

I.T.S. by Tecnodue

PT 500

**WITH REVOLVING HEATING MIRROR & FACING
TOOL, ROLLERS
Ser. no. 1121 1744**

Operating Manual

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

PT 500

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.

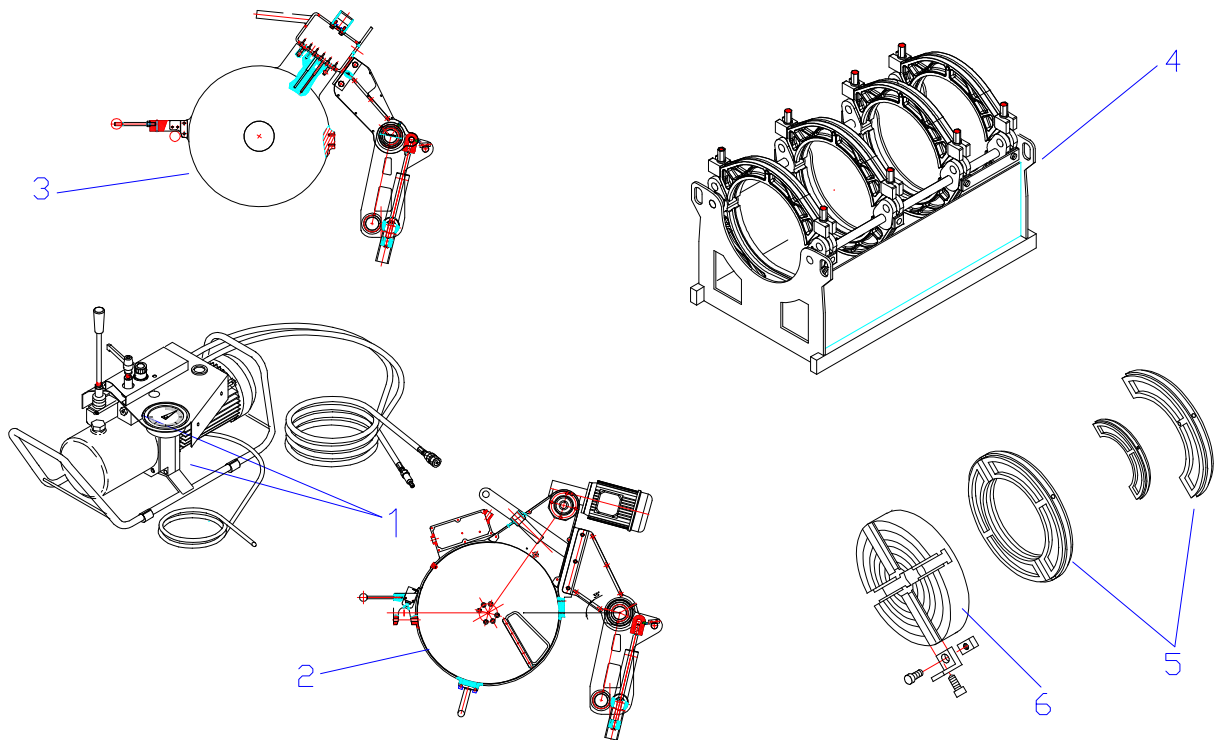
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Standard Components

1. Hydraulic Unit
2. Facing Tool
3. Heating Mirror
4. Basic machine

On request can be supplied:

5. Light weight alloy reducing rings for pipes and fittings d. 200,225,250,280,315,355,400,450mm
6. Stub End Device
 - Short spigot fittings clamp d. 500mm
 - Wooden transport box according to ISPM 15
 - LDU (printing and storing data machine)
 - CSE kit for machine automation
 - Electric board with automatic circuit breaker
 - Rollers

SAFETY RULES ACCORDING TO DIRECTIVES CEE

(To be read carefully and apply while utilizing the PT 500)

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/MOVEMENT

-Basic Machine, Keep the maximum care while moving and it's suggested to use mechanical aids. **ONLY MOVE THE BASIC MACHINE BY USING THE HOOKS IN THE BASIC MACHINE FRAME. DO NOT MOVE THE MACHINE BY HOOKING IT IN CLAMPS OR CYLINDERS. WHILE THE PIPES ARE FIT IN THE CLAMPS DO NOT MOVE THE MACHINE**

-Insert the facing tool between the basic machine clamps before moving the machine. Due to sharpening blades the use of gloves is compulsory.

- Insert the Heating mirror between the basic machine clamps before moving the machine

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.

-Hydraulic unit, supplied with transport's frame.

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

Avoid transporting the components by holding from the cable and remembering 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 button 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 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 using 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 MAXIMUN 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

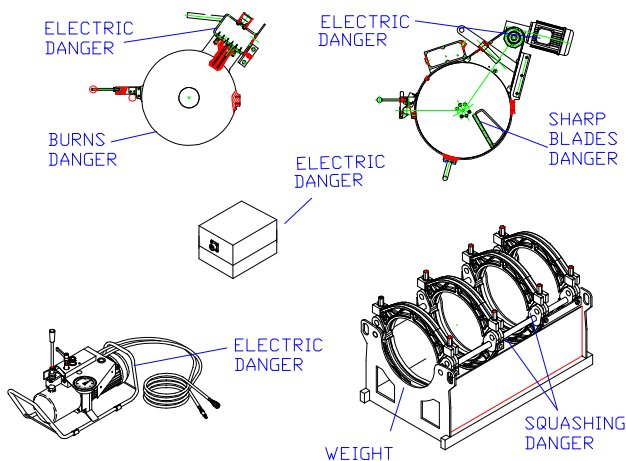
ACOUSTIC POLLUTION

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



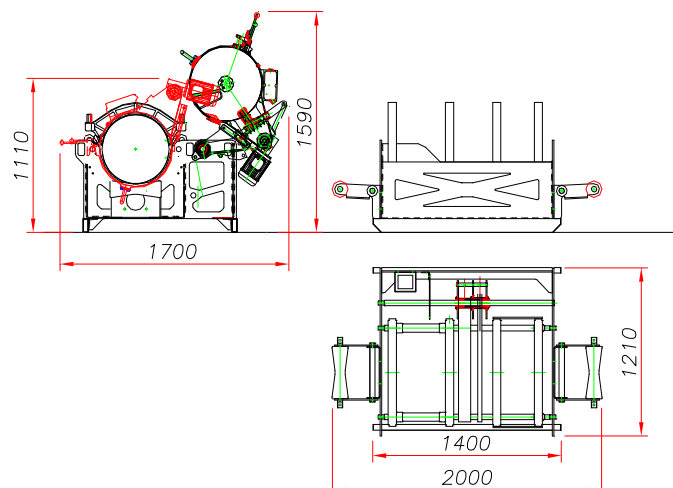
Label on machine's components showing potential dangers



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±10%
Frequency	50 Hz
Total power installed	7.7 KW 39 A
Heating mirror	IP 54 5.88 KW
Facing tool	IP 44 1.3 KW
Hydraulic unit	IP 44 0.74 KW
Hydraulic data	
Maximum working pressure	130 bar
Cylinder's section	14,13 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	270 mm
Trolley slide bar diameter	40 mm
Distance between the cylinders centre	640 mm
Dimensions	
Basic machine	1400x1210x1590 mm
Hydraulic unit	480 x 320 x 270 mm
Weights	
Basic machine	560 Kg
Hydraulic unit	28 Kg
Wooden transport box	145 Kg
Stub end device	33 Kg
Reducing inserts complete set	144 Kg

2. Machine dimensions



3. 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.

Warning: The machine has been equipped with one mobile trolley and one fixed trolley. Place the pipe to be welded on the mobile trolley and and the pipeline end on the fixed trolley! Carefully check the pipes alignment before beginning to weld!

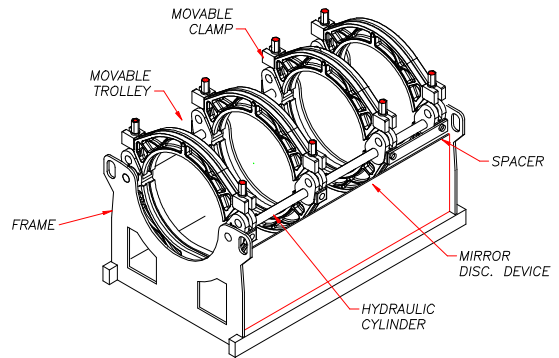
The machine is supplied complete of:

- 1) Basic machine d. 500 mm with revolving heating mirror and facing tool complete with a tools blue bag
- 2) Revolving electric facing tool with safety switch
- 3) Revolving PTFE coated heating mirror with a temperature control box.
- 4) Electro-hydraulic motor with accumulator and flexible hoses with quick couplings.

3.1 Basic machine

The basic machine is composed by:

- Two cylinders on which heads are mounted two complete clamps d. 500 mm
- One movable clamp d.500 mm sliding on cylinder's stem and fixable in different positions by means of using the clamps spacers
- A frame including the hydraulic circuit with the anti-drop quick couplings.
- A 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.

