



## Welding Data Logger

DL-SM



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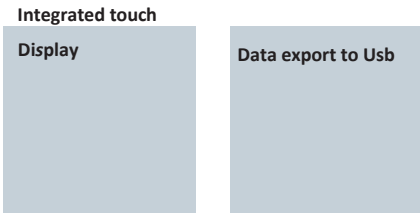


[Sturdy Machine](https://www.youtube.com/channel/UC...)

# Data Logger



## Data Logger for manually operated butt fusion machines



Standards
DVS 2207-1/DVS 2207-11/

### Description

The DL-ST assists the welder to ensure the quality of the butt-welding according to specific standard. The user is guided through all preparation and welding steps. The complete welding sequence is supervised and recorded. The welding protocols can be easily exported via USB stick to any personal computer for further management. The Data Logger is protected by a robust aluminium case. It can be connected to any hydraulically operated butt-fusion machines using pressure sensor and direct contact thermocouple for heating plate.



#### Simple operation

Easy to use

#### Reliable results

Accuracy:  $\pm 0.5\%$  of the measurement

#### Lasting efficiency

- Well known electronic parts incorporated

#### State-of-the-art technology

- PLC incorporated

Water proof connectors



Temperature sensor



Pressure sensor



## DL-ST

Data Logger for manually operated butt fusion machines

### ➤ Specification

<b>Data input</b>	Manually with a 7" HMI touch screen
<b>Monitoring Parameters</b>	Welding pressures, welding times, memory control, heating element temperature
<b>ISO 12176 traceability</b>	Machine Model,Material,Pipe Dia,SDR,Drawing No,Welding no,Welder Name,Serial No ,Project Name weather conditions, joint number, installing company
<b>Welding standard</b>	DVS 2207-1
<b>Data output</b>	USB port for data transfer
<b>Display</b>	HMI 7" touch monitor
<b>Approvals</b>	CE, ISO 9001
<b>Languages</b>	English, Turkish, Russian,Hungaria
<b>Battery power</b>	(optional)
<b>Settings</b>	Temperature offset,Date, Time
<b>Technical Specifications</b>	Input voltage 200-250 V; Input frequency 40 Hz - 60 Hz; Weight of unit approx. 8,7 kg, Dimensions (W x H x D) 350 x 450 x 200 mm
<b>Warranty</b>	12 months

## 1. Heated tool butt welding

### 1.1. Heated tool butt welding of pipes, pipeline components, fittings and sheets

#### 1.1.1. Description of the process

With the heated tool butt welding process, the joining zones of the components to be welded are aligned under pressure on the heated tool (alignment), heated up to the welding temperature with reduced pressure (heating up) and joined under pressure (joining) after removal of the heated tool (changeover). Figure 1 shows the principle of this procedure.

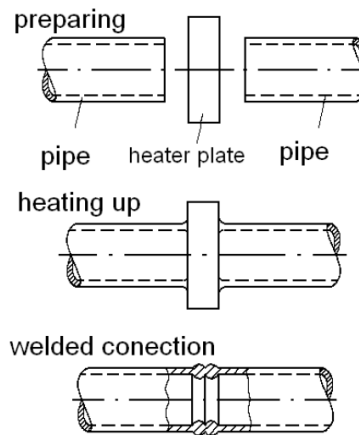


Figure 1) Principle of heated tool butt welding

#### 1.1.1. Preparation of welding

Prior to the start of the welding process, the welding temperature of the heated tool is to be checked. This is done e.g. by means of a fast-indicating measuring device with a contact surface of 10 mm for measuring the surface temperature. The control measurement must be done within the area on the heated tool which corresponds to the semi-finished product. For adjusting a thermal balance, the heated tool may be inserted at the earliest 10 minutes after reaching the set temperature.

To ensure an optimum welding connection the heated tool has to be cleaned according to section 3.2.2 before every welding operation. The anti-adhesive coating or covering of the heated tool must be free of damages in the working zone.

The joining forces and joining pressures have to be specified for the machines to be used. These can be based on e.g. manufacturer information, calculated or measured values. Additionally, at the welding of pipes, the work piece moving force res. Moving pressure is taken from the indicator of the welding machine during the slow displacement of the part to be welded and have to be added to the prior determined joining force res. Joining pressure. Electronically controlled equipment is preferred, if possible with recording.

The nominal wall thickness of the parts to be welded must match in the joining area.

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Pipes and fittings have to be aligned in axial direction in the welding machine before the clamping. The easy axial movement of the part to be welded-on can be ensured e.g. by means of dollies or swinging suspension.

The joining areas have to be planed with a clean and grease-free tool directly before the welding so that they are coplanar in clamped condition. Permissible gap width under alignment pressure see table 1.

