

I.T.S. by Tecnodue

PT 200

Edition 1208

Operating Manual

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

PT 200

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.

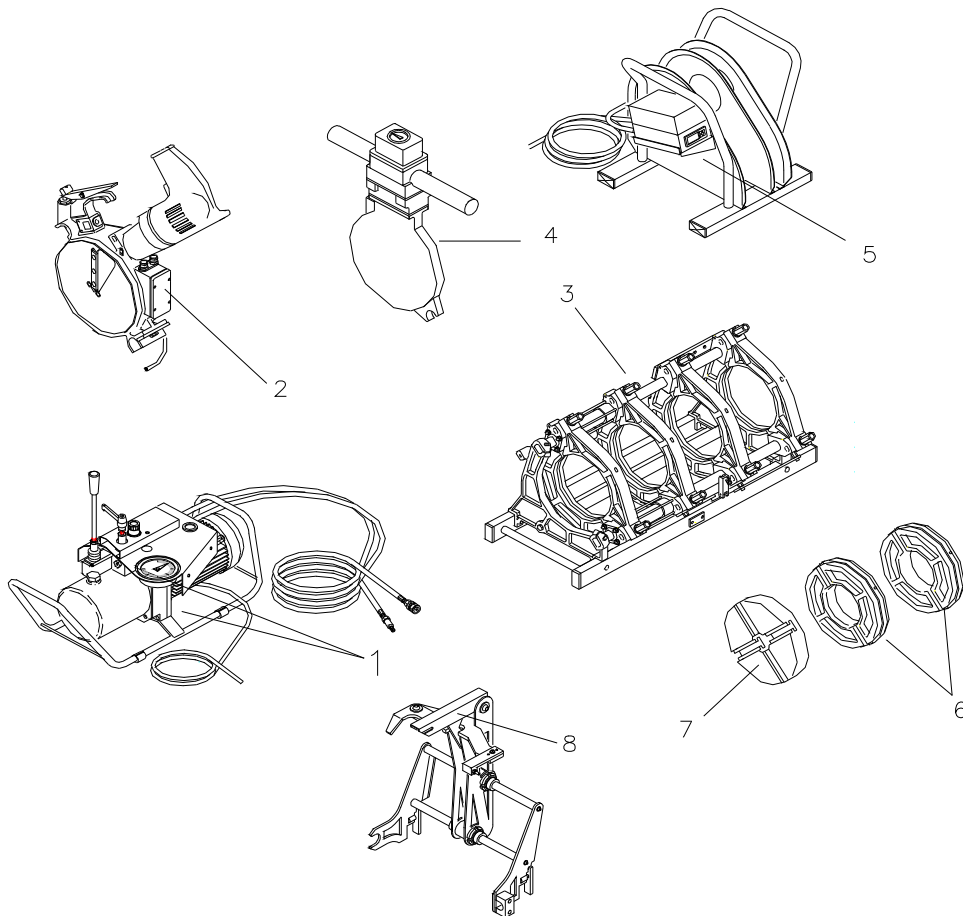
Via Scarsellini 77 , 16149 Genova Italy

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. Basic machine
4. Heating Mirror
5. Support for facing tool and heating mirror

On request can be supplied:

6. Light weight alloy reducing rings for pipes and fittings d. 63,50,75,90,110,125,140,160,180 mm
7. Stub End Device
8. MDD (PT automatic mirror device)
 - Short spigot fittings clamp d. 200mm
 - 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 200)

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 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

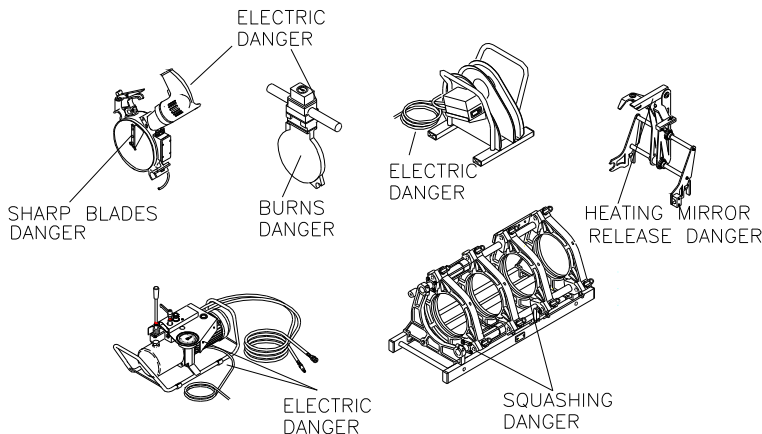
ACOUSTIC POLLUTION

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



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	2.82 KW 12.3 A
Heating mirror	IP 54 1.42 KW
Facing tool	IP 20 0.8 KW
Hydraulic unit	IP44 0.6 KW
Hydraulic data	
Maximum working pressure	100 bar
Cylinder's section	4,32 cm ²
Pressure gauge	0 - 100 bar
Pressure gauge precision class	Cl. 1.0
Hydraulic unit engine revolutions	1400 rpm
Volumetric pump's capacity	1,2 cc/rev.
Pump's capacity	1.68 l/min
Hydraulic oil	ISO 46
Oil tank's capacity	1.5 liter
Mechanical Data	
Facing tool transmission system	Gear drive
Trolley maximum stroke	145 mm
Trolley slide bar diameter	25 mm
Distance between the cylinders centre	310 mm
Dimensions	
Basic machine	895 x 320 x 470 mm
Facing tool	470 x 440 x 84 mm
Heating mirror	420 x 350 x 72 mm
Hydraulic unit	445 x 320 x 270 mm
Support for facing tool and heating mirror	415 x 550 x 270 mm
Weights	
Basic machine	46 Kg
Facing tool	13 Kg
Heating mirror	6,5 Kg
Hydraulic unit	26 Kg
Support for facing tool and heating mirror	8 Kg
Wooden transport box	47 Kg
Stub end device	4 Kg
Reducing inserts complete set	29 Kg

2. General description and application field

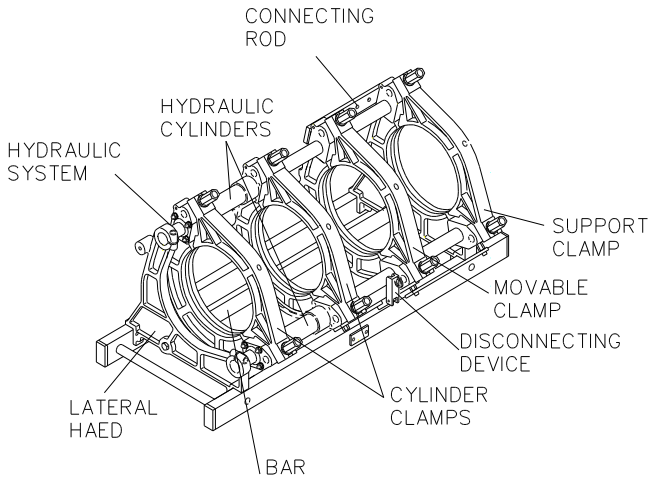
Hydraulic operated butt welding machines suitable for PE,PP,PVDF and other thermoplastics pipes and fittings.

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. 200 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



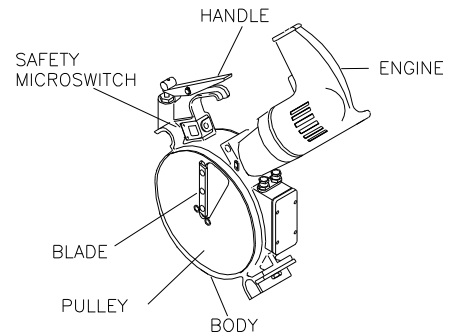
The basic machine is composed by:

- Two cylinders on which heads are mounted two complete clamps d. 200 mm
- One movable clamp d.200 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.200 mm (PT 200)
- 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:

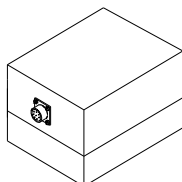
- The facing tool body
- Two disks where are mounted the blades
- A drill engine with a safety pin that, while connected keep the facing tool hooked to the machine.
- An handle with safety micro-switch allowing the engine starts only when the facing tool is fit into the machine ,avoiding the start of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



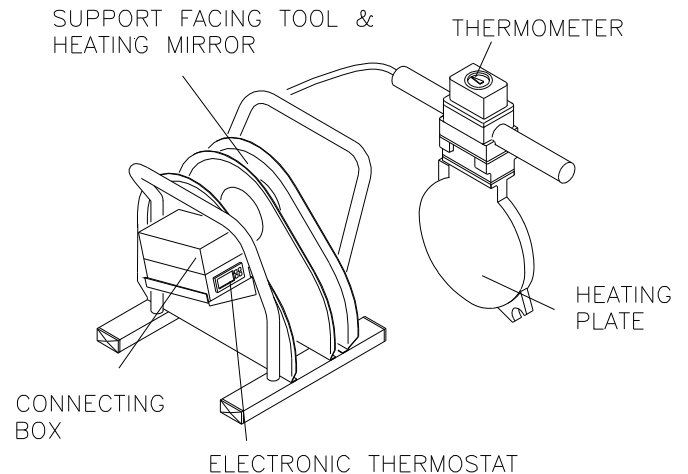
2.3 Heating Mirror

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).

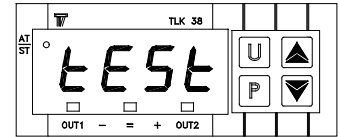


LDU Connector

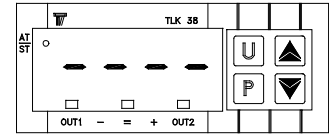


2.3.1 Electronic thermostat – different functions

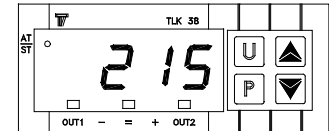
At each startup on the display will blink the writing 'TEST'. This means that the thermostat is testing the connection between the probe and the heating mirror.



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).



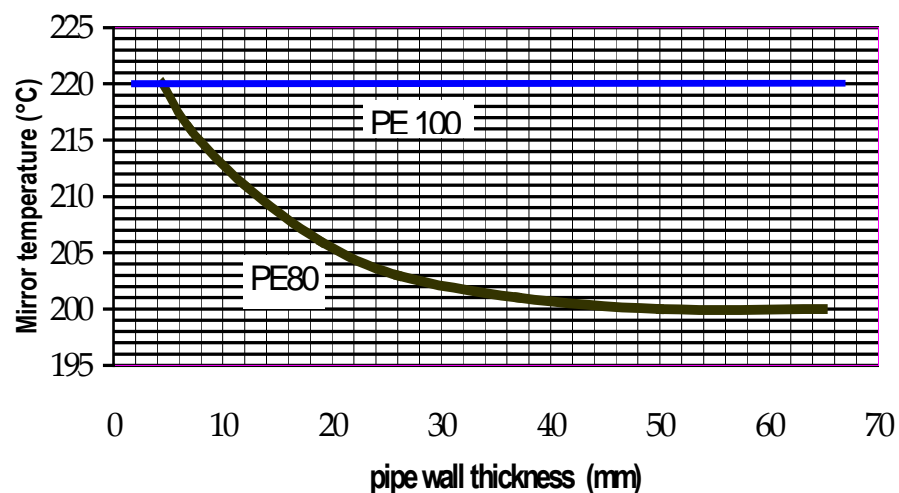
To display the actual set point value of the temperature stored by the thermostat, push the key **P**. The display will show alternately the writing 'SP1' and the **set point value of the temperature**. After 5 seconds the display will show again the real value of the heating mirror temperature