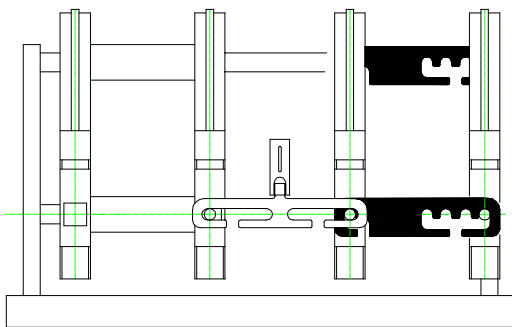


Figure 1. Configuration 2 moveable clamps + 2 fixed clamps clamp

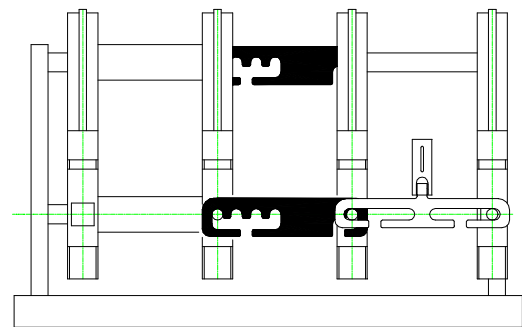


Figura 2. Configuratione 3 moveable clamps mobili + 1 fixed clamp

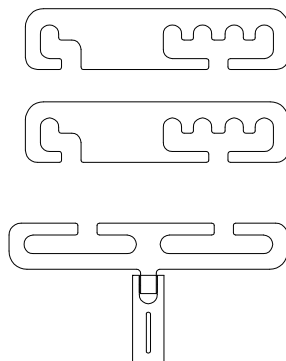
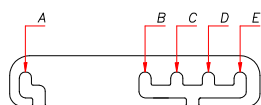


Figure 3.

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

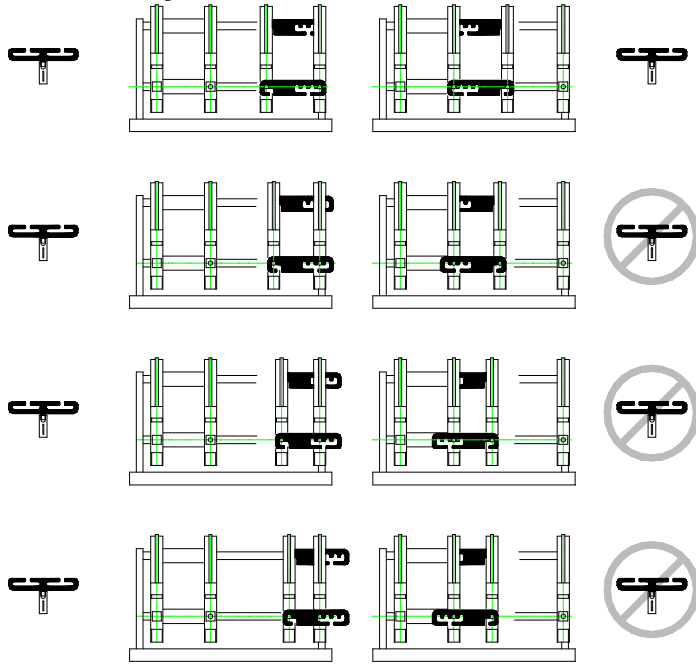
You can easily change the spacer position without using any kind of tool. You can modify the distance between the clamps connected by the spacers.

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

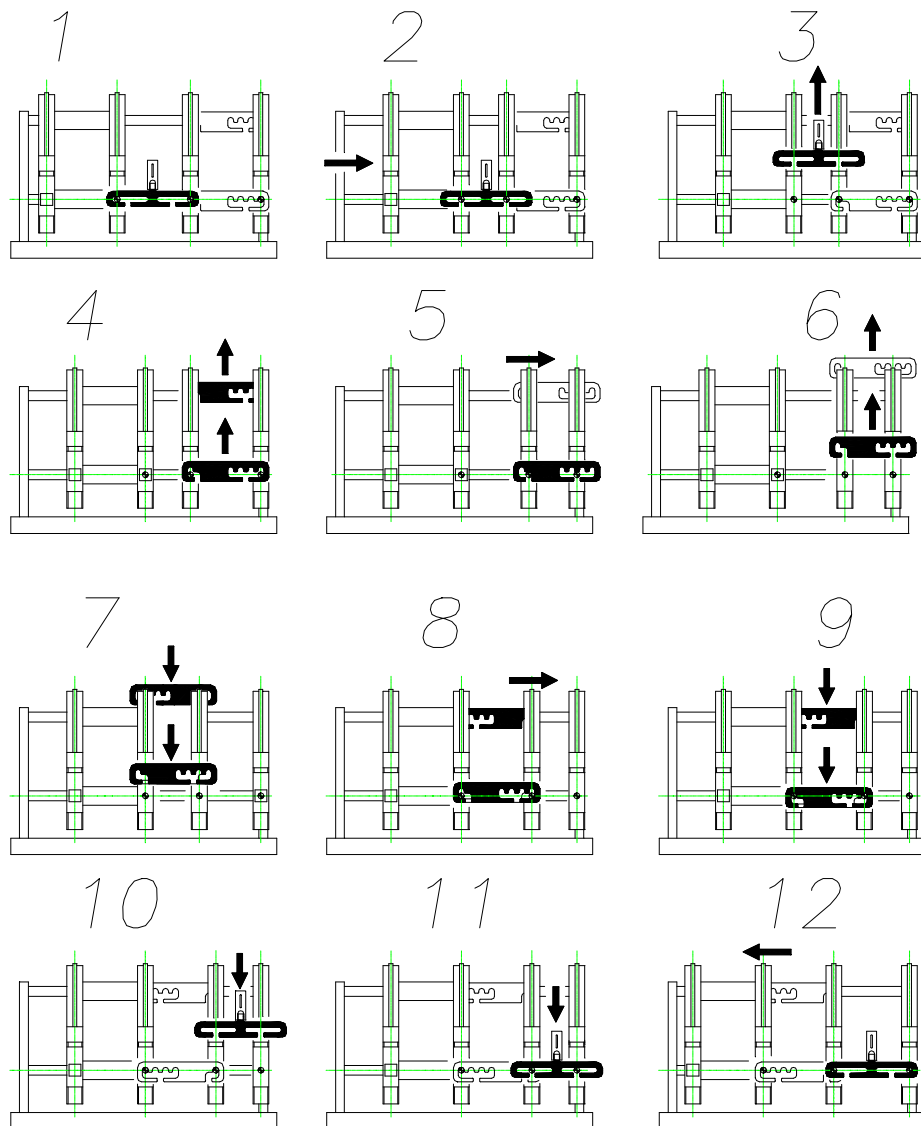
On the right (from above) Upper and lower spacer (interchangeable) and disconnecting device

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!

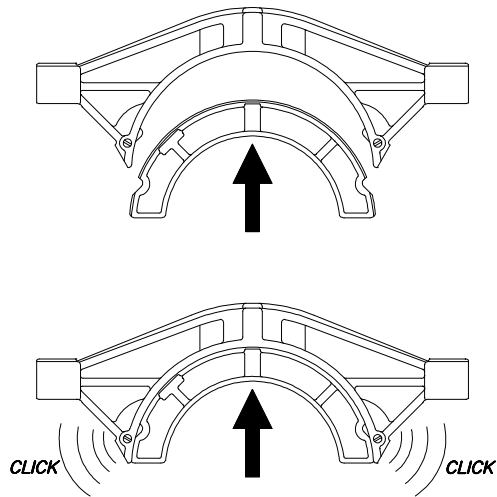
You can only place the upper and lower spacers in the same clamps and using the same holes. It is strictly forbidden to put the spacer in different clamps and in different holes.

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

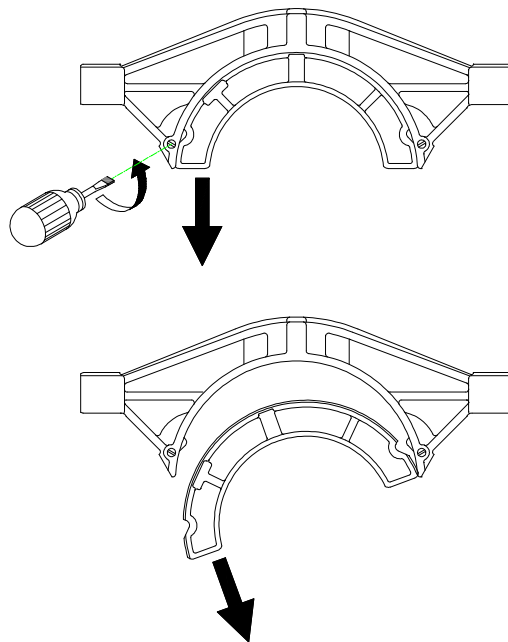
To configure the again the machine with 2 moveable clamps you must repeat the procedure above in a reverse sense.

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.