**Table 1) Maximum gap between the treated welding zones**

Pipe outside diameter d mm	Gap width mm	Sheet width mm
≤ 355	0,5	
400 ... < 630	1,0	≤ 1500
630 ... < 800	1,3	> 1500 ≤ 2000
800 ... ≤ 1000	1,5	> 2000 ≤ 2300
> 1000	2,0	> 2300 ≤ 3000

Both, the gap width and the misalignment have to be controlled. The misalignment of the joining areas on the pipe outside or sheet respectively may not exceed the permissible size of 0,1 x wall thickness. A reduction of the quality arises in case of larger misalignment which limits the strength of the joint. In this case, the evaluation according to DVS 2202-1 under consideration of requirements to the joint can be done.

The treated welding areas should be neither dirtied nor touched by hand, as a retreatment would be necessary then. An additional cleaning is not necessary and means no quality improvement. Shavings fallen into the pipe have to be removed.

### **1.1.2. Welding procedure**

With heated tool butt welding the joining areas are heated-up to the welding temperature by means of the heated tool and joined under pressure after removing the heated tool. The heated tool temperature is 200 to 220 °C. In principle the upper temperature limit is to be aspired for smaller wall thickness, the lower temperature limit for bigger ones (see figure 2). The upper temperature has to be chosen for PE 100 as well. The different steps of the welding process are illustrated in figure 3.

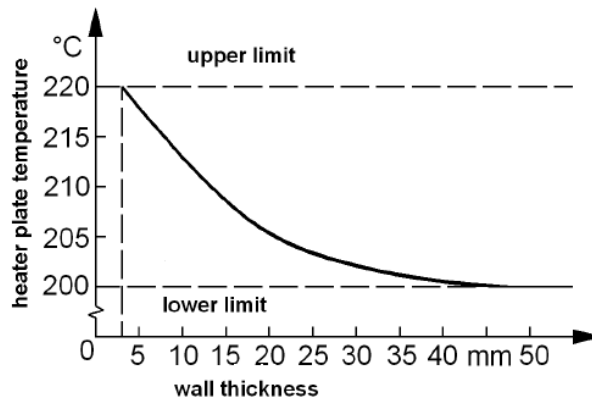


Figure 2) Recommended values for the heated tool temperatures as function of wall thickness

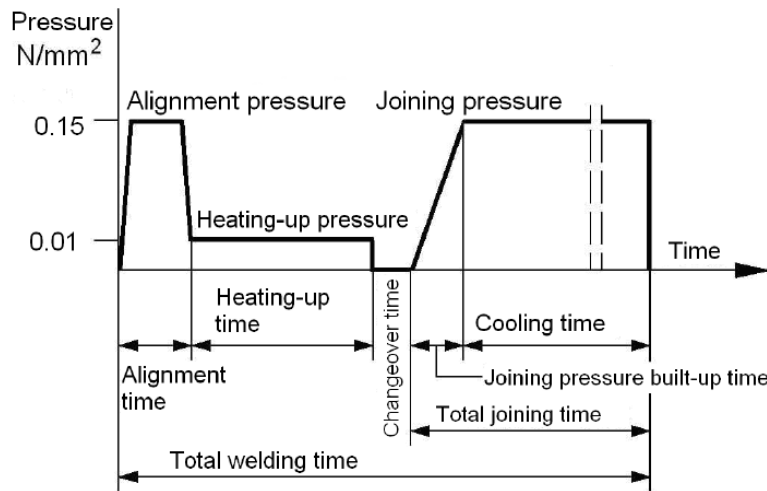


Figure 3) Process steps of heated tool butt welding

### Alignment

The joining areas of the welding components are pressed to the heated tool until all areas are coplanar on the heated tool. This fact is visible on the formation of beads. The alignment is finished when the bead heights have reached the mentioned values in table 2, column 2 on the total pipe circumference or the total sheet surface respectively. The bead sizes are an index for a complete contact of the joining areas on the heated tool.

### Heating-up

For heating-up, the joining areas must contact the heated tool with low pressure. The pressure is reduced to nearly zero ( $\leq 0,01$  N/mm<sup>2</sup>). During heating-up, the heat penetrates the joining areas and the welding temperature is reached. Heating-up times are given in table 2, column 3.

## Changeover

After heating-up, the joining areas are to be detached from the heated tool. The heated tool should be withdrawn without damage or contamination of the heated joining zones. The joining areas should be joined together quickly until they almost have contact. The changeover time should be as short as possible (see table 2, column 4), as otherwise the plasticized areas will cool down. The welding joint quality would be influenced negatively.