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



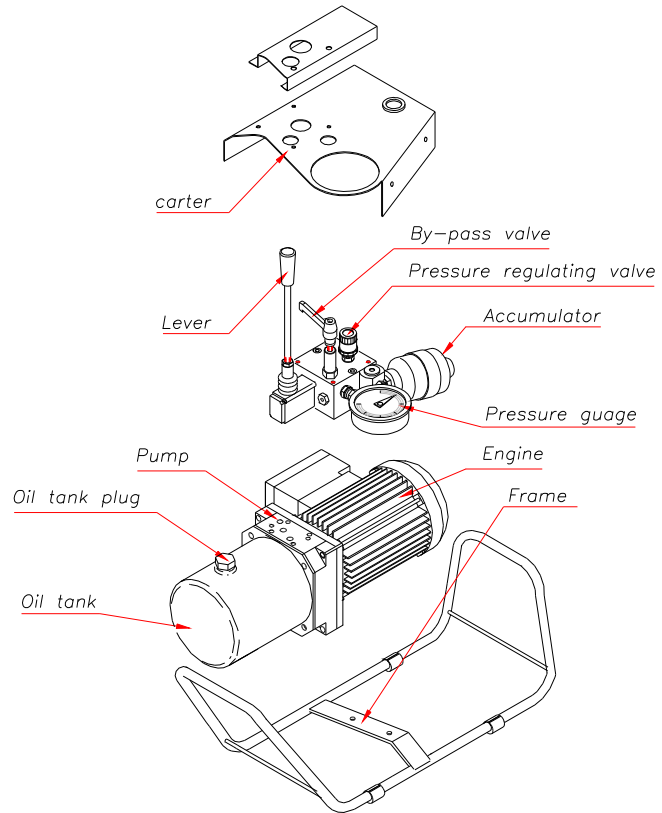
Remember

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

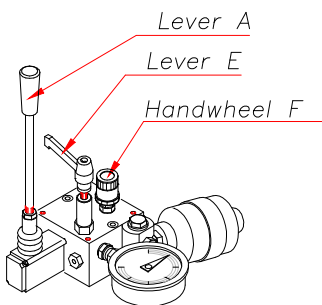
2.4 Hydraulic Unit

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

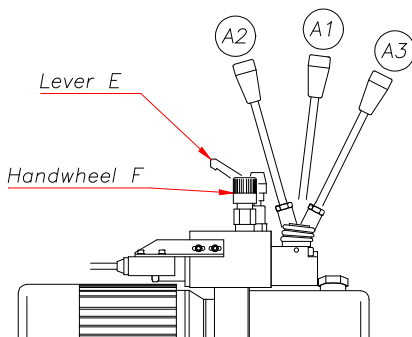


The control lever **A** open and close the machine's trolley according to the position selected.

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

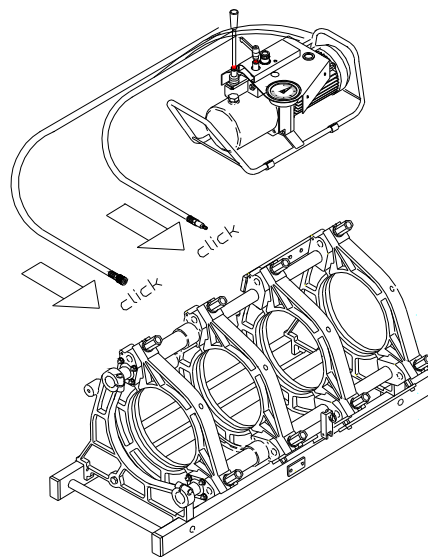
In order to make easy the learning we shall proceed to the description step by step of all operations need in order to complete a welding according to the following description:

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.

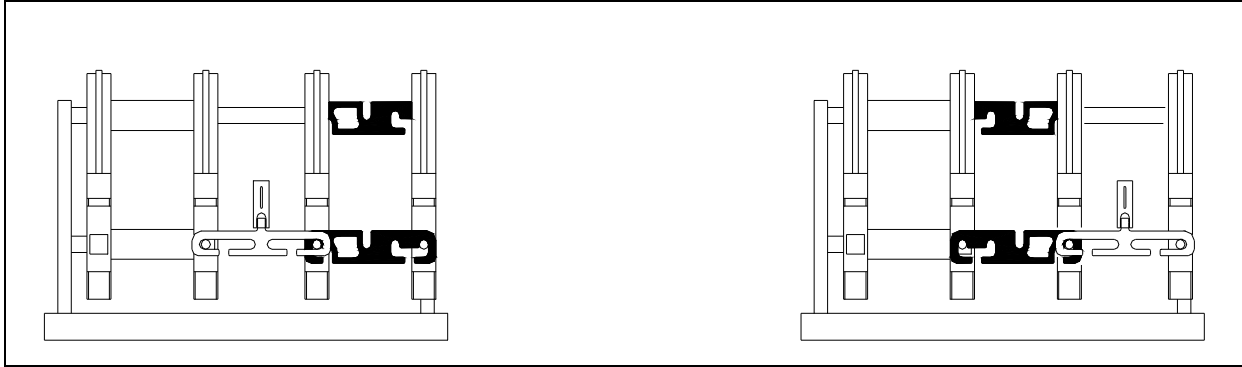


Figure 1. Configuration 2 moveable clamps + 2 fixed clamps

Figure 2. Configuration 3 moveable clamps + 1 fixed clamp

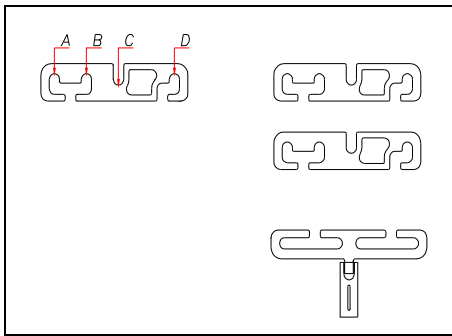


Figure 3.

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.

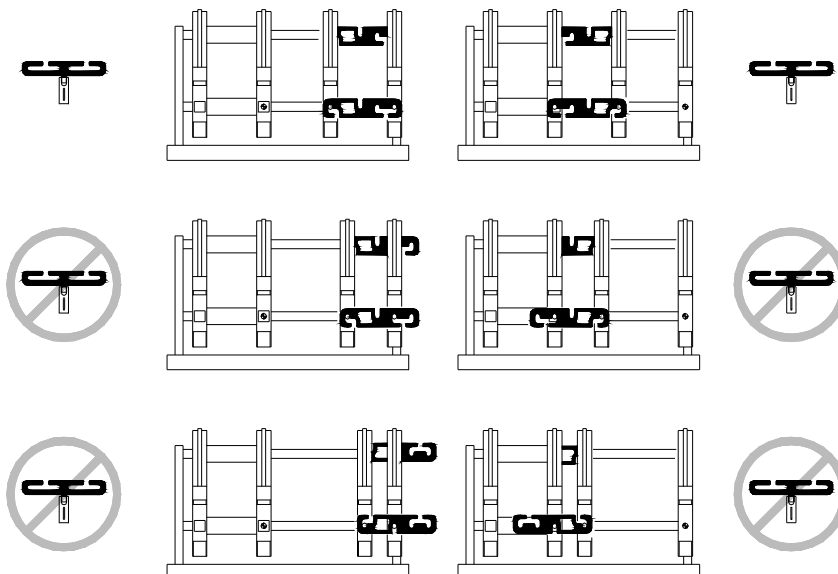
You can modify the distance between the clamps connected by the spacers.

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

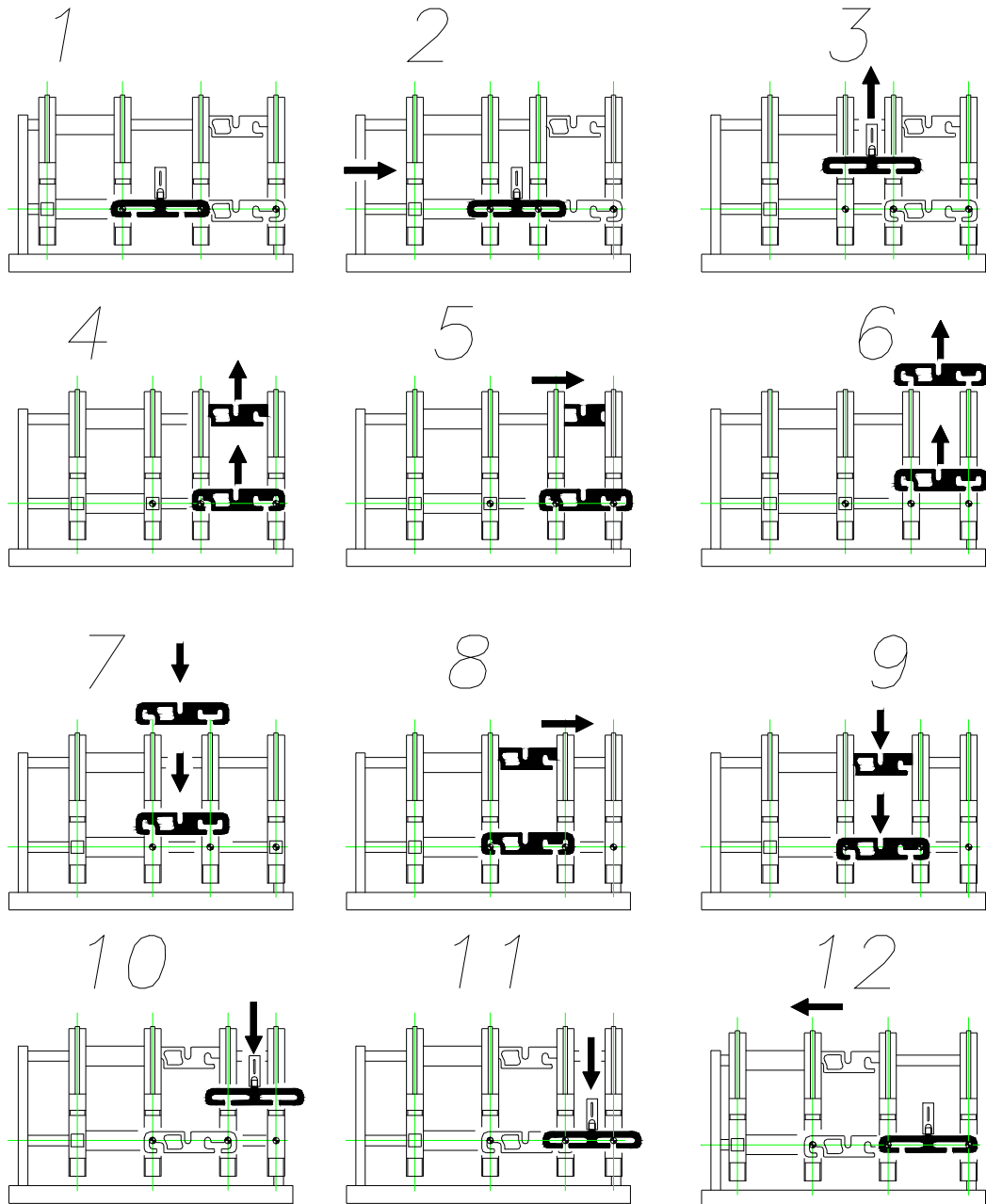
On the right (from above) Upper and lower spacer (interchangeable) and disconnecting device

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.

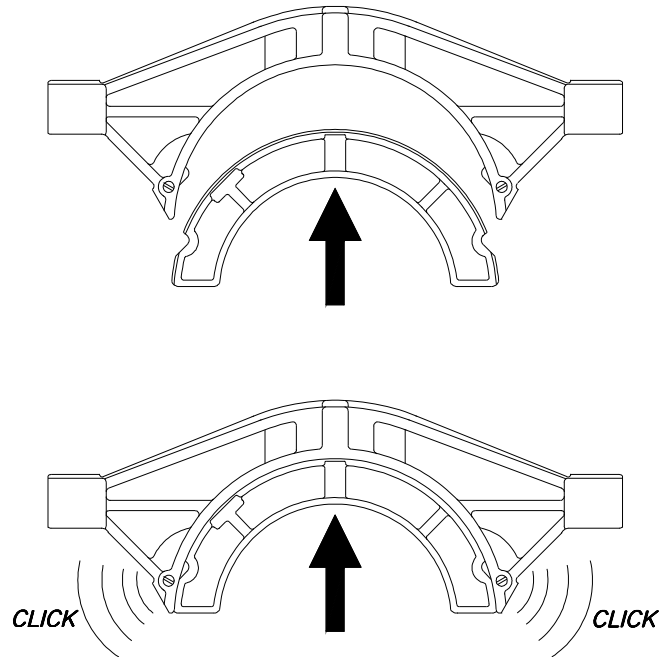
1. Configuration 2 moveable clamps + 2 fixed clamps
2. Not completely close the trolleys
3. Remove the heating mirror disconnecting device
4. Lift the spacers as shown in the figure above
5. By using your hands translate the third clamps as in the figure above
6. Remove the spacers
7. Place the spacers 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

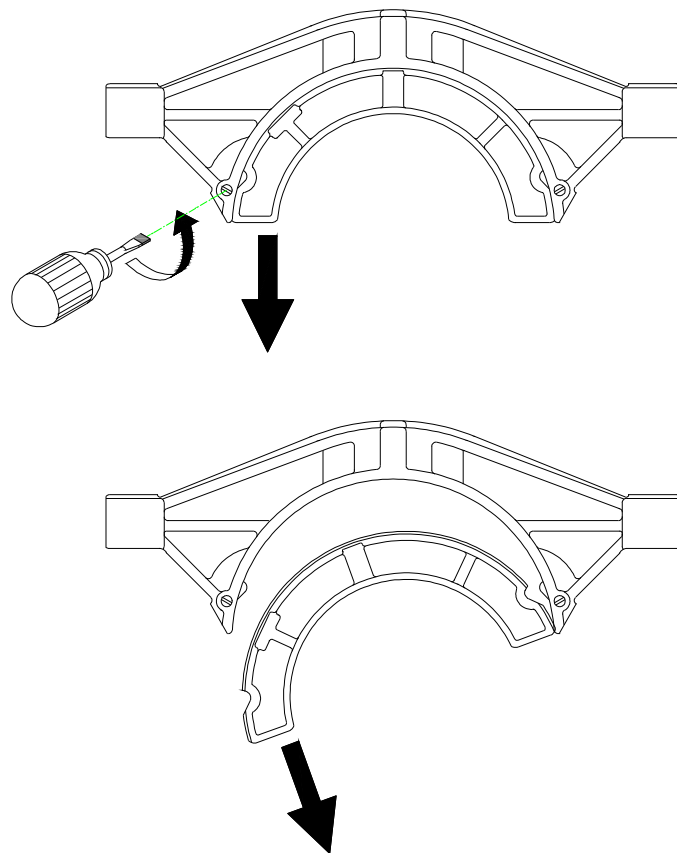
To use a beep-beep inserts reduction

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.