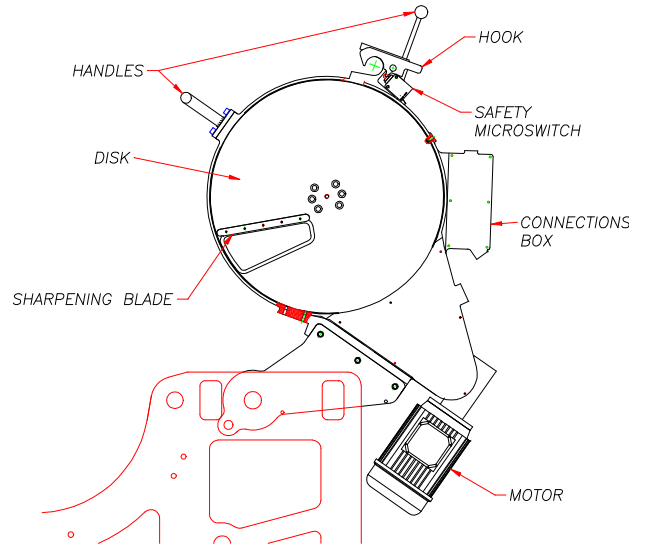


Attention: If you need to use reductions under d. 280mm you must before install the reductions d. 315x500mm - If you need to use reductions under d. 250mm you must before install the reductions d. 315x500mm and 250x315mm.

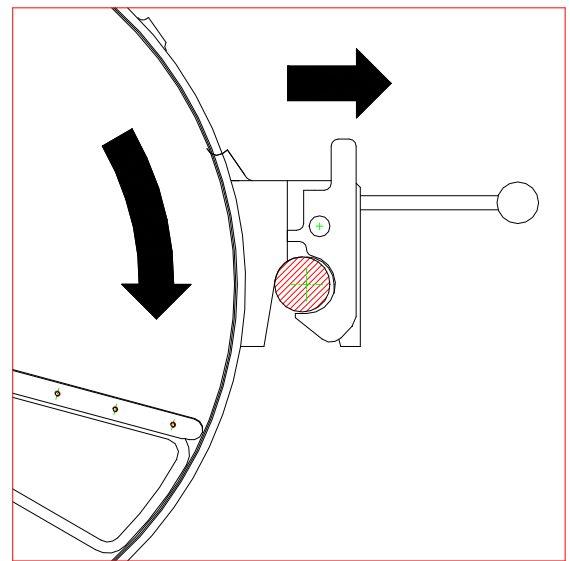
3.2 Facing Tool

The electric facing tool is composed by:

- The facing tool body
- Two disks where are mounted the blades
- A motor with a reducing gear supplied
- Handle with hook to avoid the facing tool moving from facing position pin.
- A 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.



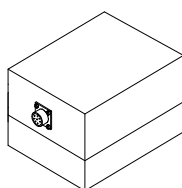
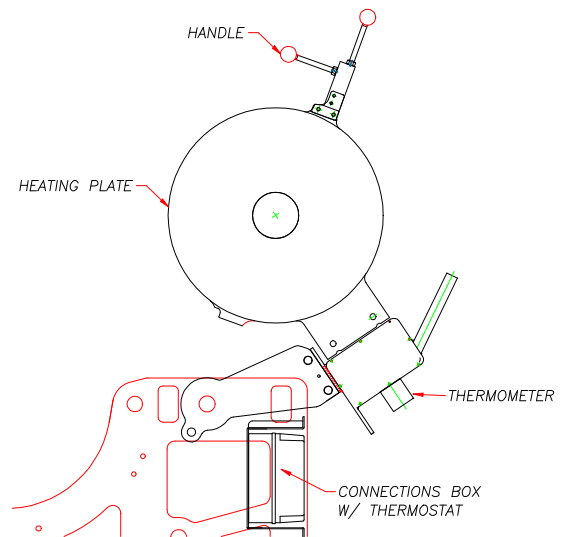
During facing operations keep on pulling the handles to avoid that safety microswitch stopping the disks rotation.



3.3 Heating Mirror

The heating mirror is composed by:

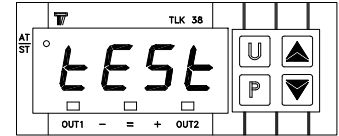
- The heating mirror coated with green color PTFE complete with thermometer (the thermometer does not depend upon the power supply and always survey the real temperature of the heating plate) and connecting box
- The electronic thermostat located on the connections box .
- LDU connector. (The below figure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



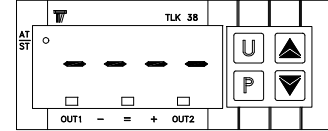
LDU Connector

3.3.1 Electronic thermostat – different functions

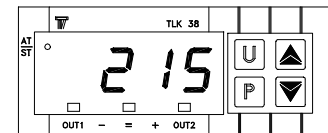
At each startup on the display will blink the writing 'TEST'. This means that the thermostat is testing the connection between the probe and the heating mirror.



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**):

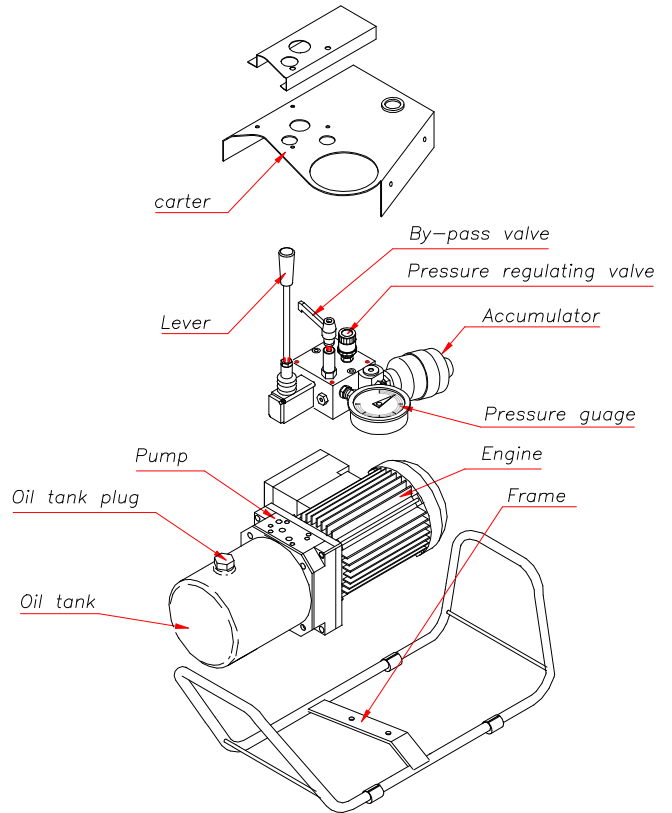
1. Push the key **P** (The display will show alternately the writing 'SP1' and the **set point value of the temperature**)
2. By acting on the arrow keys UP and DOWN it is possible to increase or decrease the set point value.
3. When you reach the desired value push the key **P** to confirm.
4. The display 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!)

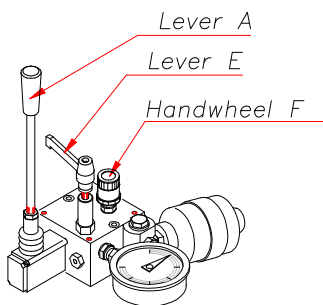
3.4 Hydraulic Unit

The basic components of the hydraulic unit are the following:

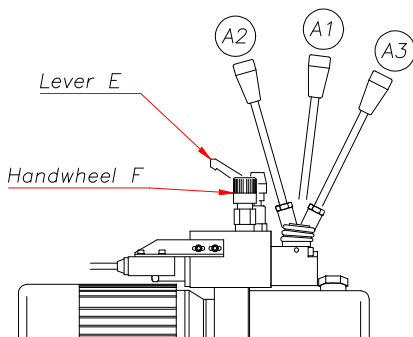
- Electric engine
- Hydraulic pump
- Oil tank
- Hydraulic unit controls
- Pressure accumulator
- Pressure gauge
- Metal frame



3.4.1 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.

3.4.2 How to use the hydraulic unit

Operating Instructions

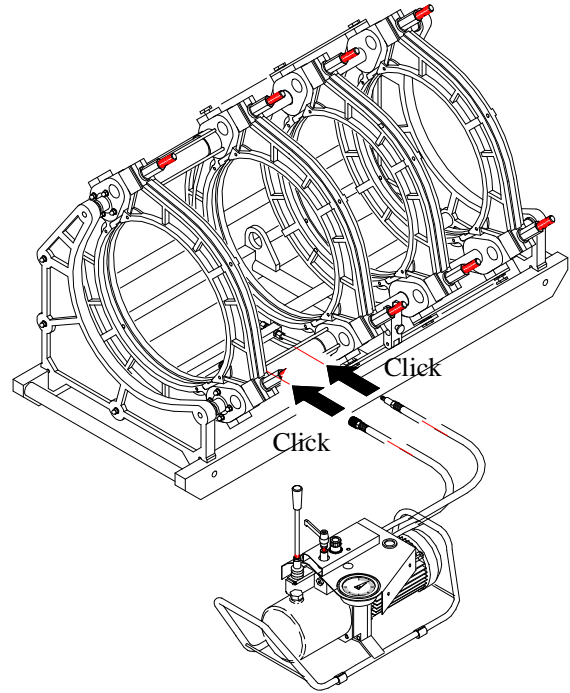
In order to make easy the learning we shall proceed to the description step by step of all operations need in order to complete a welding according to the following description:

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..

3.4 Rollers

You can adjust the roller height by moving the shackle in the appropriated position.