## Joining

The areas to be welded should meet with a speed of nearly zero. The demanded joining pressure is built possibly linear. The required times are shown in table 2, column 5. The joining pressure is  $0,15 \pm 0,01$  N/mm<sup>2</sup>. Raised mechanical loads during or directly after the declamping are allowed only after finished cooling. The joining pressure has to be kept completely during the cooling time at ambient temperature (see table 2, column 5). The reduction of the cooling time up to 50 %, that means joining pressure release and removal of the welded part from the welding equipment, is allowed under the following requirements: – the welding is done under workshop conditions – the removal from the welding equipment and the temporary storage are causing only slight loads to the joint – it concerns components with a wall thickness of  $\geq 15$  mm. A further treatment with full mechanic load of the joint is allowed only after complete cooling down according to table 2, column 5.

**Table 2) Recommended values for the heated tool butt welding of pipes, fittings and sheets made of PE-HD at an outside temperature of approx 20C and moderate air flow (interim values have to be interpolated)**

1 Nominal wall thickness s	2 Alignment Heated tool temperature see figure 2 Bead height on heated tool on the end of the alignment time (alignment p = 0,15 N/mm <sup>2</sup> )	3 Heating-up Heating-up time =10 x wall thickness p= ≤ 0,01 N/mm <sup>2</sup>	4 Changeover Changeover time (Maximum time)	5 Joining	
				Joining pressure build-up time	Cooling time under joining pressure (minimum values) p = 0,15 N/mm <sup>2</sup> ± 0,01
mm	mm	s	s	s	min
up to 4,5	0,5	up to 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

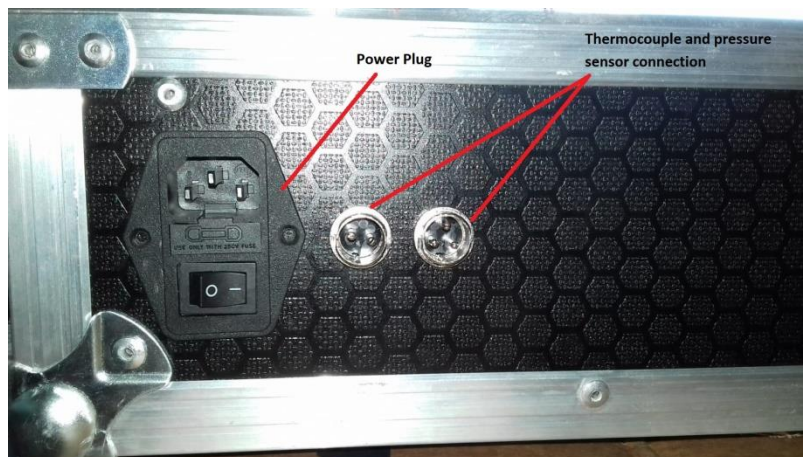


## 2. Machine start up

Power connection is 220v-50Hz and connected to the machine via 2-3 pin metal connector (**Error! Reference source not found.**).

Just next to power connection there are 2 pin and 3 pin water proof connector that is for heating plate temperature sensor and pressure sensor for hydraulic unit (Figure 4).

Figure 4) Temperature and pressure sensor connector



After power cable and sensors connected to the machine the home page will come up. There are keys as below: Click on the empty box to choose machine brand and click on next button to proceed.