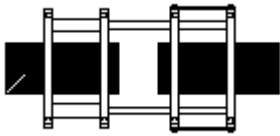


4. Butt welding in brief

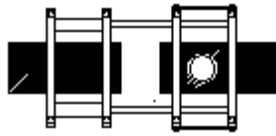
4.1 Introduction

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:

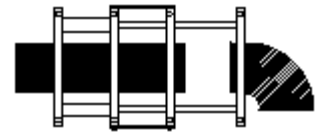
- 1) Pipe with Pipe, standard configuration of the machine
- 2) Pipe with long spigot fitting, standard configuration of the machine
- 3) Pipe with short spigot fitting, to achieve this kind of welding it is strongly suggested to configure the machine with three moveable clamps and 1 fixed clamp. Furthermore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



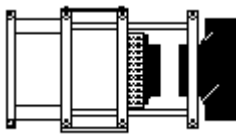
1. PIPE WITH PIPE



2. PIPE WITH LONG SPIGOT FITTING



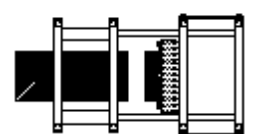
3. PIPE WITH SHORT SPIGOT FITTING



4. FITTING WITH SHORT SPIGOT STUB END



5. PIPE WITH SHORT SPIGOT STUB END

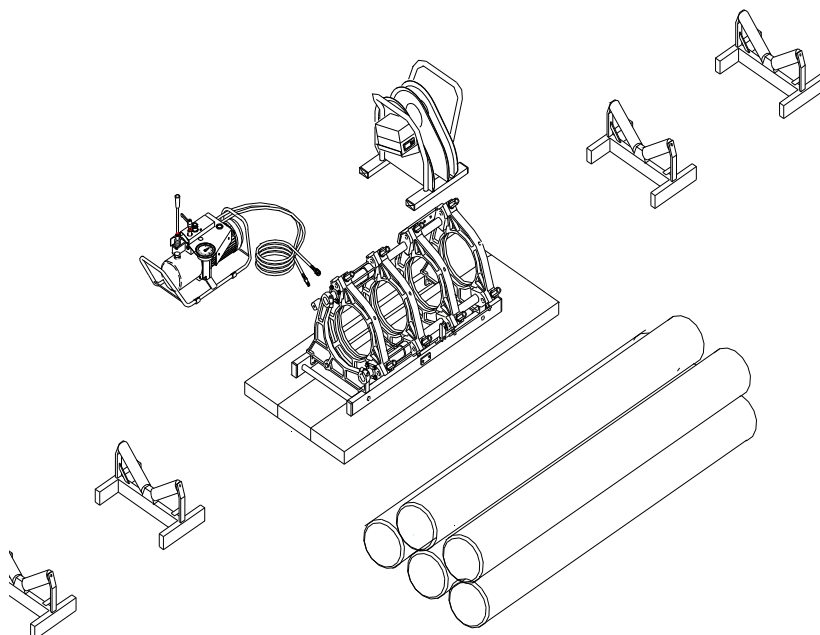


6. PIPE WITH SHORT SPIGOT STUB END

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

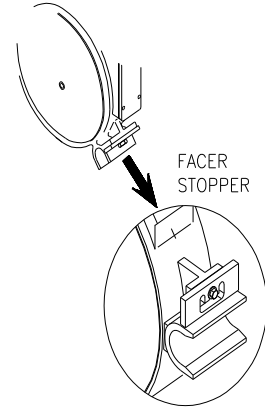


- b) Connect the flexible hoses of the hydraulic unit to the machine

- 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 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

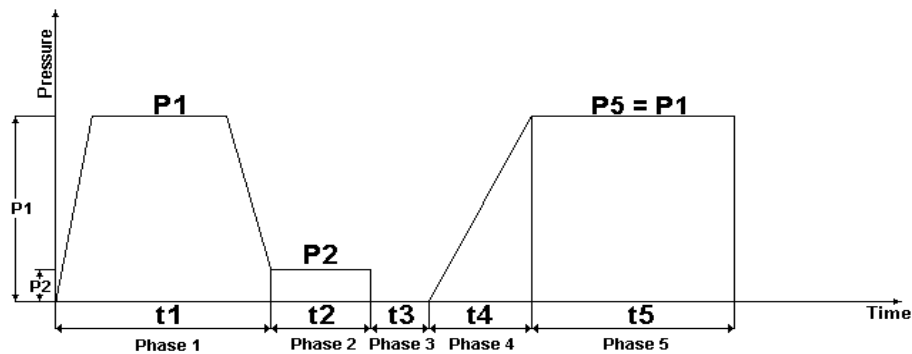
PHASE 2 = t_2 = Time requested for the continual heating

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

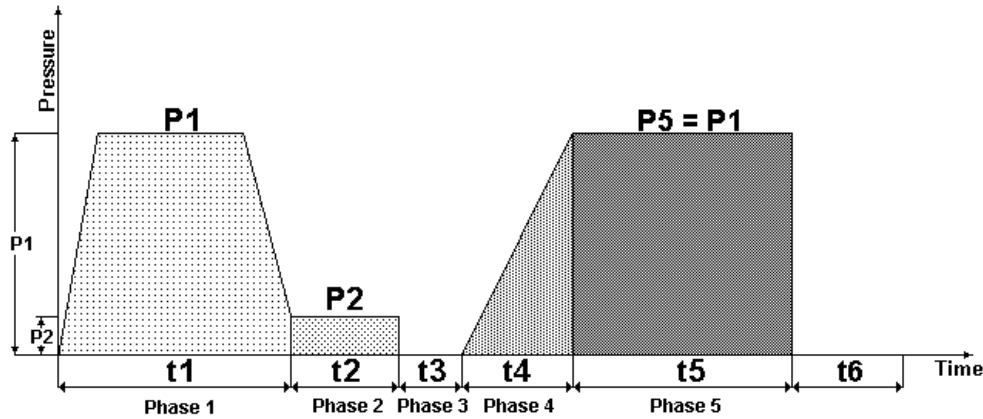
- Bring the lever **A** into position **A1** and keep such situation for all the cooling time indicated into the attached welding table, taking care that the pressure will not decrease too much
- Elapsed the cooling time by acting on lever **E** anticlockwise bring the pressure to zero.
- Take away the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



- 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:

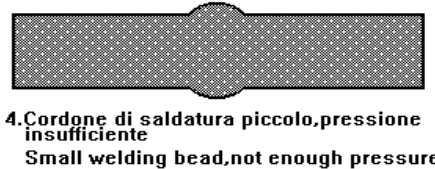
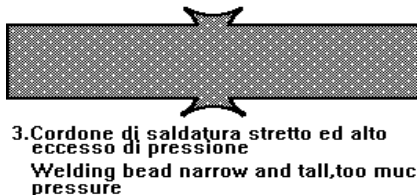
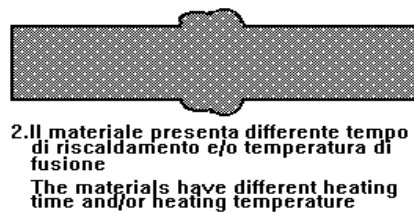
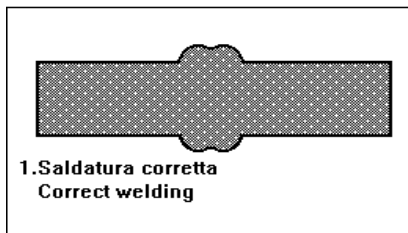
$$\frac{\text{Pipe section (cm}^2\text{)} \times \text{Material thrust coefficient (Kg./cm}^2\text{)}}{\text{Total machine cylinders section (cm}^2\text{)}} = \text{bar}$$

Total machine cylinders section(cm²)

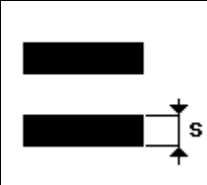
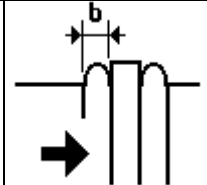
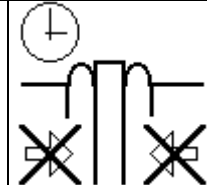
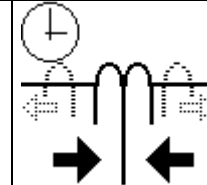
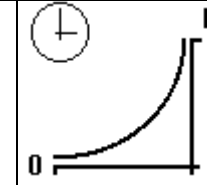
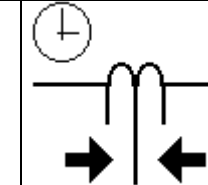
Material thrust coefficient for PE s 63	1,5 Kg./cm ²
Material thrust coefficient for PP	1,0 Kg./cm ²
Total PT 200 cylinders section	4,32 cm ²

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

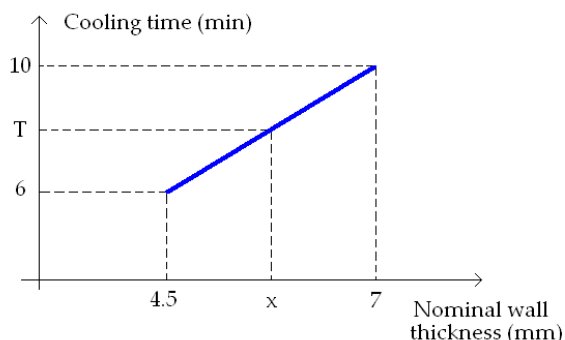
Optical checking of butt welding result



5.1 Welding Parameters for PE & PP sheets, pipes & fittings according to DVS 2207-1 – 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 200 - DVS 2207-1			Cyl. section cm ² 4,32				Welding range 63-200 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	2,1	0,5	0.. 0,1	22	0.. 5	5	2,1	6
110	2,7	220	3,1	0,5	0.. 0,2	27	0.. 5	5	3,1	6
125	3,0	220	4,1	0,5	0.. 0,3	30	0.. 5	5	4,1	6
140	3,4	220	5,1	0,5	0.. 0,3	34	0.. 5	5	5,1	6
160	3,9	220	6,6	0,5	0.. 0,4	39	0.. 5	5	6,6	6
180	4,4	220	8,4	0,5	0.. 0,6	44	0.. 5	5	8,4	6
200	4,9	219	10,4	1,0	0.. 0,7	49	0.. 5	5	10,4	7