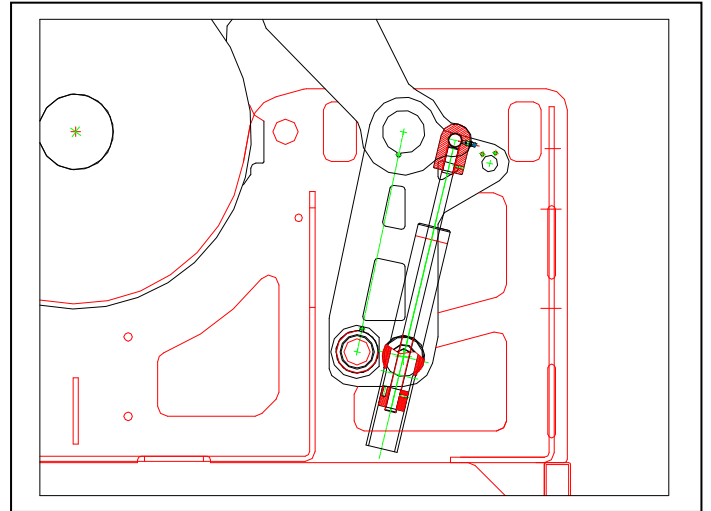


3.5 Back trolley

The machine is equipped with a back trolley for moving the heating mirror and facing tool.

Tailgate air cylinder will help to move the facing tool and heating mirror.

Always follow the maintenance instructions.

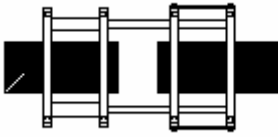


4. Butt welding in brief

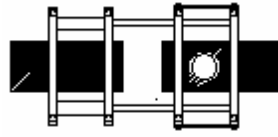
4.1 Introduction

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:

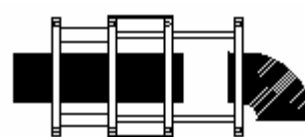
- 1) Pipe with Pipe, standard configuration of the machine
- 2) Pipe with long spigot fitting, standard configuration of the machine
- 3) Pipe with short spigot fitting, to achieve this kind of welding it is strongly suggested to configure the machine with three moveable clamps and 1 fixed clamp. Furthermore 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)



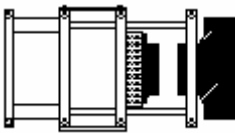
1. PIPE WITH PIPE



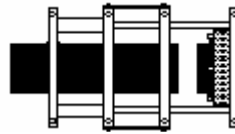
2. PIPE WITH LONG SPIGOT FITTING



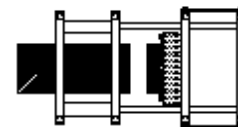
3. PIPE WITH SHORT SPIGOT FITTING



4. FITTING WITH SHORT SPIGOT STUB END



5. PIPE WITH SHORT SPIGOT STUB END

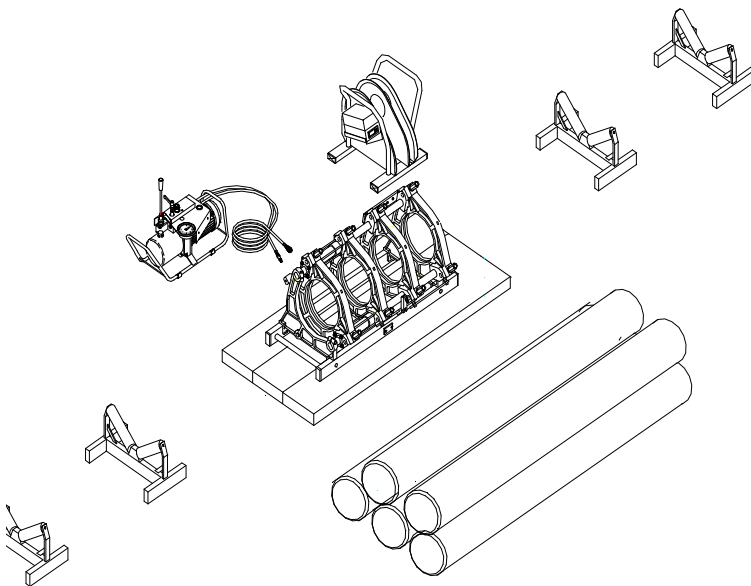


6. PIPE WITH SHORT SPIGOT STUB END

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 loosing 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 facing lock (see figure). In case one of the pipe ends has a small projection; the facing lock let you select the only pipe to face. Place the facing lock in the left or in the right hole to prevent the right or left facing. To face all the pipes put the facing lock in the central hole.
- 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

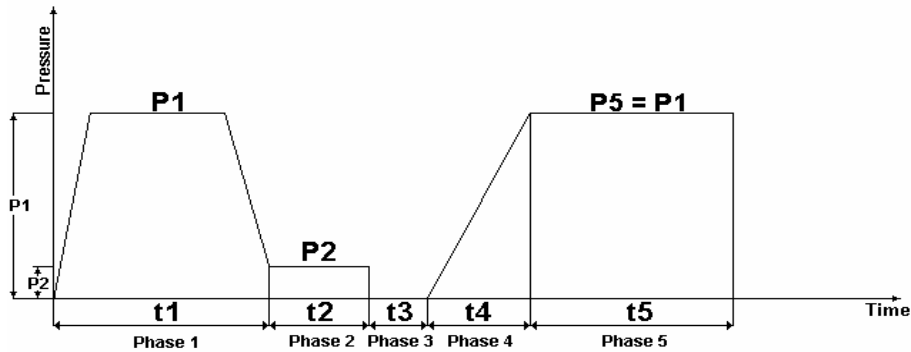
PHASE 2 = t_2 = Time requested for the continual heating

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

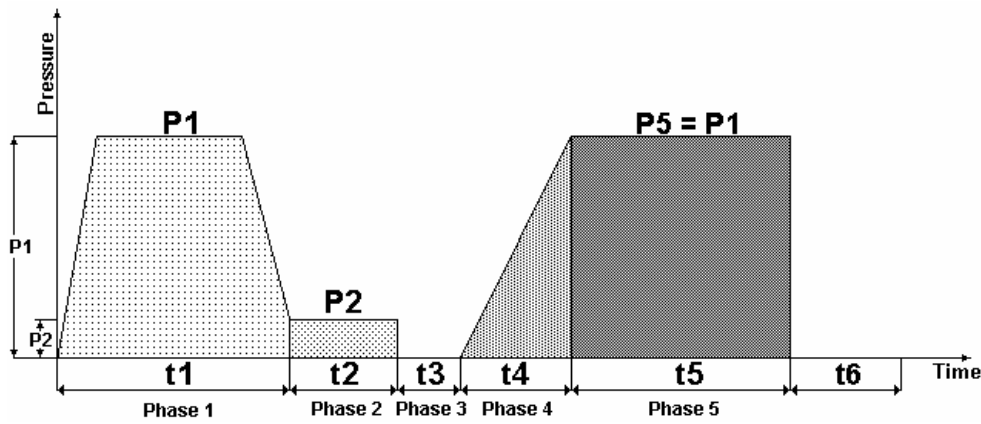
- Bring the lever **A** into position **A1** and keep such situation for all the cooling time indicated into the attached welding table, taking care that the pressure will not decrease too much
- Elapsed the cooling time by acting on lever **E** anticlockwise bring the pressure to zero.
- Take away the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



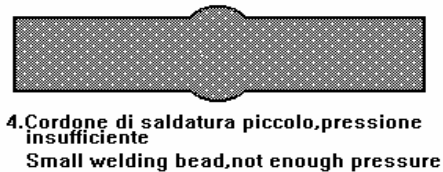
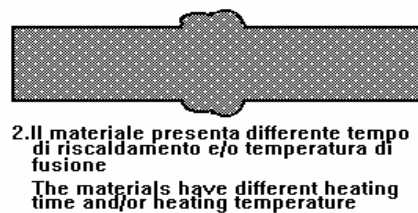
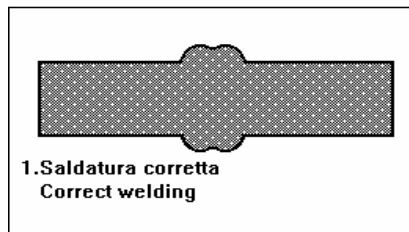
- t1 = Time requested for the bead formation with the specified wall thickness
- t2 = Time requested for the continual heating
- t3 = Time requested for the change over
- t4 = Time requested for bringing up the pressure
- t5 = time requested for cooling down
- P1 = Pressure during the bead formation and the cooling down, this value is the result of the formula:

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

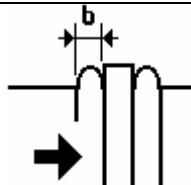
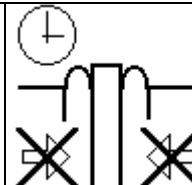
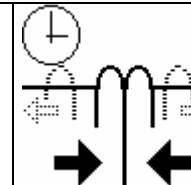
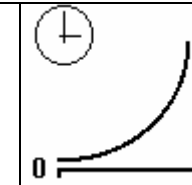
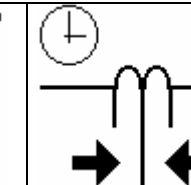
Material thrust coefficient for PE s 63	1,5 Kg./cm ²
Material thrust coefficient for PP	1,0 Kg./cm ²
Total PT 160 cylinders section	4,32 cm ²

P2 = Pressure during the continual heating, this value either for HDPE and PP is 0,1 Kg./cm².