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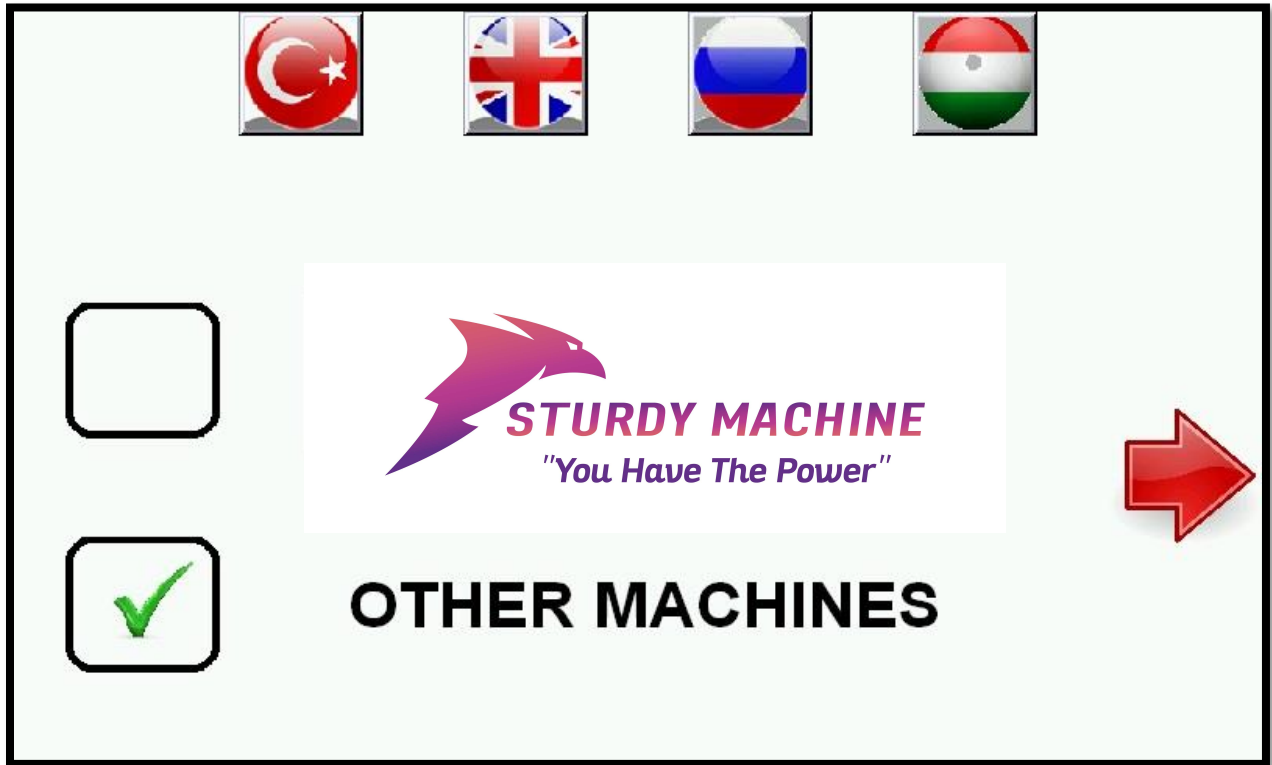




- 1- USB is inserted and the actual temperature value is displayed on the screen . All the control boxes on the screen must be clicked. If the pressure box is not checked please move the machine back and ford till actual pressure is displayed on the screen. Move to the next page with the next button.


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 <b>CONTROL PAGE</b> 	
USB :	<p style="text-align: center;"><b>READY</b></p> <div style="display: flex; justify-content: space-between; align-items: center;"></div>
TEMPERATURE VALUE	<div style="display: flex; justify-content: space-between; align-items: center;"><div style="text-align: center;"><div style="background-color: yellow; padding: 5px; border: 1px solid black; display: inline-block;">23</div> °C</div></div>
REAL PRESSURE	<div style="display: flex; justify-content: space-between; align-items: center;"><div style="text-align: center;"><div style="background-color: yellow; padding: 5px; border: 1px solid black; display: inline-block;">0</div> bar</div></div>




2- Set the date and time setting on the setting page.

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## SETTING PAGE

**HEATER TEMPERATURE**

PV: 23 °C

OFFSET:  °C

**REAL PRESSURE**

PV: 0 bar















OFFSET:  bar













**TIME-DATE**

9 : 19 : 43

11 / 7 / 2019

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<b>MACHINE CHOSE</b>		<b>MATERIAL</b>		<b>PIPE DIAMETER</b>		<b>SDR</b>	
W160		HDPE 100		160		SDR21	
 		 		 		 	
TEORICAL WELDING PRESSURE (P1) <input type="text" value="8"/> bar					<input type="button" value="SDR ON"/>		
<b>DRAWING NO</b>	<b>WELDING NO</b>	<b>WELDER NAME</b>	<b>MACHINE SERIAL NO</b>	<b>COMPANY NAME</b>	<b>PROJECT NAME</b>		
126-2019	56008	MARIA	01-1125	STURDY MACHINE GROUP	1600 OUTFALL		

							
<b>MATERIAL</b>			<b>PIPE DIAMETER</b>		<b>SDR</b>		
<b>TOTAL PISTON AREA</b>		<b>HDPE 100</b>	<b>75</b>		<b>SDR41</b>		
<input type="text" value="14.14"/> cm <sup>2</sup>		 	 		 		
TEORICAL WELDING PRESSURE (P1) <input type="text" value="0"/> bar					<input type="button" value="SDR ON"/>		
<b>DRAWING NO</b>	<b>WELDING NO</b>	<b>WELDER NAME</b>	<b>MACHINE SERIAL NO</b>	<b>COMPANY NAME</b>	<b>PROJECT NAME</b>		
126-2019	56008	MARIA	01-1125	STURDY MACHINE GROUP	1600 OUTFALL		

3- If your machine brand is not weltech please select other machine screen and press next button.