PT 200 - DVS 2207-1			Cyl. section cm ² 4,32				Welding range 63-200 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	2,6	0,5	0.. 0,2	27	0.. 5	5	2,6	6
110	3,3	220	3,9	0,5	0.. 0,3	33	0.. 5	5	3,9	6
125	3,8	220	5,	0,5	0.. 0,3	38	0.. 5	5	5,	6
140	4,2	220	6,3	0,5	0.. 0,4	42	0.. 5	5	6,3	6
160	4,8	219	8,2	1,0	0.. 0,5	48	0.. 5	5	8,2	7
180	5,5	218	10,4	1,0	0.. 0,7	55	0.. 5	5	10,4	8
200	6,1	218	12,8	1,0	0.. 0,9	61	0.. 6	6	12,8	8

PT 200 - DVS 2207-1			Cyl. section cm ² 4,32				Welding range 63-200 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
63	2,3	220	1,5	0,5	0.. 0,1	23	0.. 5	5	1,5	6
75	2,7	220	2,1	0,5	0.. 0,1	27	0.. 5	5	2,1	6
90	3,3	220	3,1	0,5	0.. 0,2	33	0.. 5	5	3,1	6
110	4,0	220	4,6	0,5	0.. 0,3	40	0.. 5	5	4,6	6
125	4,5	220	5,9	1,0	0.. 0,4	45	0.. 5	5	5,9	6
140	5,1	219	7,5	1,0	0.. 0,5	51	0.. 5	5	7,5	7
160	5,8	218	9,7	1,0	0.. 0,6	58	0.. 6	6	9,7	8
180	6,5	217	12,3	1,0	0.. 0,8	65	0.. 6	6	12,3	9
200	7,2	216	15,2	1,5	0.. 1,0	72	0.. 6	6	15,2	10

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

PT 200 - DVS 2207-1			Cyl. section cm ² 4,32				Welding range 63-200 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	
63	2,4	220	1,6	0,5	0.. 0,1	24	0.. 5	5	1,6	6	
75	2,9	220	2,3	0,5	0.. 0,2	29	0.. 5	5	2,3	6	
90	3,5	220	3,3	0,5	0.. 0,2	35	0.. 5	5	3,3	6	
110	4,2	220	4,9	0,5	0.. 0,3	42	0.. 5	5	4,9	6	
125	4,8	220	6,3	1,0	0.. 0,4	48	0.. 5	5	6,3	6	
140	5,4	219	7,9	1,0	0.. 0,5	54	0.. 5	5	7,9	7	
160	6,2	217	10,3	1,0	0.. 0,7	62	0.. 6	6	10,3	9	
180	6,9	216	13,1	1,0	0.. 0,9	69	0.. 6	6	13,1	10	
200	7,7	215	16,1	1,5	0.. 1,1	77	0.. 6	6	16,1	11	

PT 200 - DVS 2207-1			Cyl. section cm ² 4,32				Welding range 63-200 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	
63	2,9	220	1,9	0,5	0.. 0,1	29	0.. 5	5	1,9	6	
75	3,4	220	2,7	0,5	0.. 0,2	34	0.. 5	5	2,7	6	
90	4,1	220	3,8	0,5	0.. 0,3	41	0.. 5	5	3,8	6	
110	5,0	219	5,7	1,0	0.. 0,4	50	0.. 5	5	5,7	7	
125	5,7	218	7,4	1,0	0.. 0,5	57	0.. 5	5	7,4	8	
140	6,4	217	9,3	1,0	0.. 0,6	64	0.. 6	6	9,3	9	
160	7,3	216	12,1	1,5	0.. 0,8	73	0.. 6	6	12,1	10	
180	8,2	215	15,3	1,5	0.. 1,0	82	0.. 6	6	15,3	11	
200	9,1	214	18,9	1,5	0.. 1,3	91	0.. 7	7	18,9	13	

PT 200 - DVS 2207-1			Cyl. section cm ² 4,32				Welding range 63-200 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	
63	3,0	220	2,	0,5	0.. 0,1	30	0.. 5	5	2,	6	
75	3,6	220	2,8	0,5	0.. 0,2	36	0.. 5	5	2,8	6	
90	4,3	220	4,	0,5	0.. 0,3	43	0.. 5	5	4,	6	
110	5,2	219	6,	1,0	0.. 0,4	52	0.. 5	5	6,	7	
125	6,0	218	7,7	1,0	0.. 0,5	60	0.. 6	6	7,7	8	
140	6,7	217	9,7	1,0	0.. 0,6	67	0.. 6	6	9,7	9	
160	7,6	215	12,7	1,5	0.. 0,8	76	0.. 6	6	12,7	11	
180	8,6	214	16,	1,5	0.. 1,1	86	0.. 7	7	16,	12	
200	9,5	213	19,8	1,5	0.. 1,3	95	0.. 7	7	19,8	13	

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

PT 200 - DVS 2207-1			Cyl. section cm ² 4,32				Welding range 63-200 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	
63	3,6	220	2,3	0,5	0.. 0,2	36	0.. 5	5	2,3	6	
75	4,3	220	3,3	0,5	0.. 0,2	43	0.. 5	5	3,3	6	
90	5,1	219	4,7	1,0	0.. 0,3	51	0.. 5	5	4,7	7	
110	6,3	217	7,1	1,0	0.. 0,5	63	0.. 6	6	7,1	9	
125	7,1	216	9,1	1,5	0.. 0,6	71	0.. 6	6	9,1	10	
140	8,0	215	11,5	1,5	0.. 0,8	80	0.. 6	6	11,5	11	
160	9,1	214	15,	1,5	0.. 1,0	91	0.. 7	7	15,	13	
180	10,2	213	18,9	1,5	0.. 1,3	102	0.. 7	7	18,9	14	
200	11,4	212	23,4	1,5	0.. 1,6	114	0.. 8	8	23,4	15	

PT 200 - DVS 2207-1			Cyl. section cm ² 4,32				Welding range 63-200 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	
63	3,7	220	2,4	0,5	0.. 0,2	37	0.. 5	5	2,4	6	
75	4,4	220	3,4	0,5	0.. 0,2	44	0.. 5	5	3,4	6	
90	5,3	219	4,9	1,0	0.. 0,3	53	0.. 5	5	4,9	7	
110	6,5	217	7,3	1,0	0.. 0,5	65	0.. 6	6	7,3	9	
125	7,4	216	9,4	1,5	0.. 0,6	74	0.. 6	6	9,4	10	
140	8,2	215	11,8	1,5	0.. 0,8	82	0.. 6	6	11,8	11	
160	9,4	214	15,5	1,5	0.. 1,0	94	0.. 7	7	15,5	13	
180	10,6	212	19,6	1,5	0.. 1,3	106	0.. 7	7	19,6	14	
200	11,8	211	24,1	1,5	0.. 1,6	118	0.. 8	8	24,1	16	

PT 200 - DVS 2207-1			Cyl. section cm ² 4,32				Welding range 63-200 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	
63	4,6	220	2,9	1,0	0.. 0,2	46	0.. 5	5	2,9	6	
75	5,5	218	4,2	1,0	0.. 0,3	55	0.. 5	5	4,2	8	
90	6,6	217	6,	1,0	0.. 0,4	66	0.. 6	6	6,	9	
110	8,1	215	9,	1,5	0.. 0,6	81	0.. 6	6	9,	11	
125	9,2	214	11,6	1,5	0.. 0,8	92	0.. 7	7	11,6	13	
140	10,3	213	14,6	1,5	0.. 1,0	103	0.. 7	7	14,6	14	
160	11,8	211	19,	1,5	0.. 1,3	118	0.. 8	8	19,	16	
180	13,2	210	24,1	2,0	0.. 1,6	132	0.. 8	9	24,1	17	
200	14,7	209	29,7	2,0	0.. 2,0	147	0.. 9	9	29,7	19	

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

PT 200 - DVS 2207-1			Cyl. section cm ² 4,32				Welding range 63-200 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	
63	5,7	218	3,6	1,0	0.. 0,2	57	0.. 5	5	3,6	8	
75	6,8	216	5,1	1,0	0.. 0,3	68	0.. 6	6	5,1	10	
90	8,2	215	7,3	1,5	0.. 0,5	82	0.. 6	6	7,3	11	
110	10,0	213	10,9	1,5	0.. 0,7	100	0.. 7	7	10,9	14	
125	11,4	212	14,1	1,5	0.. 0,9	114	0.. 8	8	14,1	15	
140	12,7	210	17,7	2,0	0.. 1,2	127	0.. 8	8	17,7	17	
160	14,5	209	23,1	2,0	0.. 1,5	145	0.. 9	9	23,1	19	
180	16,4	208	29,2	2,0	0.. 1,9	164	0.. 9	10	29,2	21	
200	18,2	207	36,	2,0	0.. 2,4	182	0.. 10	11	36,	23	

PT 200 - DVS 2207-1			Cyl. section cm ² 4,32				Welding range 63-200 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	
63	7,0	216	4,3	1,0	0.. 0,3	70	0.. 6	6	4,3	10	
75	8,3	215	6,1	1,5	0.. 0,4	83	0.. 7	7	6,1	12	
90	10,0	213	8,7	1,5	0.. 0,6	100	0.. 7	7	8,7	14	
110	12,2	211	13,	2,0	0.. 0,9	122	0.. 8	8	13,	16	
125	13,9	210	16,8	2,0	0.. 1,1	139	0.. 9	9	16,8	18	
140	15,6	208	21,1	2,0	0.. 1,4	156	0.. 9	10	21,1	20	
160	17,8	207	27,6	2,0	0.. 1,8	178	0.. 10	10	27,6	23	
180	20,0	206	34,9	2,5	0.. 2,3	200	0.. 10	11	34,9	25	
200	22,2	205	43,1	2,5	0.. 2,9	222	0.. 11	12	43,1	28	

PT 200 - DVS 2207-1			Cyl. section cm ² 4,32				Welding range 63-200 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	
63	8,5	214	5,1	1,5	0.. 0,3	85	0.. 7	7	5,1	12	
75	10,1	213	7,2	1,5	0.. 0,5	101	0.. 7	7	7,2	14	
90	12,2	211	10,3	2,0	0.. 0,7	122	0.. 8	8	10,3	16	
110	14,9	209	15,4	2,0	0.. 1,0	149	0.. 9	9	15,4	19	
125	16,9	208	19,9	2,0	0.. 1,3	169	0.. 9	10	19,9	22	
140	18,9	206	25,	2,0	0.. 1,7	189	0.. 10	11	25,	24	
160	21,6	205	32,6	2,5	0.. 2,2	216	0.. 11	12	32,6	27	
180	24,3	204	41,3	2,5	0.. 2,8	243	0.. 11	13	41,3	30	
200	27,0	203	51,	3,0	0.. 3,4	270	0.. 12	14	51,	33	

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 4,32					
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
63	1,8	210°	0,8	0,5	0,1	135	5,0	6,0	0,8	360
75	1,9	210°	1,0	0,5	0,1	135	5,0	6,0	1,0	360
90	2,2	210°	1,4	0,5	0,1	135	5,0	6,0	1,4	360
110	2,7	210°	2,1	0,5	0,2	135	5,0	6,0	2,1	360
125	3,1	210°	2,7	0,5	0,3	135	5,0	6,0	2,7	360
140	3,5	210°	3,5	0,5	0,3	135	5,0	6,0	3,5	360
160	3,9	210°	4,4	0,5	0,4	135	5,0	6,0	4,4	360
180	4,4	210°	5,6	0,5	0,6	135	5,0	6,0	5,6	360
200	4,9	210°	6,9	0,5	0,7	141	5,2	6,2	6,9	418
material PP		SDR 33	PP		Cylinder section cm ² 4,32					
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
63	2	210°	0,9	0,5	0,1	135	5,0	6,0	0,9	360
75	2,4	210°	1,3	0,5	0,1	135	5,0	6,0	1,3	360
90	2,8	210°	1,8	0,5	0,2	135	5,0	6,0	1,8	360
110	3,5	210°	2,7	0,5	0,3	135	5,0	6,0	2,7	360
125	3,9	210°	3,4	0,5	0,3	135	5,0	6,0	3,4	360
140	4,4	210°	4,3	0,5	0,4	135	5,0	6,0	4,3	360
160	5	210°	5,6	0,5	0,6	143	5,2	6,2	5,6	432
180	5,6	210°	7,1	0,5	0,7	153	5,4	6,4	7,1	518
200	6,2	210°	8,7	0,5	0,9	162	5,7	6,7	8,7	605
material PP		SDR 26	PP		Cylinder section cm ² 4,32					
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
63	2,5	210°	1,1	0,5	0,1	135	5,0	6,0	1,1	360
75	2,9	210°	1,5	0,5	0,2	135	5,0	6,0	1,5	360
90	3,5	210°	2,2	0,5	0,2	135	5,0	6,0	2,2	360
110	4,3	210°	3,3	0,5	0,3	135	5,0	6,0	3,3	360
125	4,9	210°	4,3	0,5	0,4	141	5,2	6,2	4,3	418
140	5,4	210°	5,3	0,5	0,5	149	5,4	6,4	5,3	490
160	6,2	210°	6,9	0,5	0,7	162	5,7	6,7	6,9	605
180	7	210°	8,8	0,5	0,9	175	6,0	7,0	8,8	720
200	7,7	210°	10,8	1	1,1	185	6,1	7,6	10,8	787
material PP		SDR 17.6	PP		Cylinder section cm ² 4,32					
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
63	3,6	210°	1,6	0,5	0,2	135	5,0	6,0	1,6	360
75	4,3	210°	2,2	0,5	0,2	135	5,0	6,0	2,2	360
90	5,1	210°	3,1	0,5	0,3	145	5,2	6,2	3,1	446
110	6,3	210°	4,7	0,5	0,5	164	5,7	6,7	4,7	619
125	7,1	210°	6,1	1	0,6	176	6,0	7,1	6,1	730
140	8	210°	7,7	1	0,8	189	6,2	7,8	7,7	816
160	9,1	210°	10,0	1	1,0	204	6,4	8,7	10,0	922
180	10,2	210°	12,6	1	1,3	220	6,6	9,6	12,6	1027
200	11,4	210°	15,6	1	1,6	237	6,9	10,5	15,6	1142

