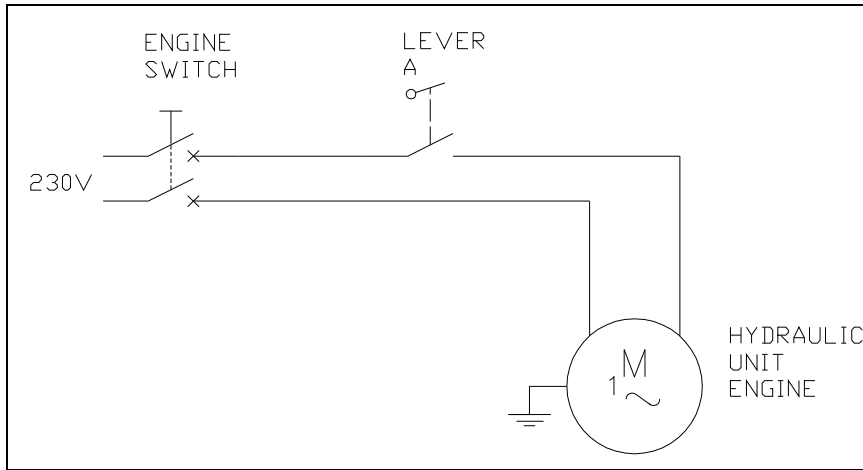
1. Check if the light is switched off , in case check the plug
2. The light is switched on, probably a wire disconnected , check the contacts as follows:
 - Take off the plug from the power
 - Unscrew the nuts and take out the thermostat support
 - Unscrew the screws and remove the cap
 - Check all the electric connections and reassemble
 - Unscrew the screws and take out the cover
 - Check all the electric connections and reassemble
3. By utilizing a Tester check if all the resistances are in good condition ,if one or more are broken the heating mirror must be changed
4. By utilizing a tester check the working of the thermostat, in case substitute
5. For additional information on electric components, please refer to our **Technical Dept.**