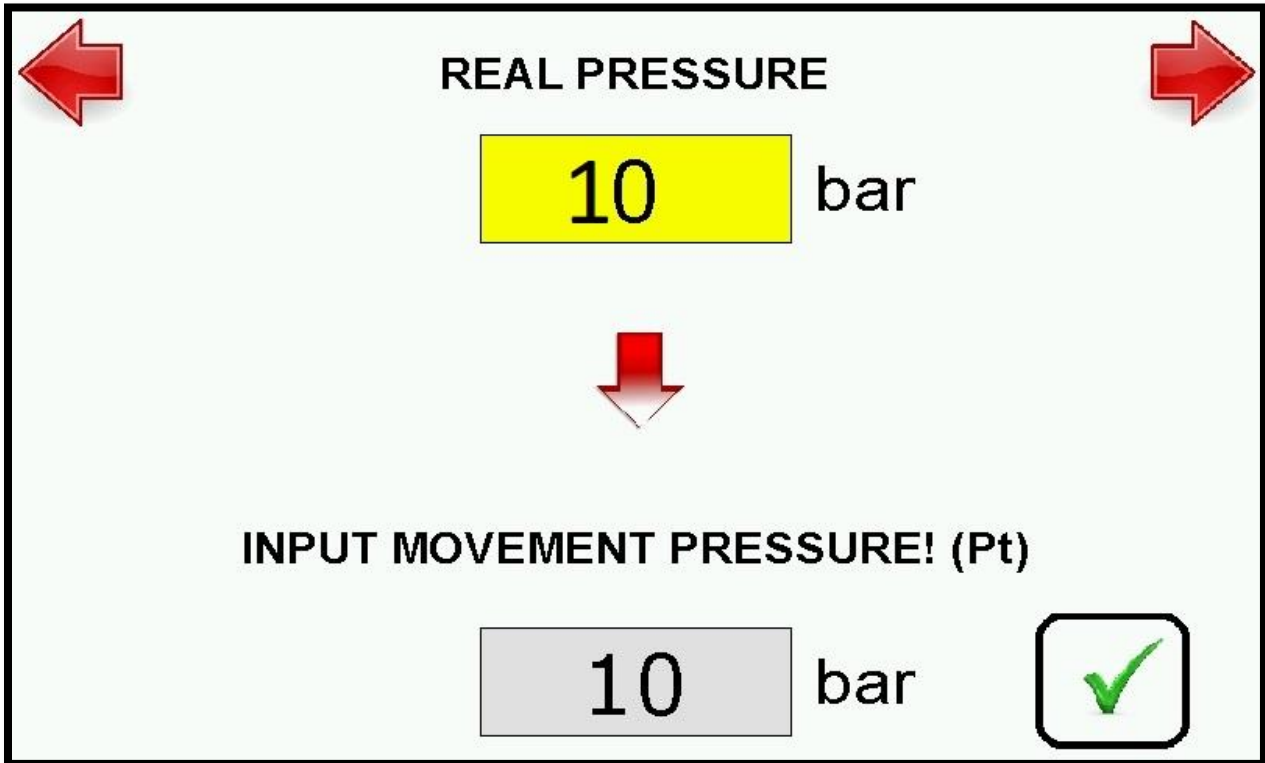
Than please enter total piston area indicated by the manufacturer of the welding machine in the appropriate box and continue with the operation.