material PP		SDR	11	PP		Cylinder section cm ² 4,32				
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
63	5,8	210°	2,4	0,5	0,2	156	5,5	6,5	2,4	547
75	6,9	210°	3,4	0,5	0,3	173	6,0	7,0	3,4	706
90	8,2	210°	4,9	1	0,5	192	6,2	8,0	4,9	835
110	10	210°	7,3	1	0,7	217	6,6	9,4	7,3	1008
125	11,4	210°	9,4	1	0,9	237	6,9	10,5	9,4	1142
140	12,8	210°	11,8	1	1,2	255	7,2	11,7	11,8	1269
160	14,6	210°	15,4	1	1,5	276	7,7	13,2	15,4	1423
180	16,4	210°	19,5	1	2,0	298	8,3	14,8	19,5	1577
200	18,2	210°	24,0	1	2,4	319	8,8	16,3	24,0	1731

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:

Consulting 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

b) The engine is burnt out:

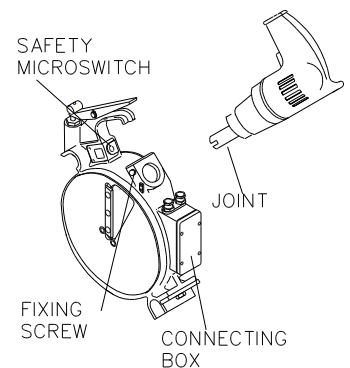
In case it's need to replace the engine the following operations must be done:

- Unplug the facing tool
- Enlighten the screws connecting the engine to the facing tool, disconnect the safety micro-switch and wires
- Remove the engine by means of pulling in upper direction, remove the joint from the drill
- Screw the joint on the new engine
- Mount the new drill engine by taking care to fix the joint gap in a proper way
- Tighten the screws connecting the engine to the facing tool, connect the safety micro-switch and wires

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.



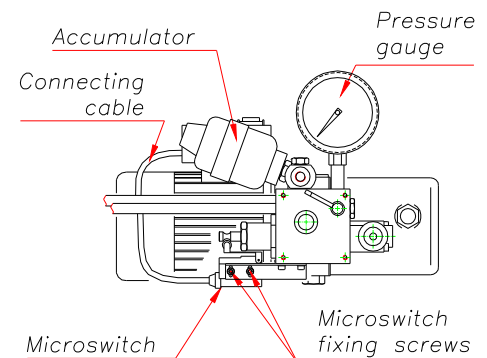
9.3 Hydraulic unit

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

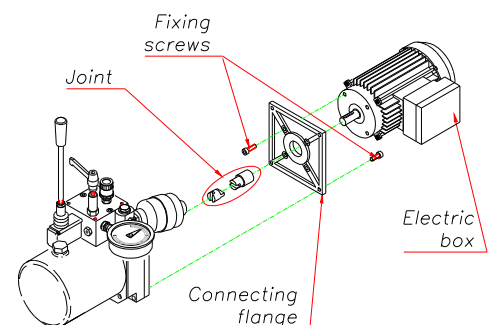
Open the electric connections box and disconnect the micro-switch cable

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

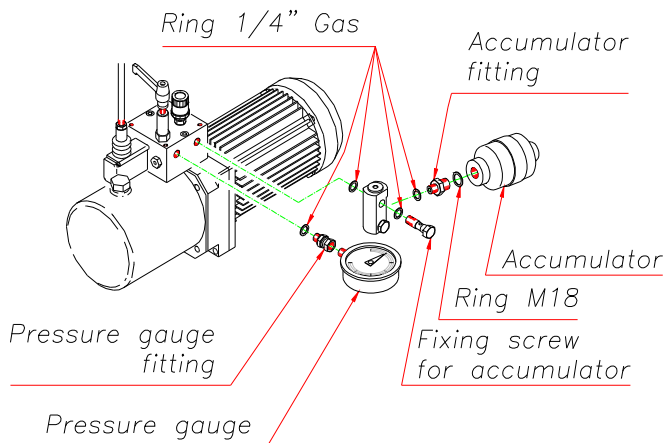


c) If the hydraulic unit cannot increase the pressure reasons could be :

- 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



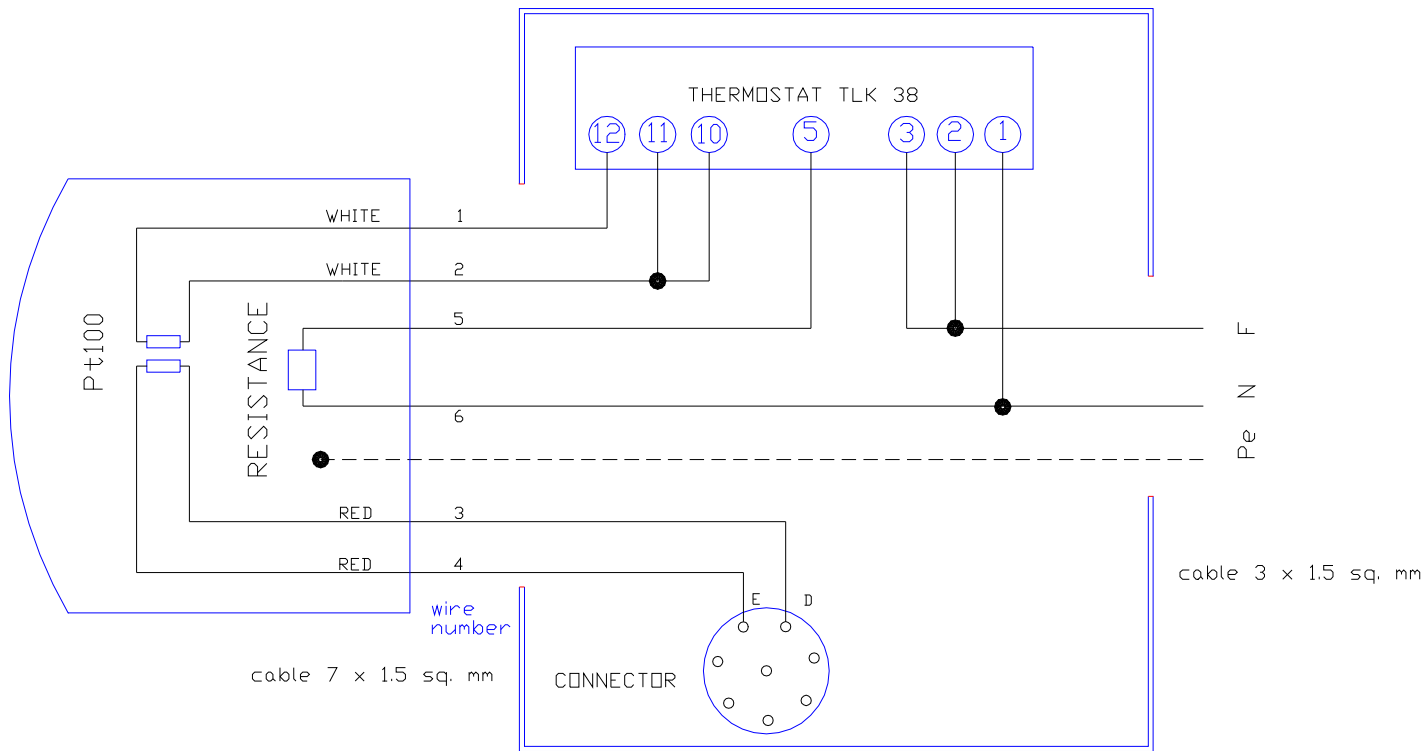
9.4 Heating mirror

a) The heating mirror does not warm up:

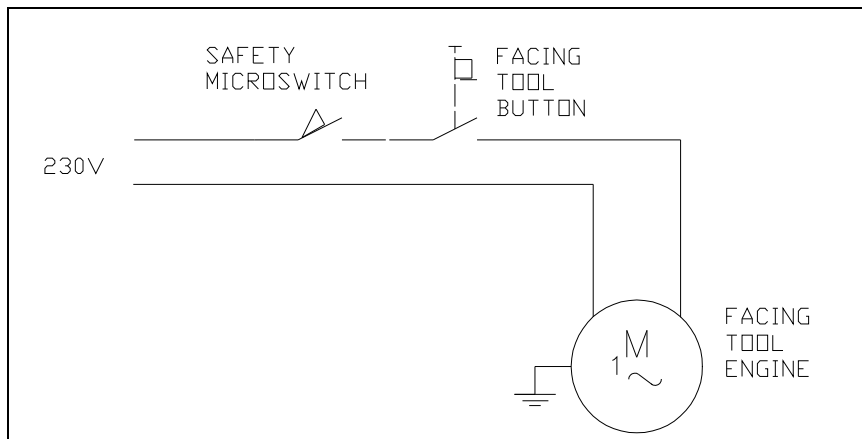
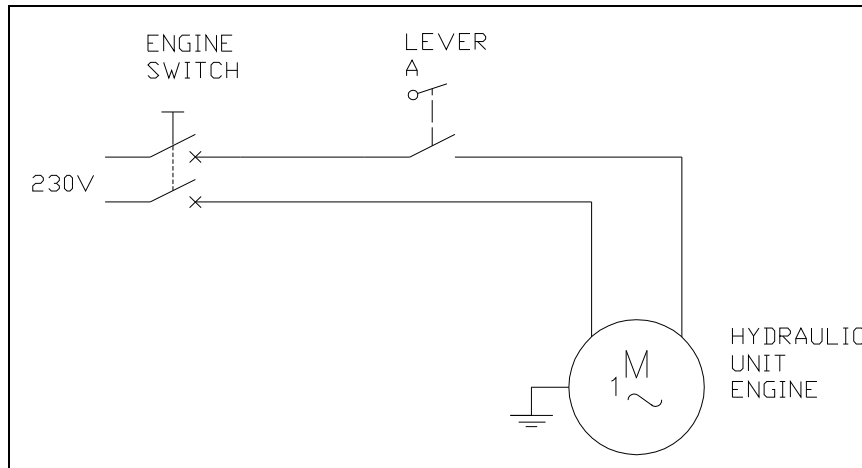
1. Check if the light is switched off, in case check the plug
2. The light is switched on, probably a wire disconnected, check the contacts as follows:
 - Take off the plug from the power
 - Unscrew the nuts and take out the thermostat support
 - Unscrew the screws and remove the cap
 - Check all the 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