10. Drawings

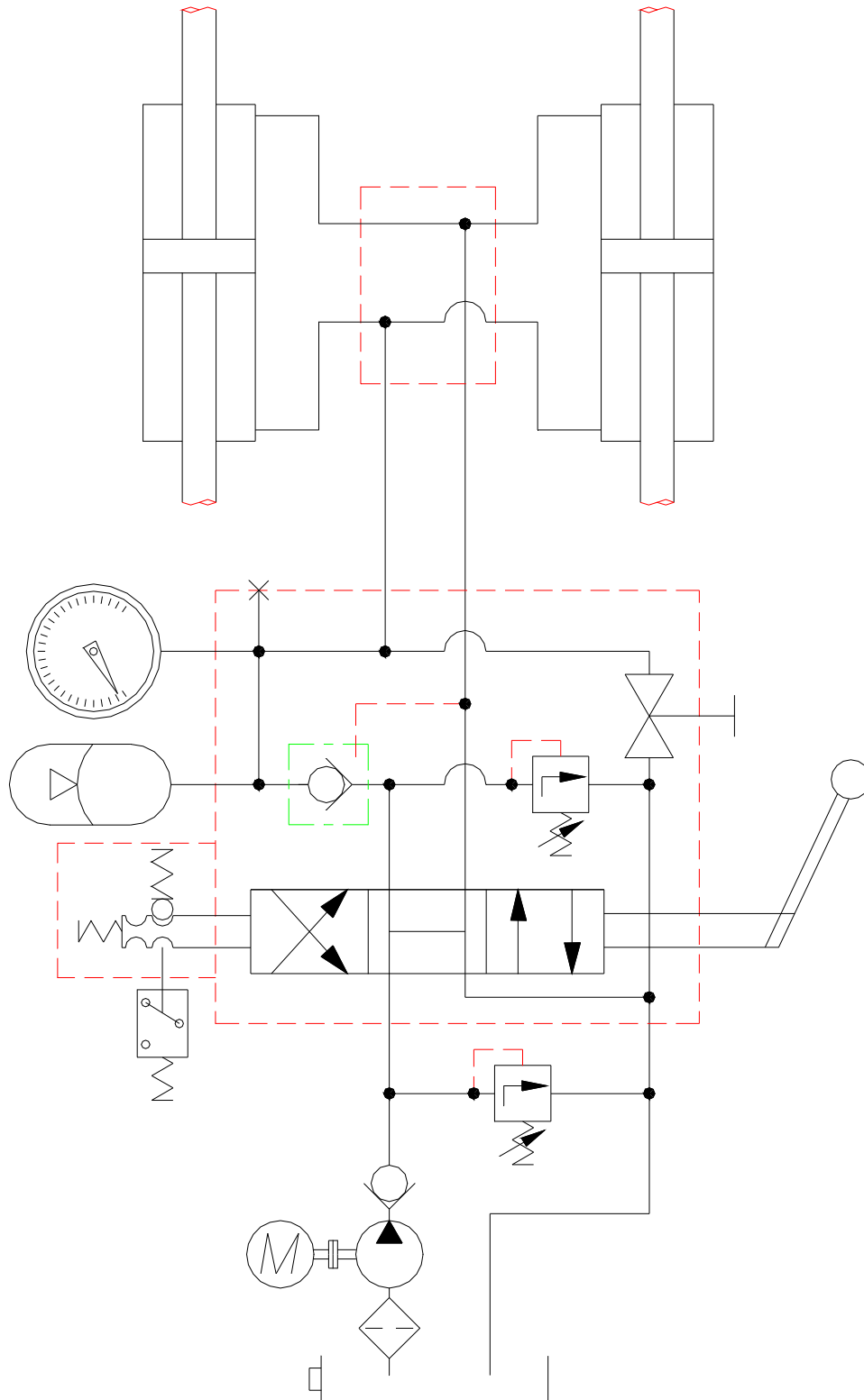
10.1 Thermostat connection



10.2 Facing tool and hydraulic unit engines connection

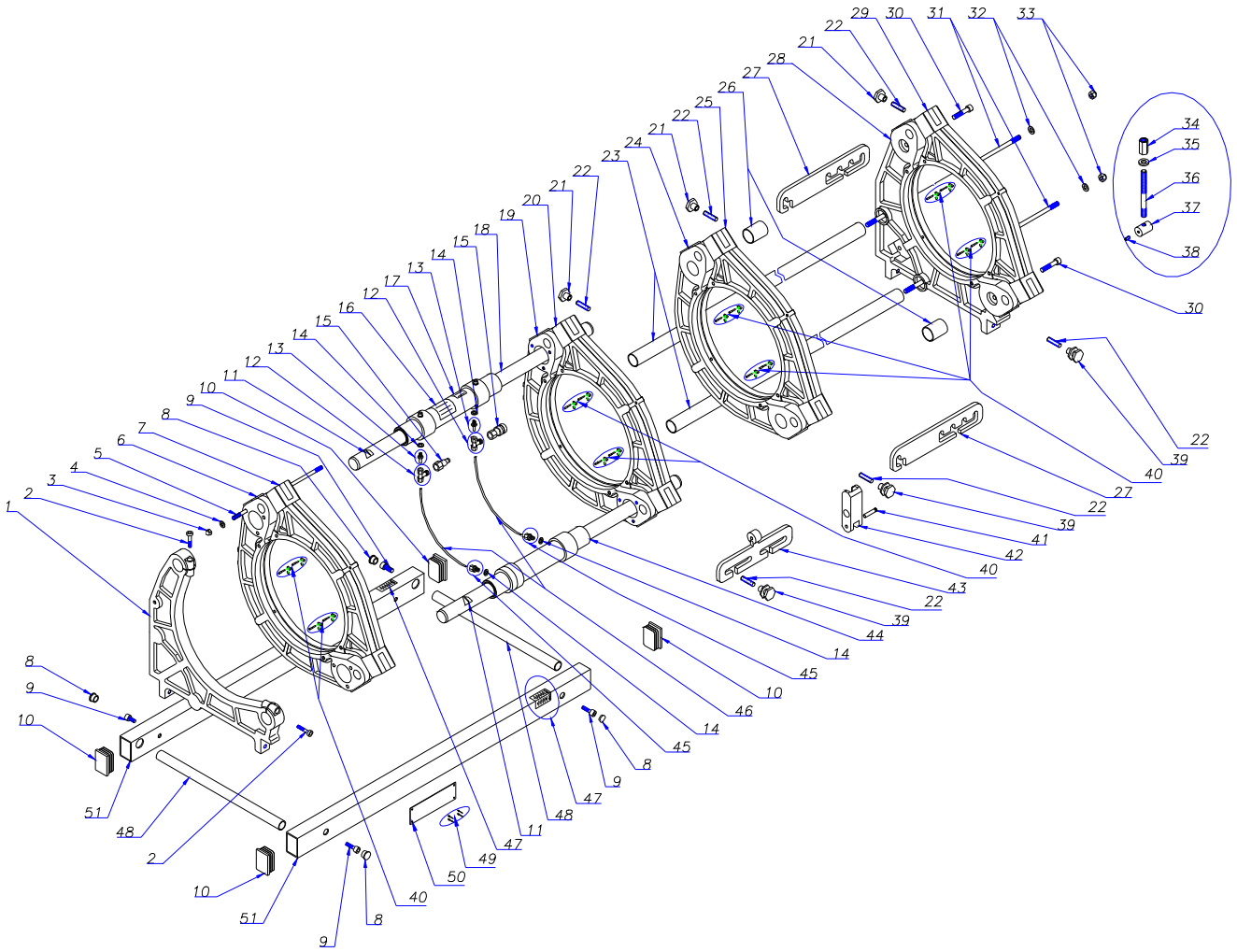


10.3 Hydraulic plan



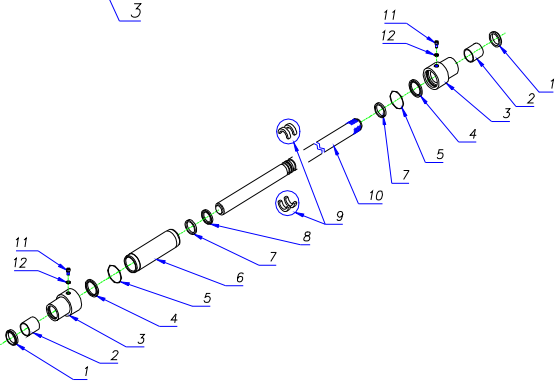
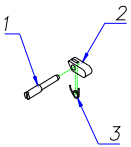
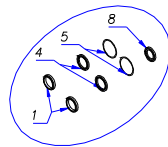
11. Exploded view and spare parts list