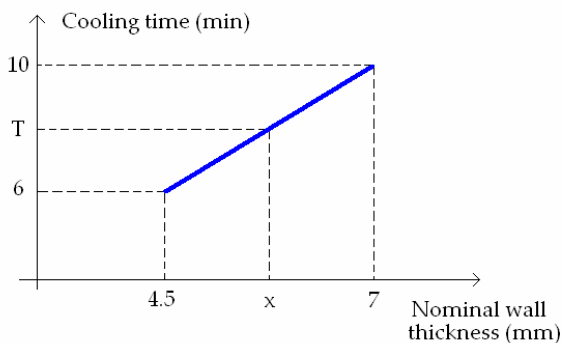
Optical checking of butt welding result



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

							
Nominal Wall thickness	Alignment	Heating-up	Changeover time	Joining pressure	Cooling time under joining pressure $p=0.15$ N/mm ² 0.01		
mm	mm (minimum values) Bead height on heater plate at the end of the alignment time (alignment under 0.15 N/mm ²)	s Heating-up time= 10 x wallthickness (heating-up 0.02 N/mm ²)	S (maximum time)	s	Min (minimum values)		
MATERIAL PE							
					Temp. <15°C	Temp. 15-+25°C	Temp. 25-40°C
Until 4.5	0.5	45	5	5	4	5	6,5
4.5 ... 7	1.0	45 ... 70	5 ... 6	5 ... 6	4 - 6	5-7,5	6,5-9,5
7 ... 12	1.5	70 ... 120	6 ... 8	6 ... 8	6-9,5	7,5-12	9,5-15,5
12 ... 19	2.0	120 ... 190	8 ... 10	8 ... 11	9,5-14	12-18	15,5-24
19 ... 26	2.5	190 ... 260	10 ... 12	11 ... 14	14-19	18-24	24-32
26 ... 37	3.0	260 ... 370	12 ... 16	14 ... 19	19-27	24-34	32-45
37 ... 50	3.5	370 ... 500	16 ... 20	19 ... 25	27-36	34-46	45-61
50 ... 70	4.0	500 ... 700	20 ... 25	25 ... 35	36-50	46-64	61-85
70 ... 90	4,5	700 ... 900	25 ... 30	35 ... 35	50-64	64-82	85-109
90 ... 110	5	900 ... 1100	30 ... 35	35 ... 35	64-78	82-100	109-133
110 ... 130	5,5	1100 ... 1300	35 ... 35	35 ... 35	78-92	100-118	133-157

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 !!!!!!!

Machine PT 500		DVS 2207-1 rel. August 2015	
Thrust section sq.cm. 14,13		Material PE	

SDR 41						Welding range 200 500					
D DIAMETER mm	S THICKNESS mm	P1 bead EQUALISING		P2 t2 HEATING		t3 CHANGE OV. sec	t4 JOINING sec	P5 COOLING bar	t5		
		bar	mm	bar	sec				<15° min	15°-25°c min	25°-40°c min
200	4,9	3,2	1,0	0.. 0,2	49	0.. 5	5	3,2	4,3	5,4	7,0
225	5,5	4,0	1,0	0.. 0,3	55	0.. 5	5	4,	4,8	6,0	7,7
250	6,1	5,0	1,0	0.. 0,3	61	0.. 6	6	5,	5,3	6,6	8,4
280	6,8	6,2	1,0	0.. 0,4	68	0.. 6	6	6,2	5,9	7,3	9,3
315	7,7	7,9	1,5	0.. 0,5	77	0.. 6	6	7,9	6,5	8,1	10,3
355	8,7	10,0	1,5	0.. 0,7	87	0.. 7	7	10,	7,2	9,0	11,5
400	9,8	12,7	1,5	0.. 0,8	98	0.. 7	7	12,7	7,9	10,0	12,8
450	11,0	16,1	1,5	0.. 1,1	110	0.. 8	8	16,1	8,8	11,1	14,3
500	12,2	19,8	2,0	0.. 1,3	122	0.. 8	8	19,8	9,6	12,2	15,7

SDR 33						Welding range 200 500					
D DIAMETER mm	S THICKNESS mm	P1 bead EQUALISING		P2 t2 HEATING		t3 CHANGE OV. sec	t4 JOINING sec	P5 COOLING bar	t5		
		bar	mm	bar	sec				<15° min	15°-25°c min	25°-40°c min
200	6,1	3,9	1,0	0.. 0,3	61	0.. 6	6	3,9	5,2	6,6	8,4
225	6,8	5,0	1,0	0.. 0,3	68	0.. 6	6	5,	5,9	7,3	9,3
250	7,6	6,1	1,5	0.. 0,4	76	0.. 6	6	6,1	6,4	8,0	10,2
280	8,5	7,7	1,5	0.. 0,5	85	0.. 7	7	7,7	7,0	8,8	11,3
315	9,5	9,7	1,5	0.. 0,6	95	0.. 7	7	9,7	7,8	9,8	12,6
355	10,8	12,4	1,5	0.. 0,8	108	0.. 8	8	12,4	8,6	10,9	14,0
400	12,1	15,7	2,0	0.. 1,0	121	0.. 8	8	15,7	9,6	12,1	15,6
450	13,6	19,8	2,0	0.. 1,3	136	0.. 8	9	19,8	10,6	13,4	17,5
500	15,2	24,5	2,0	0.. 1,6	152	0.. 9	9	24,5	11,5	14,7	19,3

SDR 27,6						Welding range 200 500					
D	S	P1 bead		P2 t 2		t 3	t 4	P5	t 5		
DIAMETER	THICKNESS	EQUALISING		HEATING		CHANGE OV.	JOINING	COOLING	<15°	15°-25°c	25°-40°c
mm	mm	bar	mm	bar	sec	sec	sec	bar	min	min	min
200	7,2	4,7	1,5	0.. 0,3	72	0.. 6	6	4,7	6,2	7,7	9,8
225	8,2	5,9	1,5	0.. 0,4	82	0.. 6	6	5,9	6,8	8,5	10,9
250	9,1	7,3	1,5	0.. 0,5	91	0.. 7	7	7,3	7,4	9,4	12,0
280	10,1	9,1	1,5	0.. 0,6	101	0.. 7	7	9,1	8,2	10,3	13,3
315	11,4	11,6	1,5	0.. 0,8	114	0.. 8	8	11,6	9,1	11,5	14,8
355	12,9	14,7	2,0	0.. 1,0	129	0.. 8	8	14,7	10,1	12,7	16,5
400	14,5	18,6	2,0	0.. 1,2	145	0.. 9	9	18,6	11,1	14,1	18,5
450	16,3	23,6	2,0	0.. 1,6	163	0.. 9	10	23,6	12,3	15,7	20,7
500	18,1	29,1	2,0	0.. 1,9	181	0.. 10	11	29,1	13,4	17,2	22,9

REMEMBER:

Heating mirror temperature must be 220 °C +/- 10°C;

Add drag pressure to P1 and P5;

A reduction of cooling time of up to 50% is permitted in the following circumstances:

- The joint connection was created under workshop conditions and
- the removal of the part from the welding machine and its temporary until the complete cooling time according to column t5 causes negligible loading of the joint connection