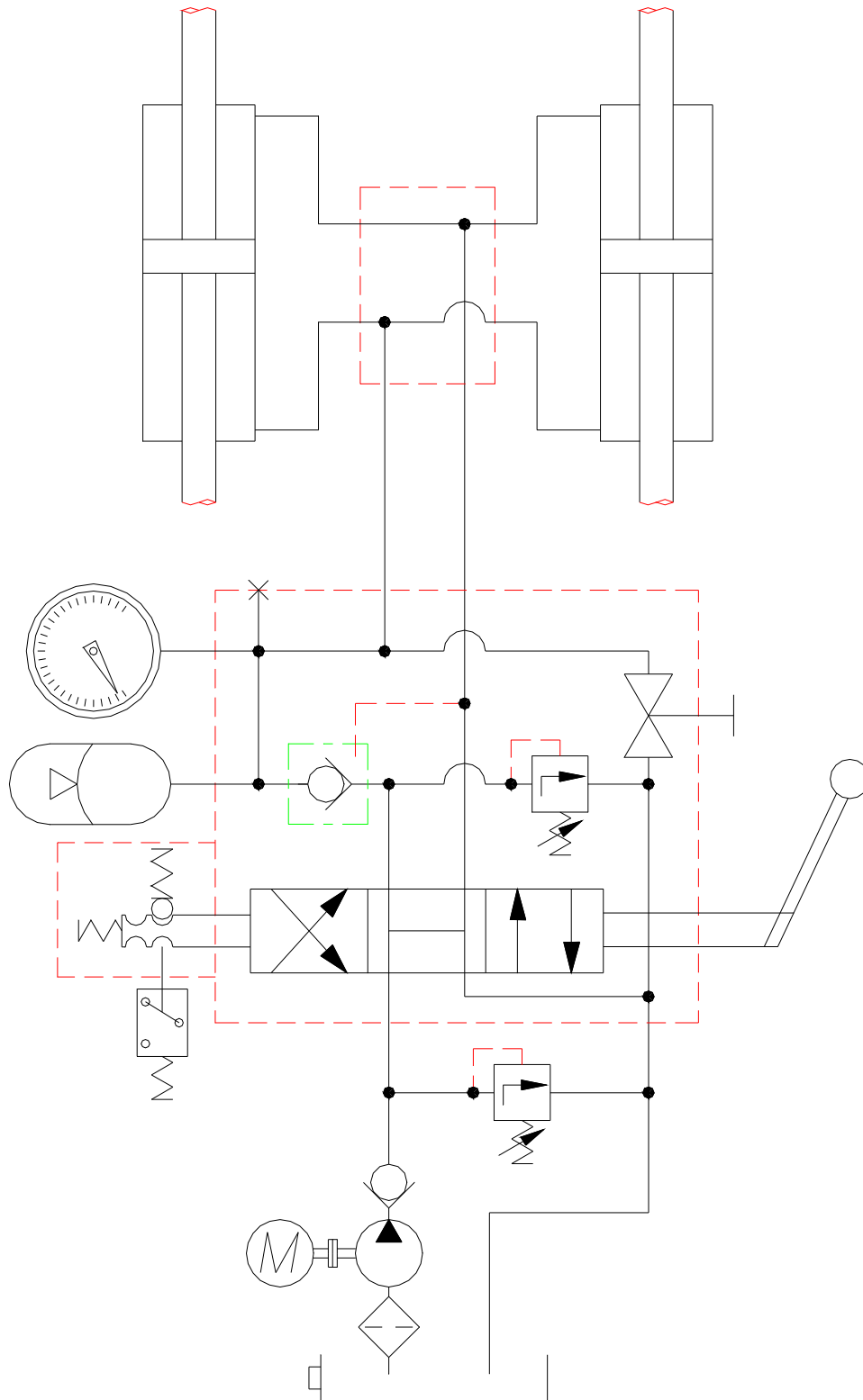
10.1 Thermostat connection



10.2 Facing tool and hydraulic unit engines connection

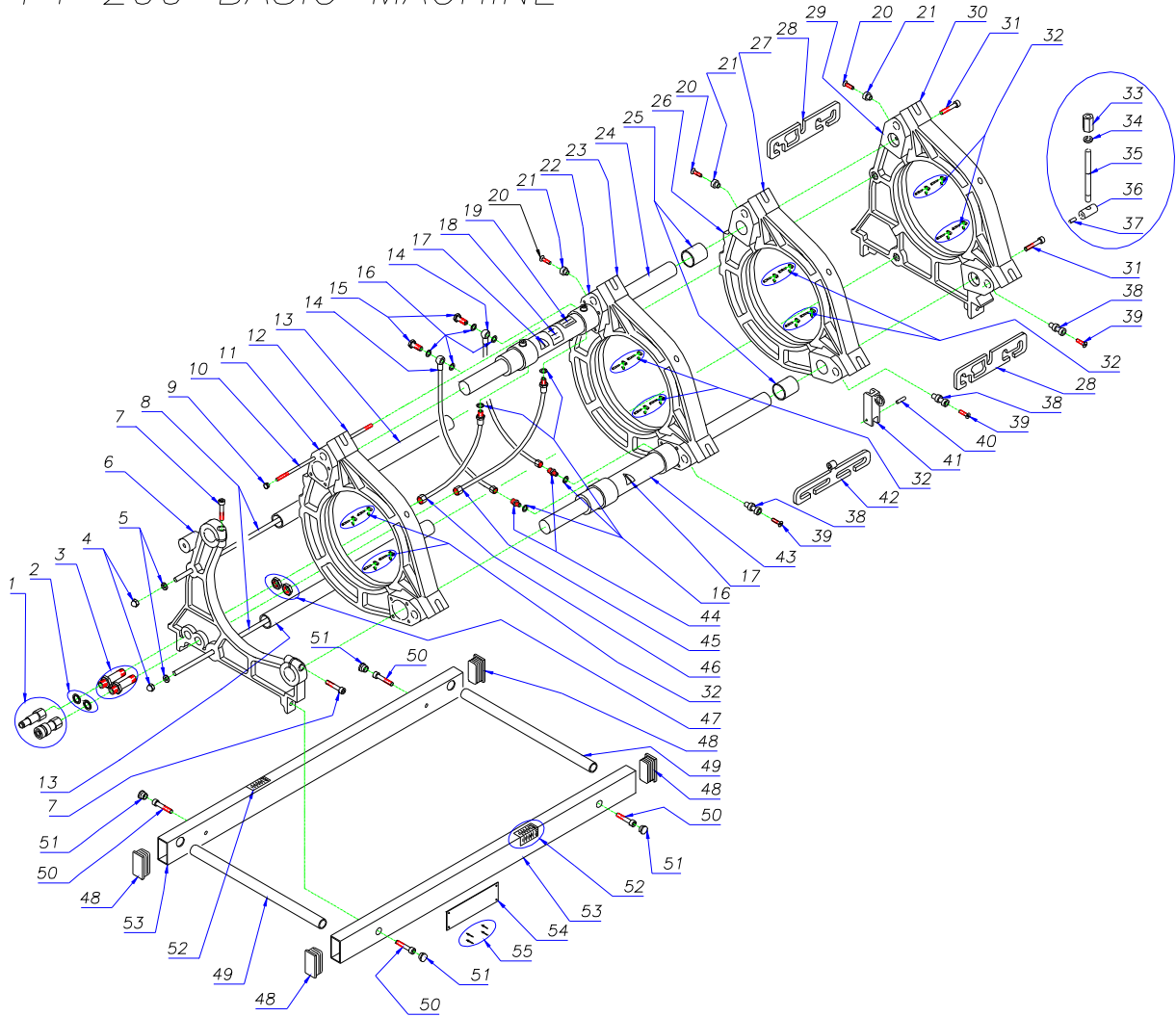


10.3 Hydraulic plan



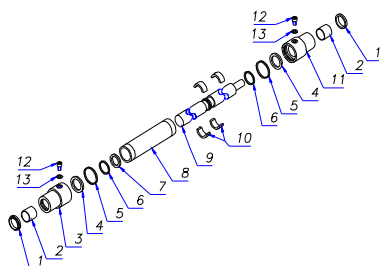
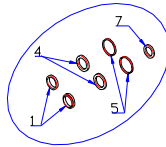
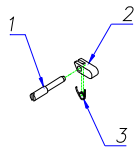
11. Exploded view and spare parts list

PT 200 BASIC MACHINE

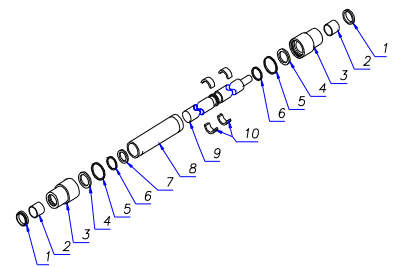


PT 160-200 GASKET KIT (1 cylinder)