PT 315 BASIC MACHINE

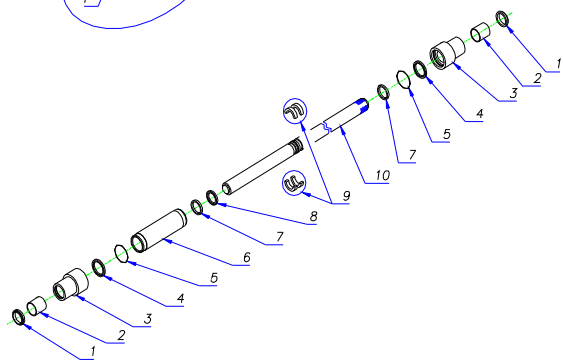


PT 315 GASKET KIT (1 cylinder)

PT315 BEEP-BEEP SYSTEM



PT315 UPPER CYLINDER

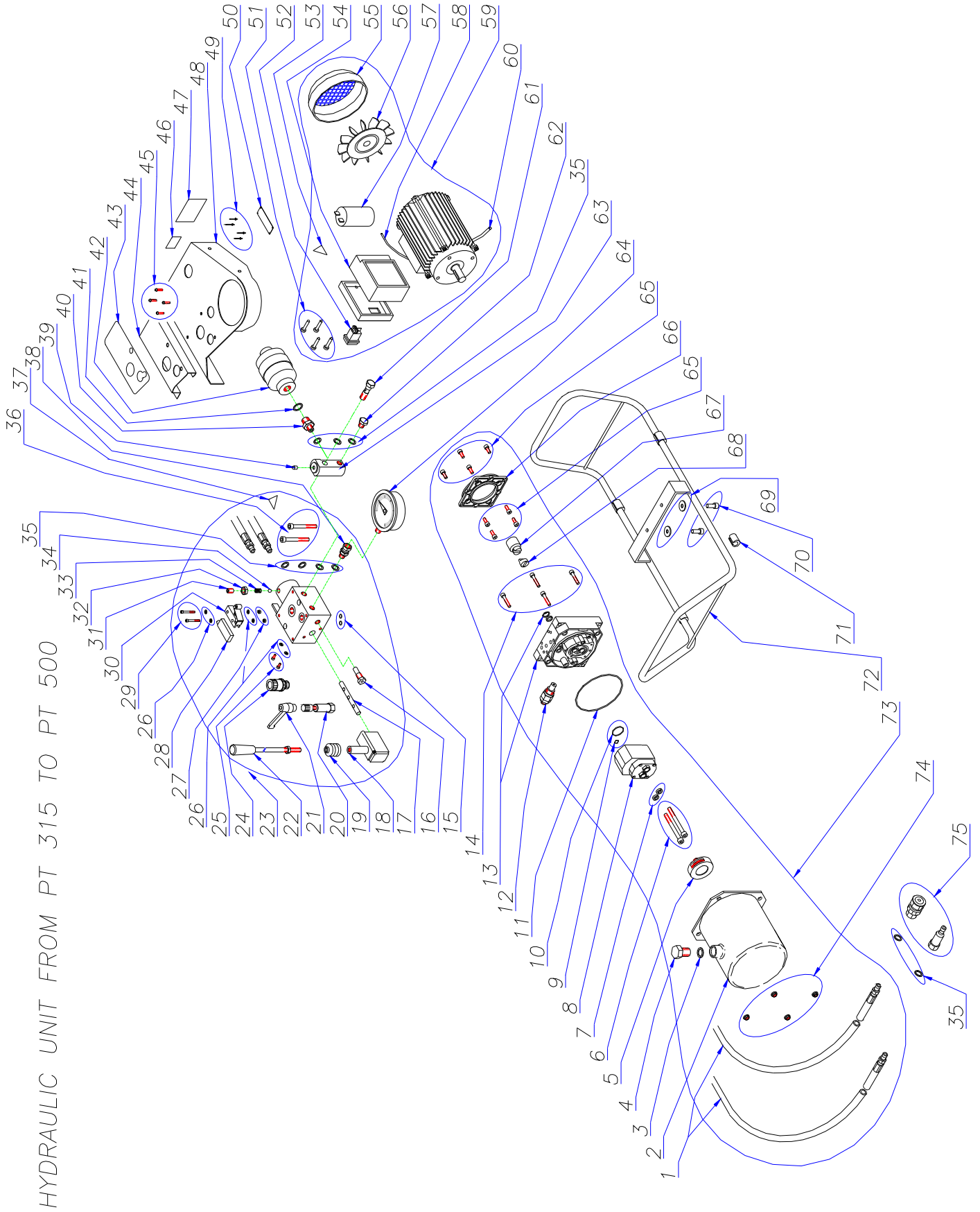


PT315 LOWER CYLINDER

PT 315 Basic Machine , Code: PT315B				PT 315 Basic Machine , Code: PT315B			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT315B01	side support	1	28+29	PT315B28+29	Fourth clamp c/w support (28+29)	1
2	PT315B02	screw TCEI UNI 5931 8.8 8x35	2	30	PT315B30	Screw TCEI UNI 5931 8.8 10x50z	2
3	PT315B03	Nut fixing cylinder's tie rod	6	31	PT315B31	Third bar tie rod	2
4	PT315B04	Washer uni 6592 m 8z	6	32	PT315B32	washer UNI 6592 m 10 z	2
5	PT315B05	cylinder's tie rod	6	33	PT315B33	blind nut UNI 5721 8 m 10 z	2
6+7	PT315B06+07	first clamp (06+07)	1	34	PT315B34	Nut tie rods	8
8	PT315B08	Covers ABS 22X2	4	35	PT315B35	Washer for tie rods	8
9	PT315B09	Screw TCEI UNI 5931 8.8 10x20z	4	36	PT315B36	Tie rod closer	8
10	PT315B10	Black plastic plug 60x30	4	37	PT315B37	Tie rod pivot	8
11	PT315B11	Danger label	2	38	PT315B38	Screw STEI UNI 5923 45h 8x16z	8
12	PT315B12	Tee fitting TN 96 10 LR	2	39	PT315B39	Front nut for spacer	3
13	PT315B13	Fitting TN 126 10 LR	2	40	PT315B40	Beep beep coupler system	16
14	PT315B14	washer bonded 1/4	4	41	PT315B41	H. mirror disconnecting device pin	1
15	PT315B15	quick coupling M/F 1/4	1	42	PT315B42	H.mirror disconnecting dev. hooker	1
16	PT315B16	Technical data label	1	43	PT315B43	H.mirror disconnecting dev. body	1