Machine PT 500						DVS 2207-1 rel. August 2015					
Thrust section sq.cm. 14,13						Material PE					
SDR 26						Welding range 200 500					
D	S	P1 bead		P2 t2		t3	t4	P5	t5		
DIAMETER	THICKNESS	EQUALISING		HEATING		CHANGE OV.	JOINING	COOLING	<15°	15°-25°C	25°-40°C
mm	mm	bar	mm	bar	sec	sec	sec	bar	min	min	min
200	7,7	4,9	1,5	0.. 0,3	77	0.. 6	6	4,9	6,5	8,1	10,3
225	8,7	6,2	1,5	0.. 0,4	87	0.. 7	7	6,2	7,2	9,0	11,5
250	9,6	7,7	1,5	0.. 0,5	96	0.. 7	7	7,7	7,8	9,9	12,6
280	10,8	9,7	1,5	0.. 0,6	108	0.. 8	8	9,7	8,6	10,9	14,0
315	12,1	12,2	2,0	0.. 0,8	121	0.. 8	8	12,2	9,6	12,1	15,6
355	13,7	15,5	2,0	0.. 1,0	137	0.. 8	9	15,5	10,6	13,4	17,5
400	15,4	19,7	2,0	0.. 1,3	154	0.. 9	9	19,7	11,7	14,9	19,6
450	17,3	25,0	2,0	0.. 1,7	173	0.. 10	10	25,0	12,9	16,5	21,9
500	19,2	30,8	2,5	0.. 2,1	192	0.. 10	11	30,8	14,2	18,2	24,3
SDR 22						Welding range 200 500					
D	S	P1 bead		P2 t2		t3	t4	P5	t5		
DIAMETER	THICKNESS	EQUALISING		HEATING		CHANGE OV.	JOINING	COOLING	<15°	15°-25°C	25°-40°C
mm	mm	bar	mm	bar	sec	sec	sec	bar	min	min	min
200	9,1	5,8	1,5	0.. 0,4	91	0.. 7	7	5,8	7,5	9,4	12,0
225	10,2	7,3	1,5	0.. 0,5	102	0.. 7	7	7,3	8,3	10,4	13,4
250	11,4	9,0	1,5	0.. 0,6	114	0.. 8	8	9,0	9,1	11,4	14,7
280	12,7	11,3	2,0	0.. 0,8	127	0.. 8	8	11,3	10,0	12,6	16,4
315	14,3	14,4	2,0	0.. 1,0	143	0.. 9	9	14,4	11,0	14,0	18,3
355	16,1	18,2	2,0	0.. 1,2	161	0.. 9	10	18,2	12,2	15,5	20,5
400	18,2	23,2	2,0	0.. 1,5	182	0.. 10	11	23,2	13,5	17,3	23,0
450	20,5	29,3	2,5	0.. 2,0	205	0.. 10	12	29,3	15,0	19,2	25,7
500	22,7	36,2	2,5	0.. 2,4	227	0.. 11	13	36,2	16,7	21,2	28,3
SDR 21						Welding range 200 500					
D	S	P1 bead		P2 t2		t3	t4	P5	t5		
DIAMETER	THICKNESS	EQUALISING		HEATING		CHANGE OV.	JOINING	COOLING	<15°	15°-25°C	25°-40°C
mm	mm	bar	mm	bar	sec	sec	sec	bar	min	min	min
200	9,5	6,0	1,5	0.. 0,4	95	0.. 7	7	6,0	7,8	9,8	12,5
225	10,7	7,7	1,5	0.. 0,5	107	0.. 7	7	7,7	8,6	10,8	14,0
250	11,9	9,5	1,5	0.. 0,6	119	0.. 8	8	9,5	9,4	11,9	15,4
280	13,3	11,9	2,0	0.. 0,8	133	0.. 8	9	11,9	10,4	13,1	17,1
315	15,0	15,0	2,0	0.. 1,0	150	0.. 9	9	15,0	11,4	14,6	19,1
355	16,9	19,1	2,0	0.. 1,3	169	0.. 9	10	19,1	12,7	16,2	21,5
400	19,0	24,2	2,5	0.. 1,6	190	0.. 10	11	24,2	14,0	18,0	24,1
450	21,4	30,6	2,5	0.. 2,0	214	0.. 11	12	30,6	15,7	20,1	26,8
500	23,8	37,8	2,5	0.. 2,5	238	0.. 11	13	37,8	17,4	22,1	29,5

REMEMBER:

Heating mirror temperature must be 220 °C +/- 10°C;

Add drag pressure to P1 and P5;

A reduction of cooling time of up to 50% is permitted in the following circumstances:

- The joint connection was created under workshop conditions and
- the removal of the part from the welding machine and its temporary until the complete cooling time according to column t5 causes negligible loading of the joint connection

Machine PT 500						DVS 2207-1 rel. August 2015					
Thrust section sq.cm. 14,13						Material PE					
SDR 17,6						Welding range 200 500					
D	S	P1 bead		P2 t 2		t 3	t 4	P5	t 5		
DIAMETER	THICKNESS	EQUALISING		HEATING		CHANGE OV.	JOINING	COOLING	<15°	15°-25°C	25°-40°C
mm	mm	bar	mm	bar	sec	sec	sec	bar	min	min	min
200	11,4	7,1	1,5	0.. 0,5	114	0.. 8	8	7,1	9,1	11,4	14,7
225	12,8	9,0	2,0	0.. 0,6	128	0.. 8	8	9,	10,0	12,7	16,5
250	14,2	11,2	2,0	0.. 0,7	142	0.. 9	9	11,2	10,9	13,9	18,2
280	15,9	14,0	2,0	0.. 0,9	159	0.. 9	10	14,	12,0	15,4	20,2
315	17,9	17,7	2,0	0.. 1,2	179	0.. 10	11	17,7	13,3	17,1	22,7
355	20,2	22,5	2,5	0.. 1,5	202	0.. 10	12	22,5	14,8	19,0	25,3
400	22,7	28,6	2,5	0.. 1,9	227	0.. 11	13	28,6	16,7	21,2	28,3
450	25,6	36,2	2,5	0.. 2,4	256	0.. 12	14	36,2	18,7	23,6	31,5
500	28,4	44,7	3,0	0.. 3,0	284	0.. 13	15	44,7	20,8	26,2	34,8
SDR 17						Welding range 200 500					
D	S	P1 bead		P2 t 2		t 3	t 4	P5	t 5		
DIAMETER	THICKNESS	EQUALISING		HEATING		CHANGE OV.	JOINING	COOLING	<15°	15°-25°C	25°-40°C
mm	mm	bar	mm	bar	sec	sec	sec	bar	min	min	min
200	11,8	7,4	1,5	0.. 0,5	118	0.. 8	8	7,4	9,3	11,8	15,2
225	13,2	9,3	2,0	0.. 0,6	132	0.. 8	9	9,3	10,3	13,1	17,0
250	14,7	11,5	2,0	0.. 0,8	147	0.. 9	9	11,5	11,2	14,3	18,8
280	16,5	14,5	2,0	0.. 1,0	165	0.. 9	10	14,5	12,4	15,8	20,9
315	18,5	18,3	2,0	0.. 1,2	185	0.. 10	11	18,3	13,7	17,6	23,4
355	20,9	23,3	2,5	0.. 1,6	209	0.. 11	12	23,3	15,3	19,6	26,2
400	23,5	29,5	2,5	0.. 2,0	235	0.. 11	13	29,5	17,2	21,9	29,2
450	26,5	37,4	3,0	0.. 2,5	265	0.. 12	14	37,4	19,3	24,4	32,6
500	29,4	46,2	3,0	0.. 3,1	294	0.. 13	16	46,2	21,5	27,1	36,0
SDR 13,6						Welding range 200 500					
D	S	P1 bead		P2 t 2		t 3	t 4	P5	t 5		
DIAMETER	THICKNESS	EQUALISING		HEATING		CHANGE OV.	JOINING	COOLING	<15°	15°-25°C	25°-40°C
mm	mm	bar	mm	bar	sec	sec	sec	bar	min	min	min
200	14,7	9,1	2,0	0.. 0,6	147	0.. 9	9	9,1	11,2	14,3	18,8
225	16,5	11,5	2,0	0.. 0,8	165	0.. 9	10	11,5	12,4	15,9	21,0
250	18,4	14,2	2,0	0.. 0,9	184	0.. 10	11	14,2	13,6	17,5	23,3
280	20,6	17,8	2,5	0.. 1,2	206	0.. 10	12	17,8	15,1	19,4	25,8
315	23,2	22,5	2,5	0.. 1,5	232	0.. 11	13	22,5	17,0	21,6	28,8
355	26,1	28,6	3,0	0.. 1,9	261	0.. 12	14	28,6	19,1	24,1	32,1
400	29,4	36,4	3,0	0.. 2,4	294	0.. 13	16	36,4	21,5	27,1	36,0
450	33,1	46,0	3,0	0.. 3,1	331	0.. 15	17	46,	24,2	30,4	40,4
500	36,8	56,8	3,0	0.. 3,8	368	0.. 16	19	56,8	26,8	33,8	44,7

REMEMBER:

Heating mirror temperature must be 220 °C +/- 10°C;

Add drag pressure to P1 and P5;

A reduction of cooling time of up to 50% is permitted in the following circumstances:

- The joint connection was created under workshop conditions and
- the removal of the part from the welding machine and its temporary until the complete cooling time according to column t5 causes negligible loading of the joint connection