PT 200 BEEP-BEEP SYSTEM



PT 200 UPPER CYLINDER

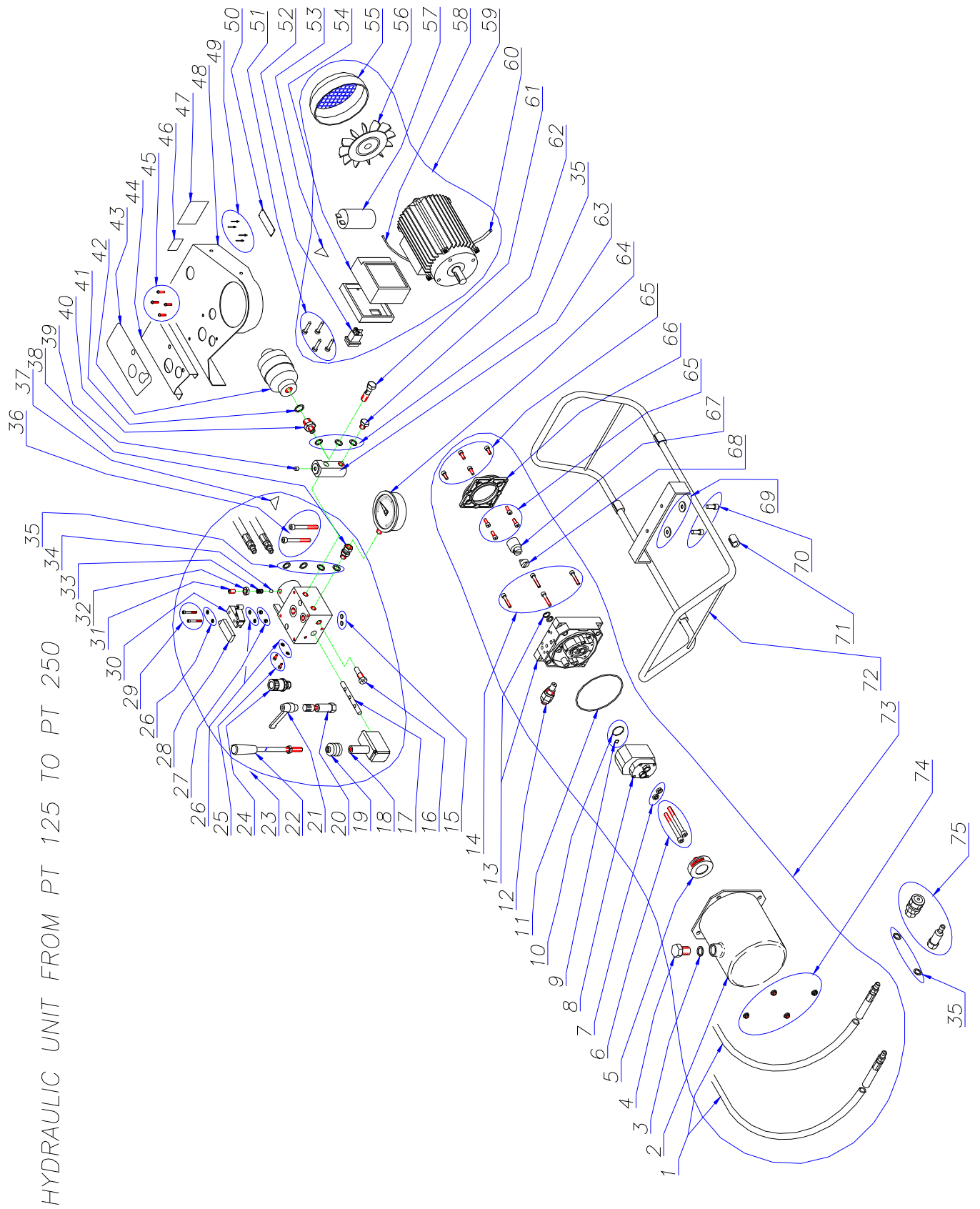


PT 200 LOWER CYLINDER

PT 200 Basic Machine , Code: PT200B				PT 200 Basic Machine , Code: PT200B			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT200B01	quick coupling M/F 1/4	1	31	PT200B31	Screw TCEI UNI 5931 8.8 10x30	2
2	PT200B02	washer bonded 1/4	2	32	PT200B32	Beep beep coupler system	16
3	PT200B03	Fitting	2	33	PT200B33	Nut tie rods	8
4	PT200B04	blind nut UNI 5721 5s m 10 z	2	34	PT200B34	Washer for tie rods	8
5	PT200B05	washer UNI 6592 m 10	2	35	PT200B35	Tie rod closer	8
6	PT200B06	side support	1	36	PT200B36	Tie rod pivot	8
7	PT200B07	screw TCEI UNI 5931 8.8 8x35	2	37	PT200B37	Screw STEI UNI 5923 45h 6x10	8
8	PT200B08	Third bar tie rod	2	38	PT200B38	front pivot	3
9	PT200B09	Nut fixing cylinder's tie rod	8	39	PT200B39	Screw TSPEI 10.9 10x45z	3
10	PT200B10	cylinder's tie rod	8	40	PT200B40	H. mirror disconnecting device pin	1
11+12	PT200B11+12	first clamp (11+12)	1	41	PT200B41	H.mirror disconnecting dev. hooker	1
13	PT200B13	Third bar	2	42	PT200B42	H.mirror disconnecting dev. body	1
14	PT200B14	hose	2	43	PT200B43	Lower Cylinder	1
15	PT200B15	plug hose 1/8 GAS	2	44	PT200B44	Nipples M 1/8	2
16	PT200B16	washer bonded 1/8	8	45	PT200B45	Hose R7 3/16 M 1/8 + FD ¼ L=600	1
17	PT200B17	Danger label	2	46	PT200B46	Hose R7 3/16 M 1/8 + FD ¼ L=420	1
18	PT200B18	Technical data label	1	47	PT200B47	Nut for fitting	2
19	PT200B19	Serial no. label	1	48	PT200B48	Black plastic plug 60x30	4
20	PT200B20	Screw TSPEI 10.9 8x30z	3	49	PT200B49	transport pipe	2
21	PT200B21	Nut for spacer	3	50	PT200B50	Screw TCEI UNI 5931 8.8 8x16	4
22+23	PT200B22+23	Second clamp (22+23)	1	51	PT200B51	Covers ABS 22X2	4
24	PT200B24	Upper Cylinder	1	52	PT200B52	Stop limit label	2
25	PT200B25	25.30 FB1 bush	2	53	PT200B53	Ground support	2
26+27	PT200B26+27	Third clamp (26+27)	1	54	PT200B54	ITS – TECNODUE label	1
28	PT200B28	Spacer	2	55	PT200B55	rivet tt UNI 9200 3x7 all	4
29+30	PT200B29+30	Fourth clamp (29+30)	1				

PT 200 Upper Cylinder , Code: PT200B24				PT 200 Lower Cylinder , Code: PT200B43			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT200B2401	Gasket GHK 308 25.0 33.6 5.328.0	2	1	PT200B4301	Gasket GHK 308 25.0 33.6 5.328.0	2
2	PT200B2402	25.30 FB1 bush	2	2	PT200B4302	25.30 FB1 bush	2
3	PT200B2403	Left upper cylinder head	1	3	PT200B4303	Lower cylinder head	2
4	PT200B2404	Gasket I/GR 0250 NCR	2	4	PT200B4304	Gasket I/GR 0250 NCR	2
5	PT200B2405	O-ring 3150 NBR 70 2.62x37.77 (128)	2	5	PT200B4305	O-ring 3150 NBR 70 2.62x37.77 (128)	2
6	PT200B2406	Gasket ring	2	6	PT200B4306	Gasket ring	2
7	PT200B2407	Gasket E/GR 0300 NPS	1	7	PT200B4307	Gasket E/GR 0300 NPS	1
8	PT200B2408	Cylinder's housing	1	8	PT200B4308	Cylinder's housing	1
9	PT200B2409	Cylinder's stem	1	9	PT200B4309	Cylinder's stem	1
10	PT200B2410	Stopper ring	2	10	PT200B4310	Stopper ring	2
11	PT200B2411	Right upper cylinder head	1				
12	PT200B2412	Screw TCEI UNI 5931 8.8 6x10	2				
13	PT200B2413	Washer 6x12x1,5	2				

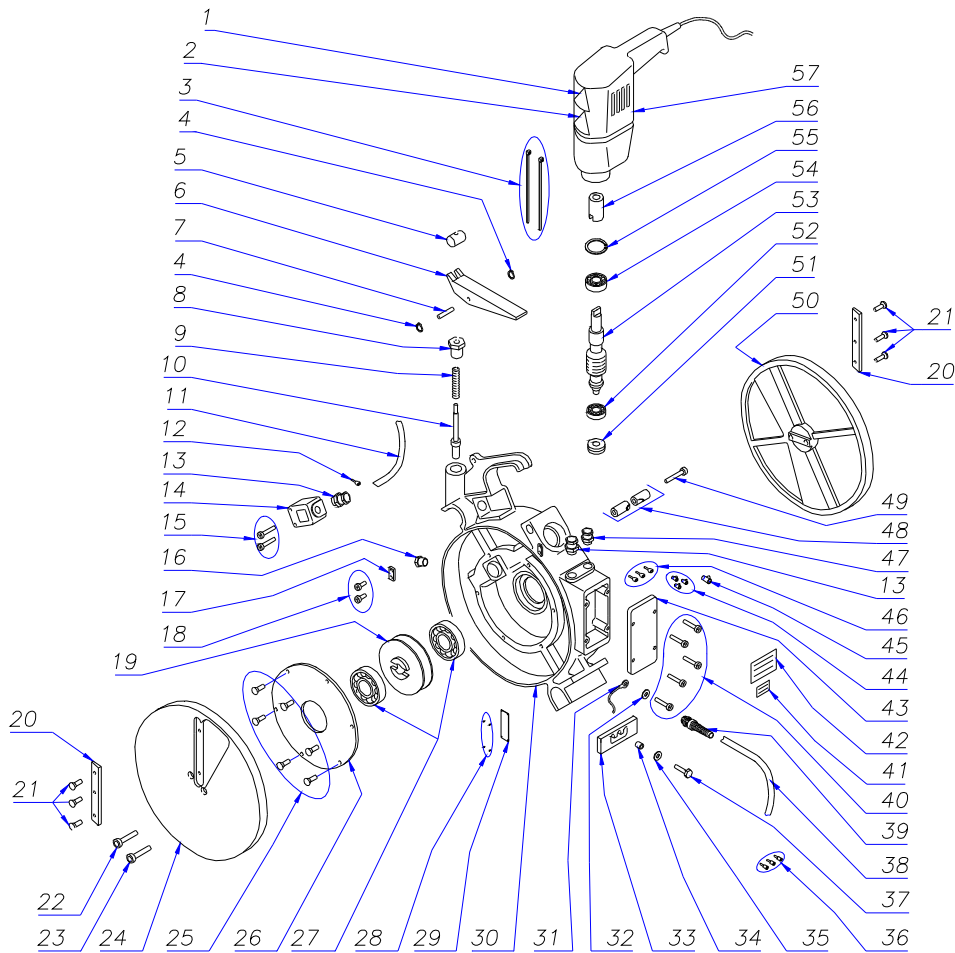
Beep Beep coupler system, Code: PT200B32				PT 200 Gasket kit, Code: PT200B43			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT200B3201	Pivot for beep beep coupler system	1	1	PT200B4301	Gasket GHK 308 25.0 33.6 5.328.0	2
2	PT200B3202	Hook for beep beep coupler system	1	4	PT200B4304	Gasket I/GR 0250 NCR	2
3	PT200B3203	Spring for beep beep coupler system	1	5	PT200B4305	O-ring 3150 NBR 70 2.62x37.77 (128)	2
				7	PT200B4307	Gasket E/GR 0300 NPS	1



HYDRAULIC UNIT FROM PT 125 TO PT 250

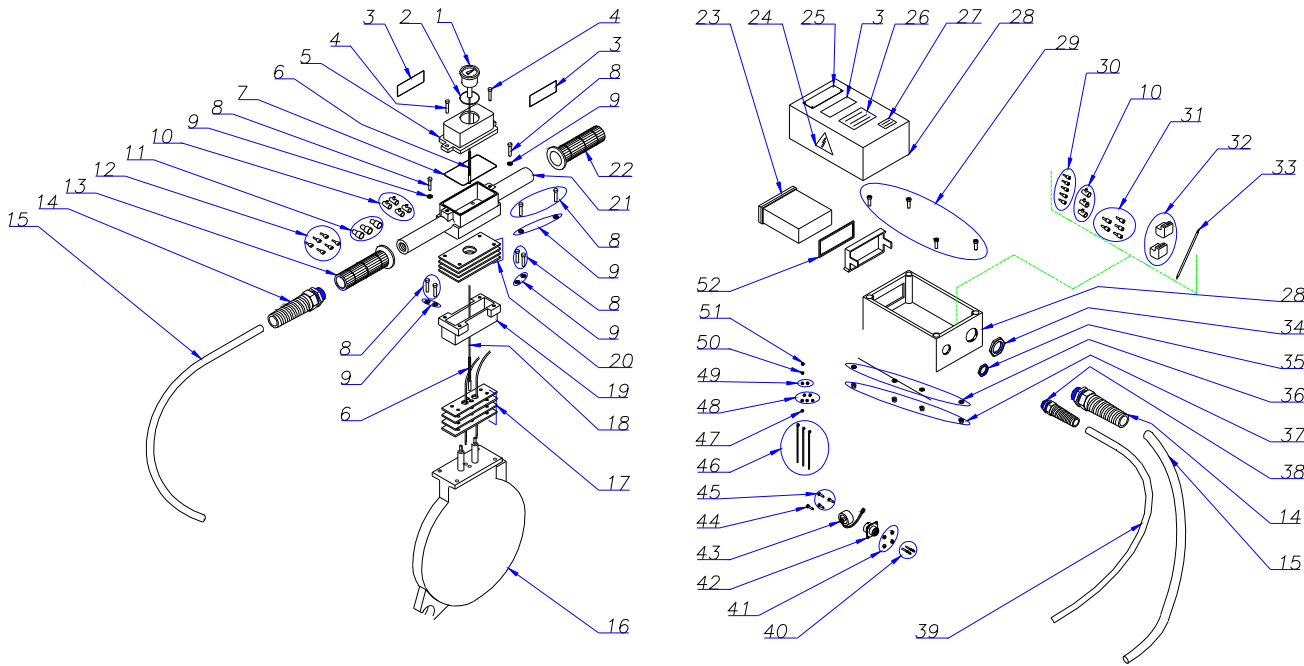
PT 200 Hydraulic Unit , Code: PT160A				PT 200 Hydraulic Unit , Code: PT160A			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT160A01	Hose R1T M 1/4 + FD 1/4 L=2500	2	39	PT160A39	Plug d. 8	1
2	PT160A02	Oil tank LT.1	1	40	PT160A40	Nipples M 1/4	1
3	PT160A03	washer 1/2	1	41	PT160A41	Washer 18X1.5	1
4	PT160A04	Plug 1/2	1	42	PT160A42	accumulator L 01/8 with 20 g. oil	1
5	PT160A05	Filter UP 100	1	43	PT160A43	Hydraulic unit control label	1
6	PT160A06	Screw TCEI uni 5931 8.8 8x85 zin	2	44	PT160A44	Carter for valves protection	1
7	PT160A07	Washer grower UNI 1751 m8 z	2	45	PT160A45	Screws TBEI 10.9 6X10 z	4
8	PT160A08	Gear pump PS-1/1.25 S	1	46	PT160A46	Serial number label	1
9	PT160A09	O-ring 2037 NBR 1.78x9.25 (012)	1	47	PT160A47	Technical data label	1
10	PT160A10	O-ring 3106 NBR 2.62x26.65 (121)	1	48	PT160A48	Carter	1
11	PT160A11	O-ring 4450 NBR 3.53x113.9 (246)	1	49	PT160A49	Rivet tt uni 9200 3x7 all	4
12	PT160A12	Max pressure valve FPMDC15P35	1	50	PT160A50	ITS - TECNODUE 80X25 label	1
13	PT160A13	Pump body HY 10 K3P0-01 1/4 BB	1	51	PT160A51	Screw TC CR UNI 6954 3.5X19 zin	4
14	PT160A14	Screw TCEI uni 5931 8.8 6x35 zin	4	52	PT160A52	light switch 16A + cap	1
15	PT160A15	O-ring 2056 NBR 1.78x14.00 (015)	2	53	PT160A53	Electric danger label	1
16	PT160A16	Check valve RPC 04 / 2.5 00 00	1	54	PT160A54	Box FMA 63 / 71	1
17	PT160A17	Distributor shaft TC2 dr. C0618	1	55	PT160A55	Fan cover MEC 71	1
18	PT160A18	Distributor block HD 104	1	56	PT160A56	Fan MEC 71	1
19	PT160A19	Lever protection HD 104	1	57	PT160A57	Condenser 20MF	1
20	PT160A20	By pass valve V03/M	1	58	PT160A58	Cable H07 RNF 2G1 TITANEX	0,35
21	PT160A21	Handle	1	59	PT160A59	Engine MEC 71 HP 0.5 B14 230V 4P	1
22	PT160A22	Distributor lever HD 104 L.185	1	60	PT160A60	Cable H07 RNF 3G1 TITANEX	3
23	PT160A23	Complete distributor TC2	1	61	PT160A61	Hollow screw	1
24	PT160A24	Pressure regulating valve VEN 06	1	62	PT160A62	Plug 1/4	1
25	PT160A25	Screw TCEI UNI 5931 8.8 4x10 z	2	63	PT160A63	Pressure gauge support	1
26	PT160A26	Washer UNI 6592 m 4 zin	6	64	PT160A64	Pressure gauge D.100 range 0-100 BAR	1
27	PT160A27	Nut UNI 7473 8 m4	2	65	PT160A65	Screw TCEI UNI 5931 8.8 6x16 zin	8
28	PT160A28	Plastic cap	1	66	PT160A66	Engine flange c.a. HP 0.33/0.5 FLCA71	1
29	PT160A29	Screw TCEI UNI 5931 8.8 4x35z	2	67	PT160A67	Joint HP 0.33/0.50	1
30	PT160A30	Microswitch ASITZ 7141	1	68	PT160A68	Pump joint g. 1 x 0.27 reinf.	1
31	PT160A31	Screw STEI UNI 5923 45h 10x14 z	2	69	PT160A69	Washer fl m 10x30x2,5 zin	2
32	PT160A32	Nut UNI 5589 8 m 10 zin	1	70	PT160A70	Screw TCEI UNI 5931 8.8 10x25 zin	2
33	PT160A33	Spring latch	1	71	PT160A71	Support 18-20	4
34	PT160A34	Ball 5/16"	1	72	PT160A72	Frame	1
35	PT160A35	Washer 1/4	9	73	PT160A73	Unit model HY10 130 complete	1
36	PT160A36	Screw TCEI UNI 5931 8.8 8x70z	2	74	PT160A74	Nut DIN 6923 8 m 6	4
37	PT160A37	Generic danger label	1	75	PT160A75	quick coupling M/F 1/4	1
38	PT160A38	Connector FT 299 44 M 1/4"	1				