17	PT315B17	Serial no. label	1	44	PT315B44	Lower Cylinder	1
18	PT315B18	Upper Cylinder	1	45	PT315B45	Fitting TN 92 10 LR (1/4)	2
19+20	PT315B19+20	Second clamp (19+20)	1	46	PT315B46	Oil collector hose	2
21	PT315B21	Back nut for spacer	3	47	PT315B47	Stop limit label	2
22	PT315B22	Screw STEI UNI 5923 45h 10x40 z	6	48	PT315B48	transport pipe	2
23	PT315B23	Third bar	2	49	PT315B49	rivet tt UNI 9200 3x7 all	4
24+25	PT315B24+25	Third clamp (24+25)	1	50	PT315B50	ITS – TECNODUE label	1
26	PT315B26	35.40 FB1 bush	2	51	PT315B51	Ground support	2
27	PT315B27	Spacer	2				

PT 315 Upper Cylinder , Code: PT315B18				PT 315 Lower Cylinder , Code: PT315B44			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT315B1801	Gasket GHK 313 35.0 43.6 5.3 38.0	2	1	PT315B4401	Gasket GHK 313 35.0 43.6 5.3 38.0	2
2	PT315B1802	35.40 FB1 bush	2	2	PT315B4402	35.40 FB1 bush	2
3	PT315B1803	Upper cylinder head	2	3	PT315B4403	Lower cylinder head	2
4	PT315B1804	Gasket I/GR 0350 NCR	2	4	PT315B4404	Gasket I/GR 0350 NCR	2
5	PT315B1805	O-ring 3200 NBR 2.62x50.47 (136)	2	5	PT315B4405	O-ring 3200 NBR 2.62x50.47 (136)	2
6	PT315B1806	Cylinder's housing	1	6	PT315B4406	Cylinder's housing	1
7	PT315B1807	Gasket ring	2	7	PT315B4407	Gasket ring	2
8	PT315B1808	Gasket E/GR 0420 NPS	1	8	PT315B4408	Gasket E/GR 0420 NPS	1
9	PT315B1809	Stopper ring	2	9	PT315B4409	Stopper ring	2
10	PT315B1810	Cylinder's stem	1	10	PT315B4410	Cylinder's stem	1
11	PT315B1811	Screw TCEI UNI 5931 8.8 6x10 z	2				
12	PT315B1812	Washer 6x12x1,5	2				