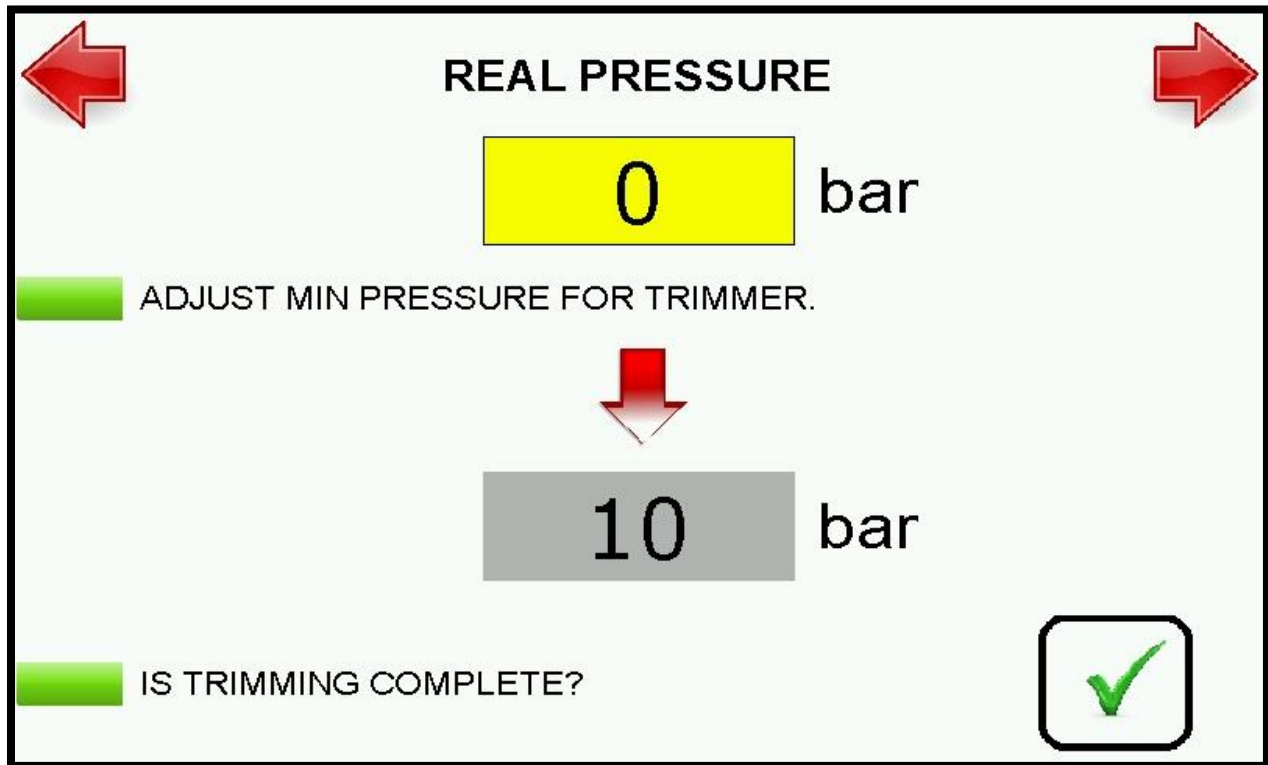
The material, pipe diameter and PN class is selected from the operator screen by means of up and down arrows. The drawing number, source number, operator name, operator number, company name, project name fields are filled from the resulting keyboard screen. The theoretical welding pressure will be automatically written to the screen. Press the 'Next' button to move to the next page.

							
<b>MACHINE CHOSE</b>		<b>MATERIAL</b>		<b>PIPE DIAMETER</b>			
W160		HDPE 100		160		<b>WALL THICKNESS</b>	
 		 		 		80.0 mm	
TEORICAL WELDING PRESSURE (P1)				48		bar	
							
<b>DRAWING NO</b>	<b>WELDING NO</b>	<b>WELDER NAME</b>	<b>MACHINE SERIAL NO</b>	<b>COMPANY NAME</b>	<b>PROJECT NAME</b>		
126-2019	56008	MARIA	01-1125	STURDY MACHINE GROUP	1600 OUTFALL		

4- Clamps on the machine are taken to the starting point. When moving forward, the value read on the screen is written in the lower box as the machine drag pressure and the blank box is clicked and the forward button is pressed.








5- The machine pressure is adjusted from the regulator so that the output value is at least 1-2 bar above of the pressure shown on the screen.

6- The trimmer is taken from the storage box and seated on the carrier shafts located on the main body. The safety pin is closed.


7- The trimmers socket is plugged into the plug on the electrical unit and is operated by pressing the operation button on the control. In cold weather, the surfaces to be shaved should be dissolved.

8- After the pipe surfaces have been cleaned, the trimmer is stopped and the plug is removed from the electrical panel and placed in the protective casing. The forward button is pressed while clicking on the empty box.

9- The pressure of the machine is set to more than 1-2 bar above the total welding pressure specified on the pressure screen. The pressure is adjusted from the regulator. Then check the empty box and move to the other page.




## REAL PRESSURE



**0**

 bar

ADJUST THE MACHINE PRESSURE FOR WELDING. ( $P_1 + P_t = P_5$ )