Machine PT 500						DVS 2207-1 rel. August 2015					
Thrust section sq.cm. 14,13						Material PE					
SDR 11						Welding range 200 500					
D	S	P1 bead		P2 t 2		t 3	t 4	P5		t 5	
DIAMETER	THICKNESS	EQUALISING		HEATING		CHANGE OV.	JOINING	COOLING	<15°	15°-25°C	25°-40°C
mm	mm	bar	mm	bar	sec	sec	sec	bar	min	min	min
200	18,2	11,0	2,0	0.. 0,7	182	0.. 10	11	11,	13,5	17,3	23,0
225	20,5	14,0	2,5	0.. 0,9	205	0.. 10	12	14,	15,0	19,2	25,7
250	22,7	17,2	2,5	0.. 1,1	227	0.. 11	13	17,2	16,7	21,2	28,3
280	25,5	21,6	2,5	0.. 1,4	255	0.. 12	14	21,6	18,6	23,5	31,4
315	28,6	27,3	3,0	0.. 1,8	286	0.. 13	15	27,3	20,9	26,4	35,1
355	32,3	34,7	3,0	0.. 2,3	323	0.. 14	17	34,7	23,6	29,7	39,4
400	36,4	44,1	3,0	0.. 2,9	364	0.. 16	19	44,1	26,5	33,4	44,2
450	40,9	55,8	3,5	0.. 3,7	409	0.. 17	21	55,8	29,7	37,6	49,8
500	45,5	68,9	3,5	0.. 4,6	455	0.. 19	23	68,9	32,9	41,8	55,4
SDR 9						Welding range 200 500					
D	S	P1 bead		P2 t 2		t 3	t 4	P5		t 5	
DIAMETER	THICKNESS	EQUALISING		HEATING		CHANGE OV.	JOINING	COOLING	<15°	15°-25°C	25°-40°C
mm	mm	bar	mm	bar	sec	sec	sec	bar	min	min	min
200	22,2	13,2	2,5	0.. 0,9	222	0.. 11	12	13,2	16,3	20,8	27,7
225	25,0	16,7	2,5	0.. 1,1	250	0.. 12	14	16,7	18,3	23,1	30,9
250	27,8	20,6	3,0	0.. 1,4	278	0.. 13	15	20,6	20,3	25,6	34,1
280	31,1	25,8	3,0	0.. 1,7	311	0.. 14	16	25,8	22,7	28,6	38,0
315	35,0	32,7	3,0	0.. 2,2	350	0.. 15	18	32,7	25,5	32,2	42,6
355	39,4	41,5	3,5	0.. 2,8	394	0.. 17	20	41,5	28,7	36,3	48,0
400	44,4	52,7	3,5	0.. 3,5	444	0.. 18	22	52,7	32,2	40,9	54,2
450	50,0	66,7	3,5	0.. 4,4	500	0.. 20	25	66,7	36,0	46,0	61,0
500	55,6	82,3	4,0	0.. 5,5	556	0.. 21	28	82,3	39,9	51,0	67,7
SDR 7,4						Welding range 200 450					
D	S	P1 bead		P2 t 2		t 3	t 4	P5		t 5	
DIAMETER	THICKNESS	EQUALISING		HEATING		CHANGE OV.	JOINING	COOLING	<15°	15°-25°C	25°-40°C
mm	mm	bar	mm	bar	sec	sec	sec	bar	min	min	min
200	27,0	15,6	3,0	0.. 1,0	270	0.. 12	14	15,6	19,7	24,9	33,2
225	30,4	19,7	3,0	0.. 1,3	304	0.. 14	16	19,7	22,2	28,0	37,2
250	33,8	24,4	3,0	0.. 1,6	338	0.. 15	18	24,4	24,7	31,1	41,2
280	37,8	30,6	3,5	0.. 2,0	378	0.. 16	19	30,6	27,6	34,8	46,0
315	42,6	38,7	3,5	0.. 2,6	426	0.. 18	22	38,7	30,9	39,1	51,9
355	48,0	49,1	3,5	0.. 3,3	480	0.. 19	24	49,1	34,6	44,1	58,5
400	54,1	62,4	4,0	0.. 4,2	541	0.. 21	27	62,4	38,8	49,6	65,9
450	60,8	78,9	4,0	0.. 5,3	608	0.. 23	30	78,9	43,6	55,7	74,0

REMEMBER:

Heating mirror temperature must be 220 °C +/- 10°C;

Add drag pressure to P1 and P5;

A reduction of cooling time of up to 50% is permitted in the following circumstances:

- The joint connection was created under workshop conditions and
- the removal of the part from the welding machine and its temporary until the complete cooling time according to column t5 causes negligible loading of the joint connection

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.

8.5 Back trolley

It's strongly suggested to keep always clean the back trolleys.

At regular intervals carry out a complete cleaning operation with a lubrication.

Suggested maintenances for PT 500 with rev. facing tool & heating mirror						
	AT THE MACHINE STARTUP	IF NECESSARY	DAILY	WEEKLY	MONTHLY	YEARLY
Cylinder's rod cleaning			X			
Quick couplers cleaning	X					
Basic machine cleaning					X	
Tie rod cleaning & lubrication				X		
Screws tightening check up					X	
Rollers cleaning and lubrication				X		
Facing tool disks cleaning				X		
Back trolley cleaning and lubrication					X	
Heating plate cleaning			X			
Heating plate surfaces check up		X				
Cables check up					X	
Hydraulic unit plug check up	X					
Oil quality check up						X
Oil level check up				X		
Oil replacement						X
Oil filter replacement		X				

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 the arrow)

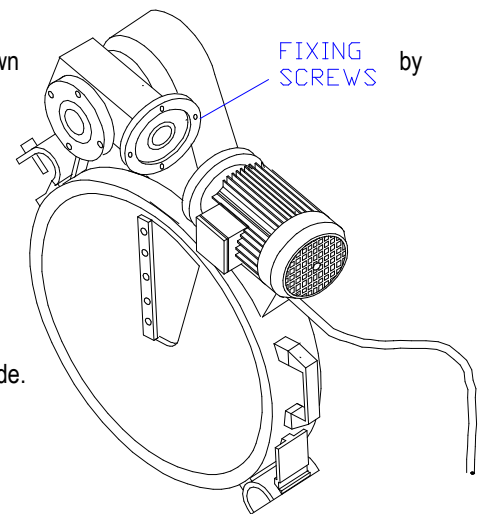
b) **The engine is burnt out:**

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

- Unplug the facing tool
- Unscrew the fixing screws
- Disconnect the safety microswitch
- Remove the engine by means of pulling in upper direction. In case of difficulties, you can use a thin blade to detach the two flanges.

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.

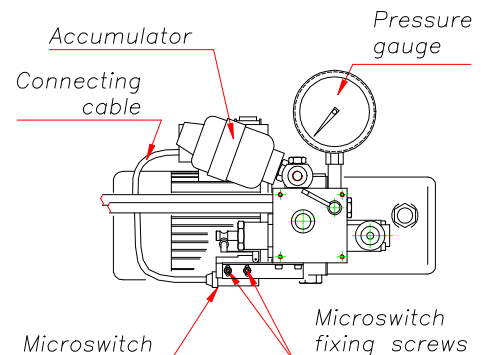


9.3 Hydraulic unit

a) **The engine does not start:**

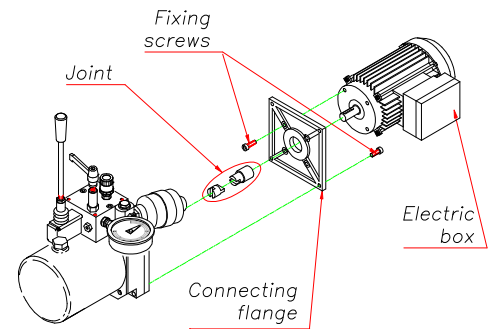
Check that the hydraulic unit engine is switched on
The microswitch is damaged or wrongly adjusted

- 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:

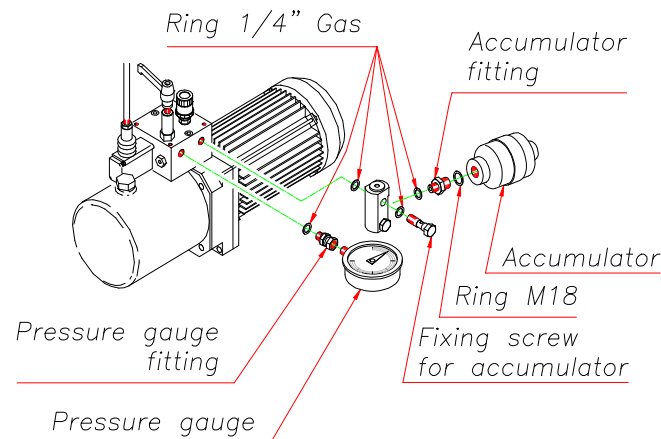
- Check that the electric plug is disconnected
- Open the electric connections box and disconnect the micro-switch cable
- Enlighten the screws and take out the engine
- Take out the joints and insert them on the new engine
- Reassemble the engine taking care that the joints are perfectly located on 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 there are some leakage on hydraulic circuit.

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

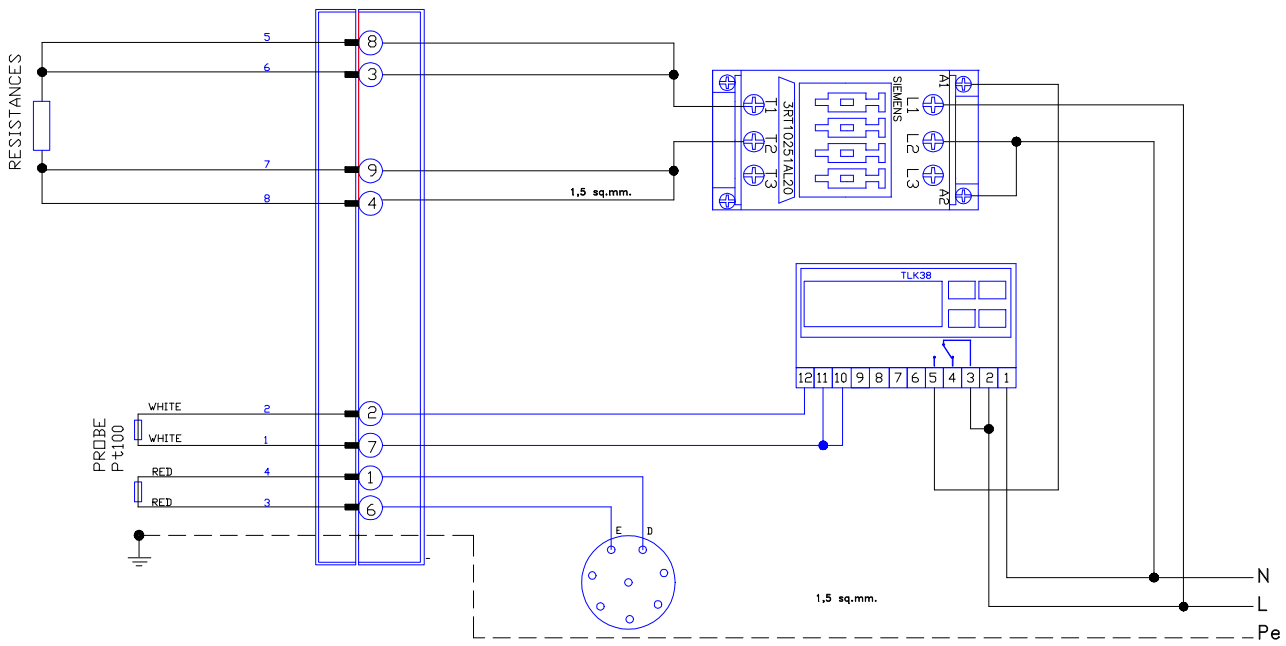
- The lever **E** is not closed.
- The accumulator is down or damaged. To replace the pressure gauge follows the below steps:
 1. Bring the pressure to zero and enlighten the bolt
 2. Take out the fitting and replace the damaged accumulator with the new one
 3. Tighten the bolt