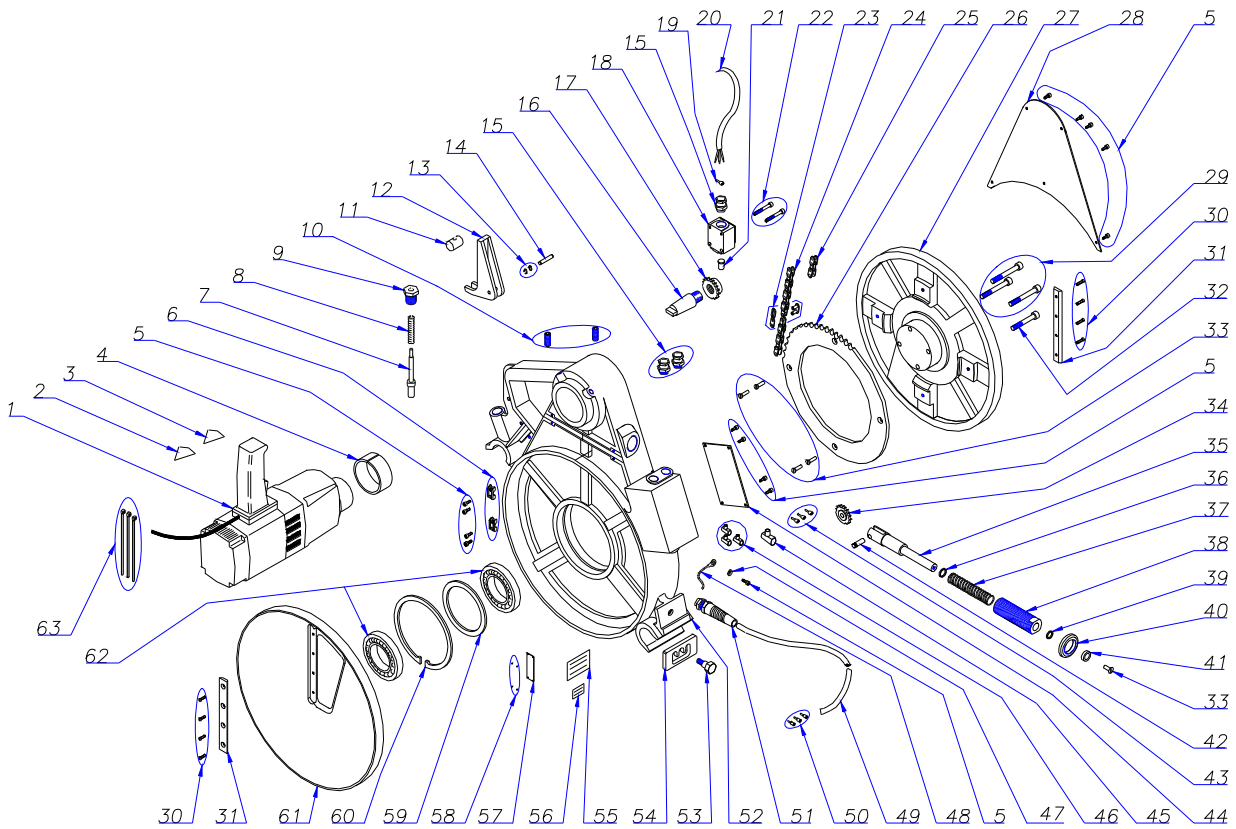
Beep Beep coupler system, Code: PT315B40				PT 315 Gasket kit, Code: PT315B44KT			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT315B4001	Pivot for beep beep coupler system	1	1	PT315B4401	Gasket GHK 313 35.0 43.6 5.3 38.0	2
2	PT315B4002	Hook for beep beep coupler system	1	4	PT315B4404	Gasket I/GR 0350 NCR	2
3	PT315B4003	Spring for beep beep coupler system	1	5	PT315B4405	O-ring 3200 NBR 70 2.62x50.47 (136)	2
				8	PT315B4408	Gasket E/GR 0420 NPS	1