**18**

 bar

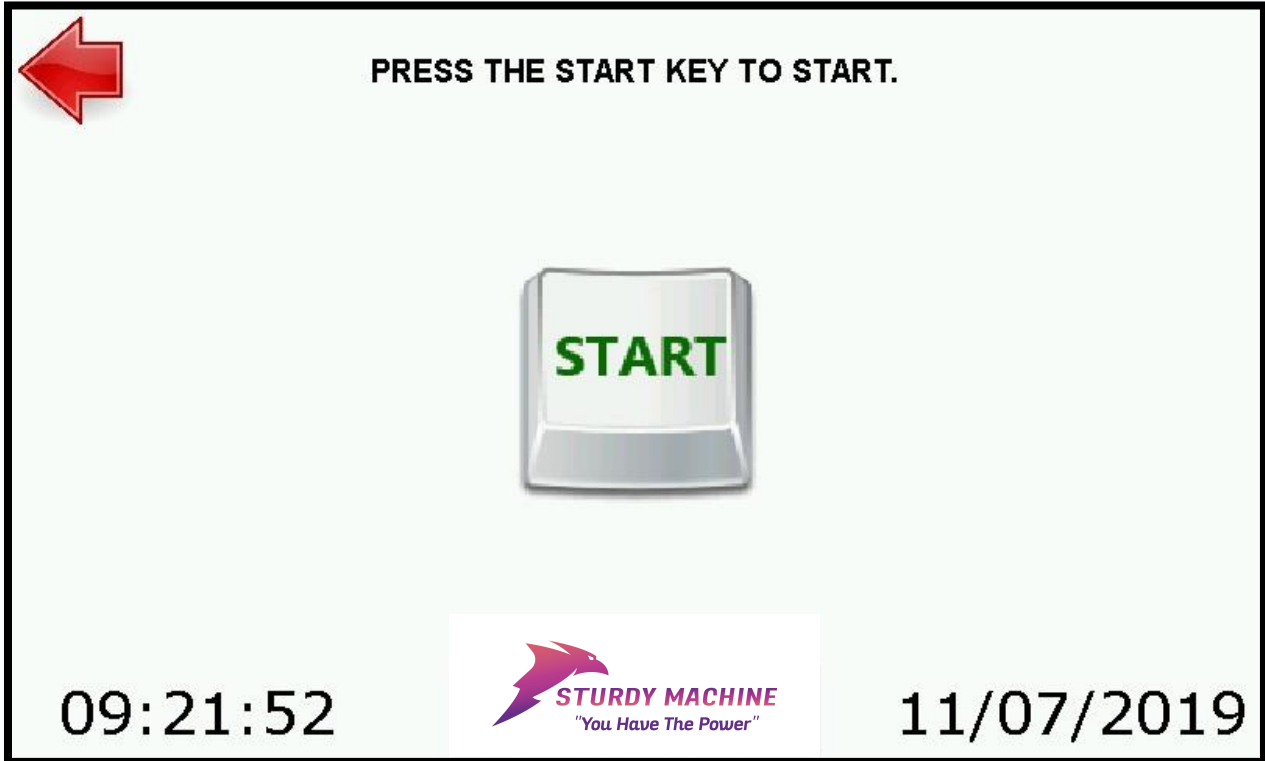
INSPECTION OF PIPES.

SET THE HEATER!