PT 200 FACING TOOL



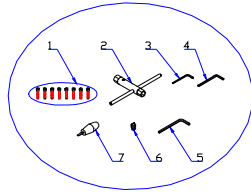
PT 200 Facing Tool , Code: PT200F				PT 200 Facing Tool , Code: PT200F			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT200F01	Generic danger label	1	30	PT200F30	Facing tool body PT 200	1
2	PT200F02	Electric danger label	1	31	PT200F31	End connector M4	1
3	PT200F03	Plastic stub 142X3.6	2	32	PT200F32	Washer fl UNI m 4x12x1,5 zin	1
4	PT200F04	Ring UNI 7434 c70 4	2	33	PT200F33	Facing tool stopper	1
5	PT200F05	Bush	1	34	PT200F34	Screw spacer	1
6	PT200F06	Lever	1	35	PT200F35	Washer fl UNI m 5x15x1,5 zin	1
7	PT200F07	Pivot	1	36	PT200F36	Insulating pipe 1.5mm ² P=10MM red	3
8	PT200F08	Nut	1	37	PT200F37	Screw TCEI UNI 5931 8.8 5x25 z	1
9	PT200F09	Spring	1	38	PT200F38	Cable H07 RNF 3G1,5 TITANEX	3,3
10	PT200F10	Facing tool stopper pivot	1	39	PT200F39	Cable stopper PG11	1
11	PT200F11	Cable H07 RNF 3G1	0,6	40	PT200F40	Screw TCEI UNI 5931 8.8 4x10 zin	5
12	PT200F12	Double insulating pipe 2x2.5mm ² P=10MM blue	1	41	PT200F41	Serial no. label	1
13	PT200F13	Cable stopper PG11 163/11	2	42	PT200F42	Technical data label	1
14	PT200F14	Switch	1	43	PT200F43	Box cover	1
15	PT200F15	Screw TCEI UNI 5931 8.8 5x35 zin	2	44	PT200F44	Terminal mm ² 2,5	3
16	PT200F16	Plug PG9	1	45	PT200F45	Terminal mm ² 4	1
17	PT200F17	Cable holder 604 / 6	1	46	PT200F46	Double ins. pipe 2X1.5mm ² P=8MM black	3
18	PT200F18	Screw UNI 6107 4.8 3x8z	2	47	PT200F47	Cable stopper PG9 163/9	1
19	PT200F19	Wheel for reducing gear	1	48	PT200F48	Stopper	1
20	PT200F20	3 holes blade	2	49	PT200F49	Screw TCEI UNI 5931 8.8 8x45 zin	1
21	PT200F21	Screw tspi UNI 6109 4x12	6	50	PT200F50	Right disk	1
22	PT200F22	Screw TCEI UNI 5931 8.8 8x60	1	51	PT200F51	Bearing 51100	1
23	PT200F23	Screw TCEI UNI 5931 8.8 8x50	1	52	PT200F52	Bearing 6002 ZZ	1
24	PT200F24	Left disk	1	53	PT200F53	Screw for reducing gear	1
25	PT200F25	Screw TSPEI 5933 10.9 5x12 z	6	54	PT200F54	Bearing 6003 ZZ	1
26	PT200F26	Flange	1	55	PT200F55	Ring UNI 7437 c 70 35	1
27	PT200F27	Bearing 16008	2	56	PT200F56	Drill joint	1
28	PT200F28	Rivets ft UNI 7346 2,5x6,5 brass	4	57	PT200F57	drill B 5-813	1
29	PT200F29	label ITS - TECNODUE 80X25	1				

PT 200 HEATING MIRROR

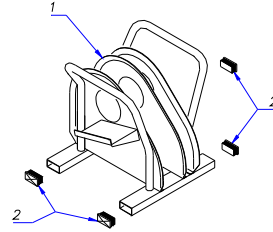


PT 200 Heating Mirror , Code: PT200T				PT 200 Heating Mirror , Code: PT200T			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT200T01	Thermometer	1	27	PT200T27	Serial no. label	1
2	PT200T02	O-ring NBR 70 1.78x50.52 (033)	1	28	PT200T28	Thermostat box	1
3	PT200T03	Danger and compulsory label	3	29	PT200T29	Screw TC CR 7687 4.8 4x16 zin	4
4	PT200T04	Screw TCEI UNI 5931 a2 5x12	2	30	PT200T30	Yellow insulating pipe 1 mm ² P=8MM	5
5	PT200T05	Thermometer holder cover	1	31	PT200T31	Red insulating pipe 1,5 mm ² P=8MM	5
6	PT200T06	Insulating red pipe D.5 1.5V	0,2	32	PT200T32	3 stud terminal	2
7	PT200T07	O-ring 2400 NBR 70 1.78x101.32	1	33	PT200T33	Black flame retardant wire 1 mm ²	1
8	PT200T08	Screw TCEI UNI 5931 a2 5x30	8	34	PT200T34	Nut ISO M25x1.5 CE	1
9	PT200T09	Washer grower UNI 1751 m5 z	8	35	PT200T35	Brass nut PG11 169/11	1
10	PT200T10	terminal mm ² 2,5	7	36	PT200T36	Washer UNI 6593 m 4	4
11	PT200T11	terminal 4/6 mm ²	3	37	PT200T37	Nut UNI 7473 8 m 4	4
12	PT200T12	Red cap for wire 2x1mm ²	6	38	PT200T38	Cable stopper PG11	1
13	PT200T13	Handle with hole for cable st.	1	39	PT200T39	Cable H07 RNF 3G1,5 TITANEX	3,3
14	PT200T14	Cable stopper M25	2	40	PT200T40	Female terminal	2
15	PT200T15	Cable H07 RNF 7G1,5 TITANEX	3,3	41	PT200T41	Nut UNI 5588 m 3 brass	4
16	PT200T16	Heating mirror PT 200	1	42	PT200T42	Connector UTG 012-8S	1
17	PT200T17	Gasket	4	43	PT200T43	Connector 8 pins	1
18	PT200T18	Probe PT100 2+2 wires	1	44	PT200T44	Screw TSPI UNI 6109 3x12 brass	1
19	PT200T19	Spacer	1	45	PT200T45	Screw TCI UNI 6107 3x10 brass	3
20	PT200T20	Gasket	4	46	PT200T46	Black plastic stub 99x2.5	3
21	PT200T21	Box	1	47	PT200T47	Ring 3.5 type 0	1
22	PT200T22	Rubber handle D. 30	1	48	PT200T48	Ring 3.5 type 1	5
23	PT200T23	Thermostat TLK38	1	49	PT200T49	Ring 3.5 type 2	2
24	PT200T24	Electric danger label	1	50	PT200T50	Ring 3.5 type 3	1
25	PT200T25	ITS - TECNODUE 80X25 label	1	51	PT200T51	Ring 3.5 type 5	1
26	PT200T26	Technical data label	1	52	PT200T52	Gasket for TLK38 thermostat 33X74	1

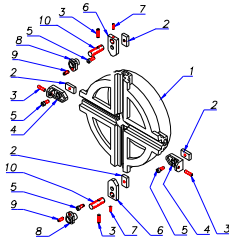
PT 200 TOOLS KIT



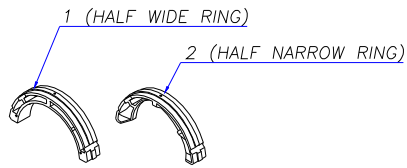
PT 200 SUPPORT FOR FACING TOOL AND H.



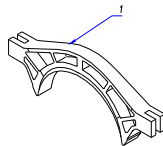
PT 200 STUB END DEVICE



PT 200 HALF RINGS REDUCTIONS



PT 200 SHORT SPIGOT FITTINGS CLAMP



PT 200 Stub Device , Code: PT200S				PT 200 Stub Device , Code: PT200S			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT200S01	Plateau PT 200	1	6	PT200S06	Fixing stub end bracket	2
2	PT200S02	Cursor	4	7	PT200S07	Screw STEI UNI 5927 45h 5x8 zin	2
3	PT200S03	Screw STEI UNI 5927 45h 8x35 zin	4	8	PT200S08	Upper stopper	2
4	PT200S04	Bracket	2	9	PT200S09	Screw STEI UNI 5923 45h 8x20	2
5	PT200S05	screw TCEI UNI 5931 8.8 8x20 zin	4	10	PT200S10	Screw for fixing s.e. braket	2

PT 200 Tools kit, Code: PT200TK				PT 200 Tools kit, Code: PT200TK			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT200TK01	Screw TCEI UNI 5931 8.8 6x35 zin	8	5	PT200TK05	Setscrew wrench 12.9 6	1
2	PT200TK02	Socket wrench	1	6	PT200TK06	Plug ½ for hydraulic unit	1
3	PT200TK03	Setscrew wrench 12.9 4	1	7	PT200TK07	Screw driver	1
4	PT200TK04	Setscrew wrench 12.9 5	1				

PT 200 Support, Code: PT200U				PT 200 Support, Code: PT200U			
Pos.	Code	Description	Qty	Pos.	Code	Description	Qty
1	PT200U01	Support PT 200	1	2	PT200U02	Black plug 60x30	4

PT 200 Half reduction			PT 200 Short spigot fit. clamp, Code: PT200G			
Pos.	Description	Qty	Pos.	Code	Description	Qty
1	Half wide ring av. sizes: 63,75,90,110,125,140,160,180mm		1	PT200G01	Short Spigot fittings clamp	1
2	Half narrow ring av. sizes: 63,75,90,110,125,140,160,180mm					

This manual has been printed on December 2008

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