HYDRAULIC UNIT FROM PT 315 TO PT 500

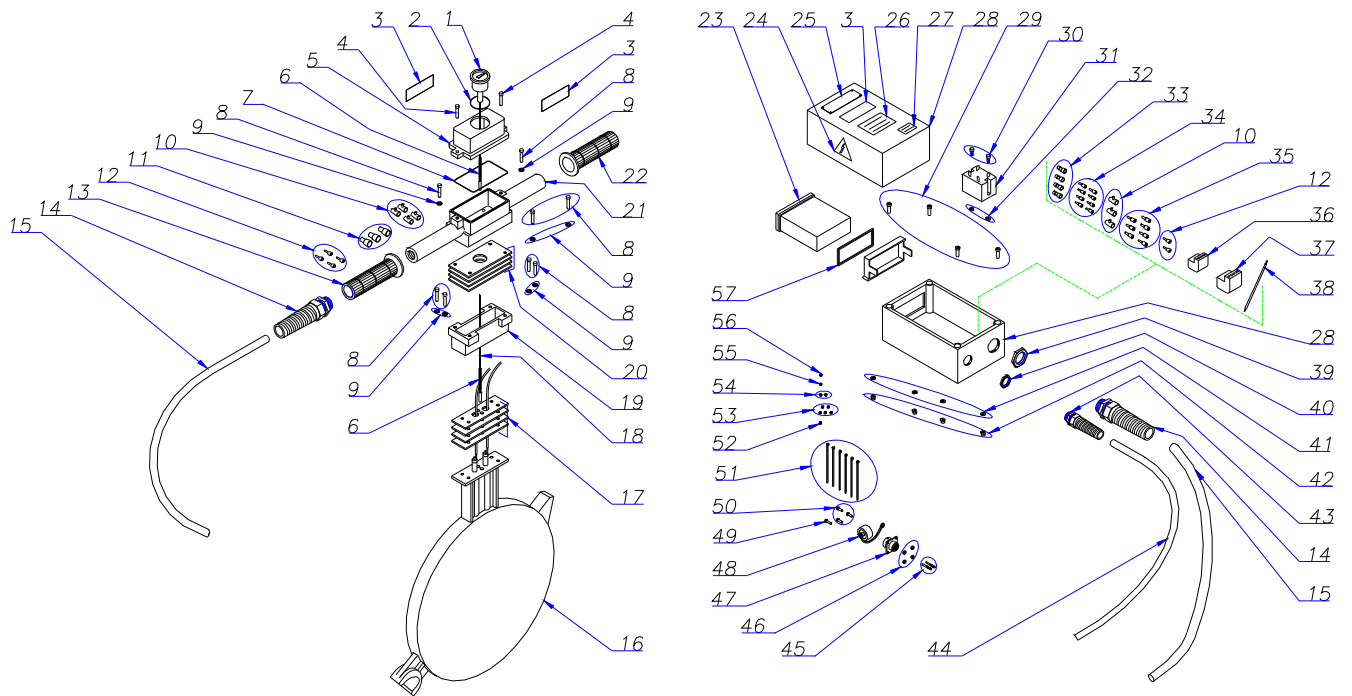
PT 315 Hydraulic Unit , Code: PT315A				PT 315 Hydraulic Unit , Code: PT315A			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT315A01	Hose R1T M 1/4 + FD 1/4 L=2500	2	39	PT315A39	Plug d. 8	1
2	PT315A02	Oil tank LT.1	1	40	PT315A40	Nipples M 1/4	1
3	PT315A03	washer 1/2	1	41	PT315A41	Washer 18X1.5	1
4	PT315A04	Plug 1/2	1	42	PT315A42	accumulator L 01/8 with 20 g. oil	1
5	PT315A05	Filter UP 100	1	43	PT315A43	Hydraulic unit control label	1
6	PT315A06	Screw TCEI uni 5931 8.8 8x85 zin	2	44	PT315A44	Carter for valves protection	1
7	PT315A07	Washer grower UNI 1751 m8 z	2	45	PT315A45	Screws TBEI 10.9 6X10 z	4
8	PT315A08	Gear pump PS-1/1.25 S	1	46	PT315A46	Serial number label	1
9	PT315A09	O-ring 2037 NBR 1.78x9.25 (012)	1	47	PT315A47	Technical data label	1
10	PT315A10	O-ring 3106 NBR 2.62x26.65 (121)	1	48	PT315A48	Carter	1
11	PT315A11	O-ring 4450 NBR 3.53x113.9 (246)	1	49	PT315A49	Rivet tt uni 9200 3x7 all	4
12	PT315A12	Max pressure valve FPMDC15P35	1	50	PT315A50	ITS - TECNODUE 80X25 label	1
13	PT315A13	Pump body HY 10 K3P0-01 1/4 BB	1	51	PT315A51	Screw TC CR UNI 6954 3.5X19 zin	4
14	PT315A14	Screw TCEI uni 5931 8.8 6x35 zin	4	52	PT315A52	light switch 16A + cap	1
15	PT315A15	O-ring 2056 NBR 1.78x14.00 (015)	2	53	PT315A53	Electric danger label	1
16	PT315A16	Check valve RPC 04 / 2.5 00 00	1	54	PT315A54	Box FMA 63 / 71	1
17	PT315A17	Distributor shaft TC2 dr. C0618	1	55	PT315A55	Fan cover MEC 71	1
18	PT315A18	Distributor block HD 104	1	56	PT315A56	Fan MEC 71	1
19	PT315A19	Lever protection HD 104	1	57	PT315A57	Condenser 30MF	1
20	PT315A20	By pass valve V03/M	1	58	PT315A58	Cable H07 RNF 2G1 TITANEX	0,35
21	PT315A21	Handle	1	59	PT315A59	Engine MEC 71 HP 0.5 B14 230V 2P	1
22	PT315A22	Distributor lever HD 104 L.185	1	60	PT315A60	Cable H07 RNF 3G1 TITANEX	3
23	PT315A23	Complete distributor TC2	1	61	PT315A61	Hollow screw	1
24	PT315A24	Pressure regulating valve VEN 06	1	62	PT315A62	Plug 1/4	1
25	PT315A25	Screw TCEI UNI 5931 8.8 4x10 z	2	63	PT315A63	Pressure gauge support	1
26	PT315A26	Washer UNI 6592 m 4 zin	6	64	PT315A64	Pressure gauge D.100 range 0-160 BAR	1
27	PT315A27	Nut UNI 7473 8 m4	2	65	PT315A65	Screw TCEI UNI 5931 8.8 6x16 zin	8
28	PT315A28	Plastic cap	1	66	PT315A66	Engine flange c.a. HP 0.33/0.5 FLCA71	1
29	PT315A29	Screw TCEI UNI 5931 8.8 4x35z	2	67	PT315A67	Joint HP 0.33/0.50	1
30	PT315A30	Microswitch ASITZ 7141	1	68	PT315A68	Pump joint g. 1 x 0.27 reinf.	1
31	PT315A31	Screw STEI UNI 5923 45h 10x14 z	1	69	PT315A69	Washer fl m 10x30x2,5 zin	2
32	PT315A32	Nut UNI 5589 8 m 10 zin	1	70	PT315A70	Screw TCEI UNI 5931 8.8 10x25 zin	2
33	PT315A33	Spring latch	1	71	PT315A71	Support 18-20	4
34	PT315A34	Ball 5/16"	1	72	PT315A72	Frame	1
35	PT315A35	Washer 1/4	9	73	PT315A73	Unit model HY10 130 complete	1
36	PT315A36	Screw TCEI UNI 5931 8.8 8x70z	2	74	PT315A74	Nut DIN 6923 8 m 6	4
37	PT315A37	Generic danger label	1	75	PT315A75	quick coupling M/F 1/4	1
38	PT315A38	Connector FT 299 44 M 1/4"	1				