**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:
 - Unplug the heating mirror
 - Unscrew the nuts and take out the thermostat support
 - Unscrew the screws and remove the cap
 - Check all the electric connections and reassemble
3. By using a multimeter check if all the resistances are in good condition, if one or more are broken the heating mirror must be changed
4. By using a multimeter check if the thermostat is working, in case replace it
5. For additional information on electric components, please contact our **Technical Dept.**

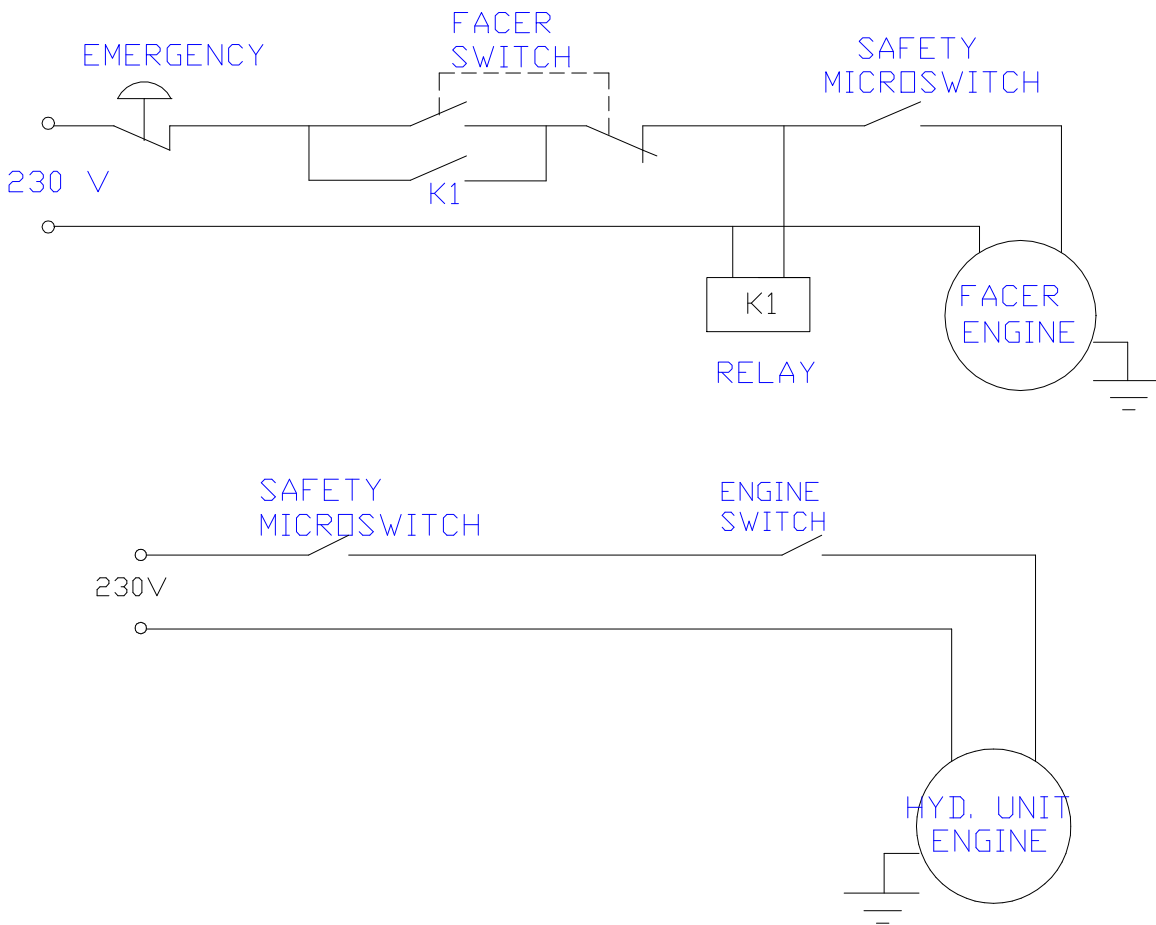
10. Drawings

10.1 Thermostat connection

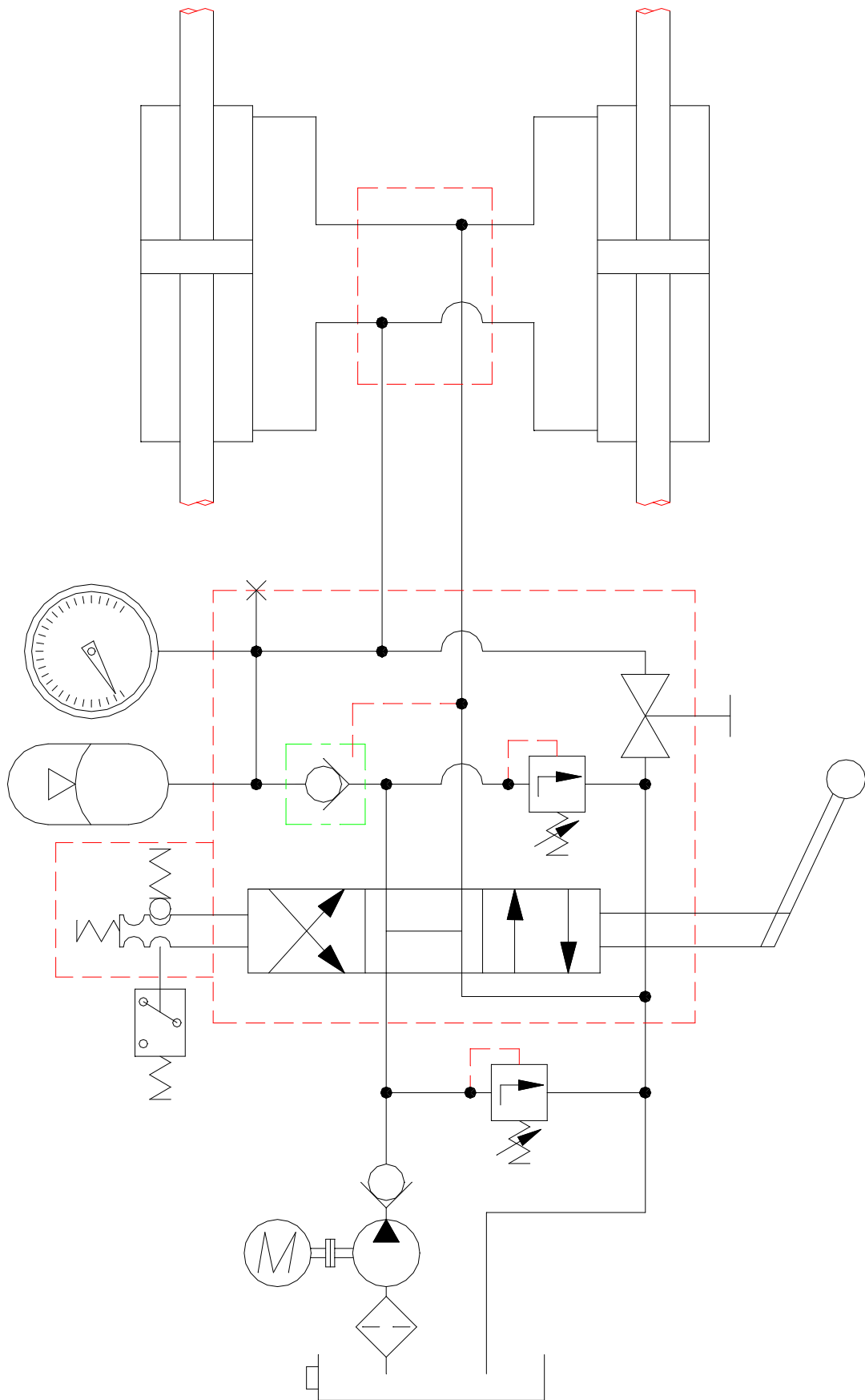


HEATING PLATE 10 PINS WEISSMUELLER CONNECTOR UTG CONNECTOR SIEMENS CONTACTOR K38 THERMOSTAT POWER SUPPLY

10.2 Facing tool and hydraulic unit engines connection



10.3 Hydraulic plan



This manual has been printed on December 2021

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