PT 315 FACING TOOL



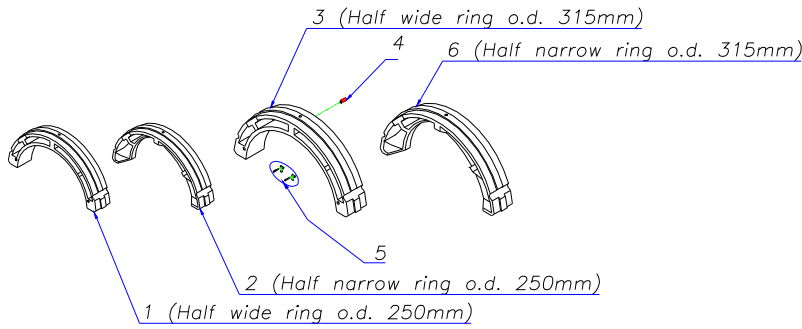
PT 315 Facing Tool , Code: PT315F				PT 315 Facing Tool , Code: PT315F			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT315F01	Drill PERLES HB 723 S	1	33	PT315F33	Screw TSPEI 5933 10.9 6x16 z	5
2	PT315F02	Generic danger label	1	34	PT315F34	Pinion 1/2 x 3/16 Z=8	1
3	PT315F03	Electric danger label	1	35	PT315F35	Chain tightener shaft	1
4	PT315F04	Drill ring PT315	1	36	PT315F36	O-ring 3068 NBR 2.62x17.13 (115)	1
5	PT315F05	Screw TCEI UNI 5931 8.8 4x10 zin	14	37	PT315F37	Spring for chain tightener shaft	1
6	PT315F06	Blue cable holder	2	38	PT315F38	Support for chain tightener shaft	1
7	PT315F07	Facing tool stopper pivot	1	39	PT315F39	O-ring 119 NBR 2.62x15.08 (616)	1
8	PT315F08	Facing tool stopper spring	1	40	PT315F40	Nut DIN 981 30x1.5	1
9	PT315F09	Facing tool stopper nut	1	41	PT315F41	Washer	1
10	PT315F10	Screw STEI UNI 5923 45h 10x25	2	42	PT315F42	Chain tightener pinion pin	1
11	PT315F11	Facing tool stopper bush	1	43	PT315F43	Double ins. pipe 2X1.5mm ² P=8MM black	3
12	PT315F12	Facing tool stopper lever	1	44	PT315F44	Box cover	1
13	PT315F13	Ring UNI 7434 c70 4	2	45	PT315F45	Terminal mm ² 4	1
14	PT315F14	Facing tool stopper Pivot	1	46	PT315F46	Terminal mm ² 2,5	3
15	PT315F15	Cable stopper PG11 163/11	3	47	PT315F47	Washer fl UNI 6593 m 4x12x1,5 zin	1
16	PT315F16	Pinion holder	1	48	PT315F48	End connector M4 (red)	1
17	PT315F17	Pinion 1/2 x 3/16 Z=10	1	49	PT315F49	Cable H07 RNF 3G1,5 TITANEX	3,3
18	PT315F18	Safety switch	1	50	PT315F50	Insulating pipe 1.5mm ² P=8MM red	3
19	PT315F19	Double insulating pipe 2x2.5mm ² P=10MM blue	1	51	PT315F51	Cable stopper PG11	1
20	PT315F20	Cable H07 RNF 3G1	0,8	52	PT315F52	Facing tool body	1
21	PT315F21	Bush for safety microswitch	1	53	PT315F53	Screw for facing stopper	1
22	PT315F22	Screw TCEI UNI 5931 8.8 5x35	2	54	PT315F54	Facing stopper	1
23	PT315F23	Chain joint 1/2 x 3/16 TPM 084	1	55	PT315F55	Technical data label	1
24	PT315F24	Chain 1/2 x 3/16 TPM 084	1,25	56	PT315F56	Serial no. label	1
25	PT315F25	Fault chain joint 1/2 x 3/16 TPM 084	1	57	PT315F57	label ITS - TECNODUE 80X25	1
26	PT315F26	Crown gear 1/2 x 3/16 Z=76	1	58	PT315F58	Rivets tt UNI 7346 2,5x6,5 brass	4
27	PT315F27	Disk with crown gear support	1	59	PT315F59	Bearing spacer	1
28	PT315F28	Carter	1	60	PT315F60	Ring UNI 7437 c 70 140	1
29	PT315F29	Screw TCEI UNI 5931 8.8 8x60 z	3	61	PT315F61	Disk	1
30	PT315F30	Screw tspi UNI 6109 4x12 a2	8	62	PT315F62	Bearing 16018	2
31	PT315F31	4 holes blade	2	63	PT315F63	Plastic stub 142X3.6	3
32	PT315F32	Screw TCEI UNI 5931 8.8 8x50 z	1				

PT 315 HEATING MIRROR

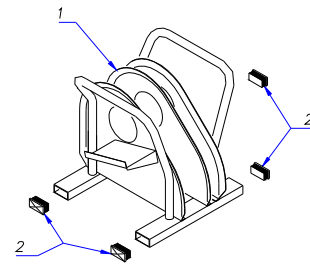


PT 315 Heating Mirror , Code: PT315T				PT 315 Heating Mirror , Code: PT315T			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT315T01	Thermometer	1	30	PT315T30	Screw TCEI UNI 5931 8.8 4x10Z	2
2	PT315T02	o-ring 2200 NBR 1.78x50.52 (033)	1	31	PT315T31	Relay 230 VAC 30A	1
3	PT315T03	Danger and compulsory label	3	32	PT315T32	Nut UNI 5588 m 4 zin	2
4	PT315T04	Screw TCEI UNI 5931 5x12 a2	2	33	PT315T33	Red female connector 6.35x0.8	4
5	PT315T05	Thermometer holder cover	1	34	PT315T34	Yellow insulating pipe 1 mm ² P=8MM	8
6	PT315T06	Insulating red pipe D.5 1.5V	0,2	35	PT315T35	Red insulating pipe 1,5 mm ² P=8MM	7
7	PT315T07	O-ring 2400 NBR 70 1.78x101.32 (045)	1	36	PT315T36	3 studs terminal	1
8	PT315T08	Screw TCEI UNI 5931 5x30 a2	8	37	PT315T37	5 studs terminal	1
9	PT315T09	Washer grower UNI 1751 m5 z	8	38	PT315T38	Black flame retardant wire 1 mm ²	2
10	PT315T10	terminal mm ² 2,5	7	39	PT315T39	Nut ISO M25x1.5 CE	1
11	PT315T11	terminal 4/6 mm ²	3	40	PT315T40	Brass nut PG11 169/11	1
12	PT315T12	Red cap for wire 2x1mm ²	6	41	PT315T41	Washer UNI 6593 m 4	4
13	PT315T13	Handle with hole for cable st.	1	42	PT315T42	Nut UNI 7473 8 m 4	4
14	PT315T14	Cable stopper M25	2	43	PT315T43	Cable stopper PG11	1
15	PT315T15	Cable H07 RNF 7G1,5 TITANEX	3,3	44	PT315T44	Cable H07 RNF 3G1,5 TITANEX	3,3
16	PT315T16	Heating plate	1	45	PT315T45	Female terminal	4
17	PT315T17	Lower insulating gasket	4	46	PT315T46	Nut UNI 5588 m 3 brass	4
18	PT315T18	Probe PT100 2+2 wires	1	47	PT315T47	Connector UTG 012-8S	1
19	PT315T19	Spacer	1	48	PT315T48	Connector 8 pins	1
20	PT315T20	Upper insulating gasket	4	49	PT315T49	Screw TSPI UNI 6109 3x12 brass	1
21	PT315T21	Box with handle	1	50	PT315T50	Screw TCI UNI 6107 3x10 brass	3
22	PT315T22	Rubber handle D. 30	1	51	PT315T51	Black plastic stub 99x2.5	6
23	PT315T23	Thermostat TLK38	1	52	PT315T52	Ring 3.5 type 0	1
24	PT315T24	Electric danger label	1	53	PT315T53	Ring 3.5 type 1	5
25	PT315T25	ITS – TECNODUE 80X25 label	1	54	PT315T54	Ring 3.5 type 2	2
26	PT315T26	Technical data label	1	55	PT315T55	Ring 3.5 type 3	1
27	PT315T27	Serial no. label	1	56	PT315T56	Ring 3.5 type 5	1
28	PT315T28	Thermostat box	1	57	PT315T57	Gasket for TLK38 thermostat 33X74	1
29	PT315T29	Screw TC CR 7687 4.8 4x16 zin	4				

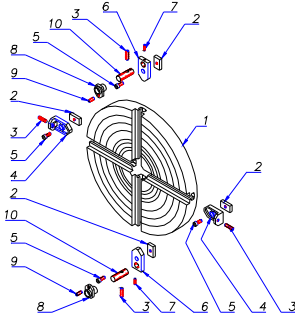
PT 315 HALF RINGS REDUCTIONS



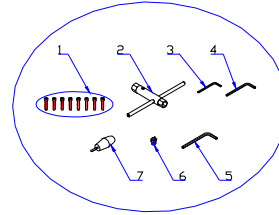
PT315 SUPPORT



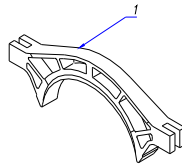
PT 315 STUB END DEVICE



PT 315 TOOLS KIT



PT 315 SHORT SPIGOT FITTINGS CLAMP



PT 315 Stub Device , Code: PT315S				PT 3615 Stub Device , Code: PT315S			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT315S01	Plateau PT 315	1	6	PT315S06	Fixing stub end bracket	2
2	PT315S02	Cursor	4	7	PT315S07	Screw STEI UNI 5927 45h 5x8 zin	2
3	PT315S03	Screw STEI UNI 5927 45h 8x35 zin	4	8	PT315S08	Upper stopper	2
4	PT315S04	Bracket	2	9	PT315S09	Screw STEI UNI 5923 45h 8x20	2
5	PT315S05	screw TCEI UNI 5931 8.8 8x20 zin	4	10	PT315S10	Screw for fixing s.e. braket	2

PT 315 Tools kit, Code: PT315TK				PT 315 Tools kit, Code: PT315TK			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT315TK01	Screw TCEI UNI 5931 8.8 6x65 zin	8	5	PT315TK05	Setscrew wrench UNI 6753 s 6	1
2	PT315TK02	Socket wrench	1	6	PT315TK06	Plug 1/2 for hydraulic unit	1
3	PT315TK03	Setscrew wrench UNI 6753 s 4	1	7	PT315TK07	Screw driver	1
4	PT315TK04	Setscrew wrench UNI 6753 s 5	1				

PT 315 Support, Code: PT315U				PT 315 Support, Code: PT315U			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT315U01	Support	1	2	PT315U02	Black plug 60x30	4

PT 315 Half reduction			PT 315 Short spigot fit. clamp, Code: PT250G			
Pos.	Description	Qty	Pos.	Code	Description	Qty
1	Half wide ring av. sizes: 90,110,125,140,160,180,200,225mm		1	PT315G	Short Spigot fittings clamp	1
2	Half narrow ring av. sizes: 90,110,125,140,160,180,200,225mm					
3	Half wide ring d. 250x315mm and 280x315mm					
4	Screw steio 5923 45h 8x16					
5	Beep beep coupler system					
6	Half narrow ring d. 250x315mm and 280x315mm					

This manual has been printed on December 2008

The technical data and information contained in this manual can be changed without any notice