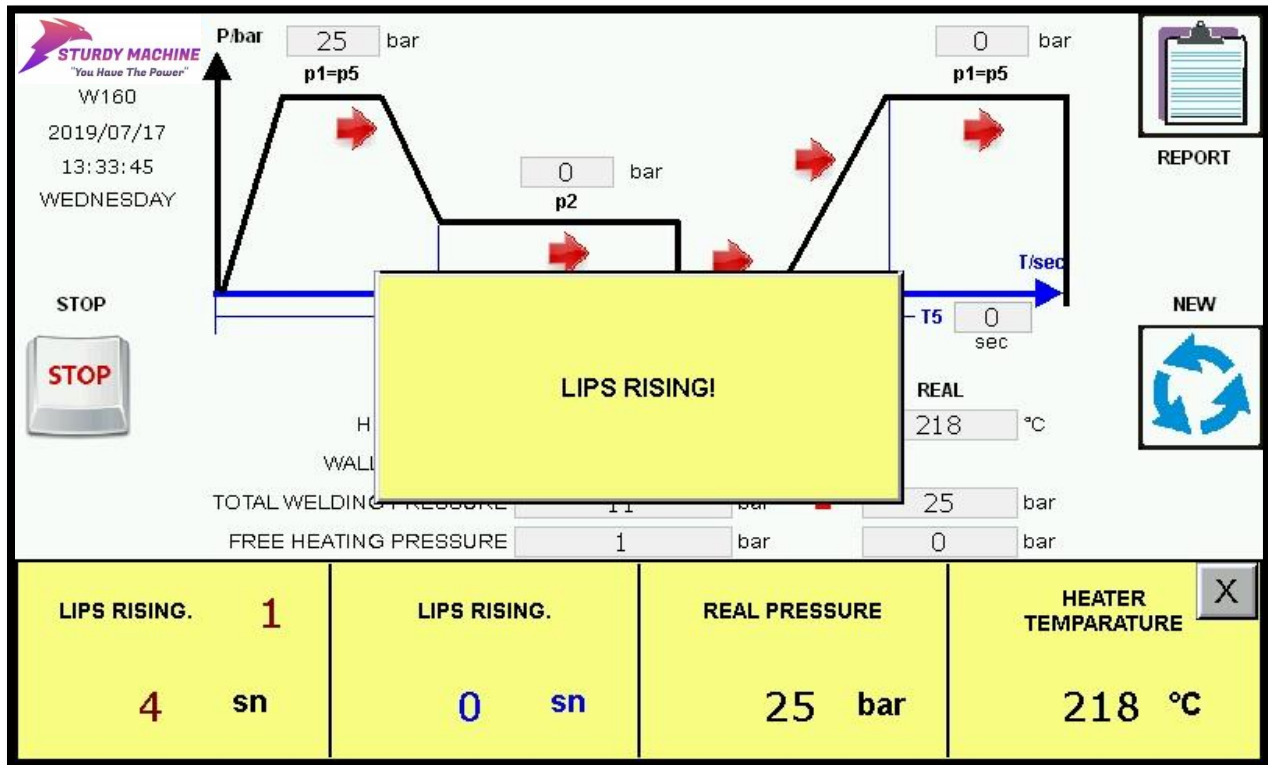


11- Check the heater plate if it is up to the desired welding temperature. Use the 'T.01' table for the reference temperature.

12- Then the heater plate is taken out from the protective casing and placed on the machine.

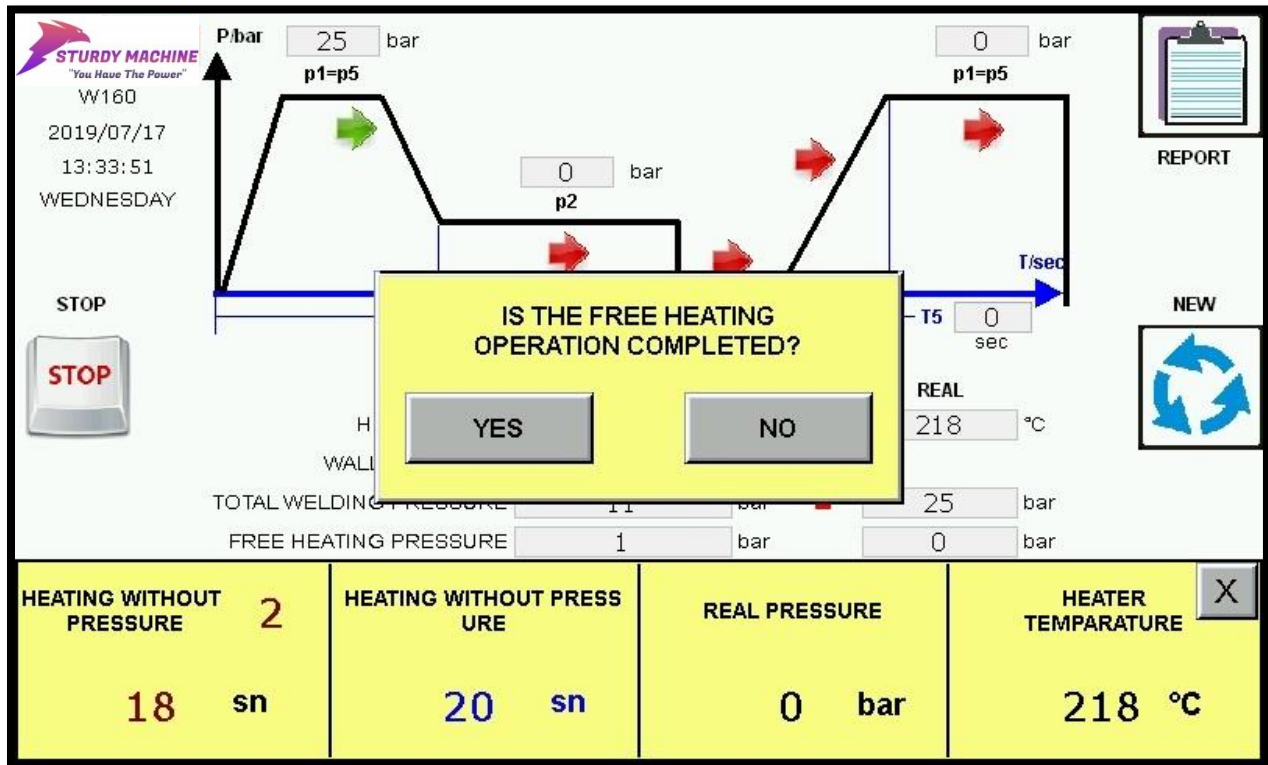


13- Press the start button from the operator screen and heating process is started. Pressure lip boost T1 time is started.

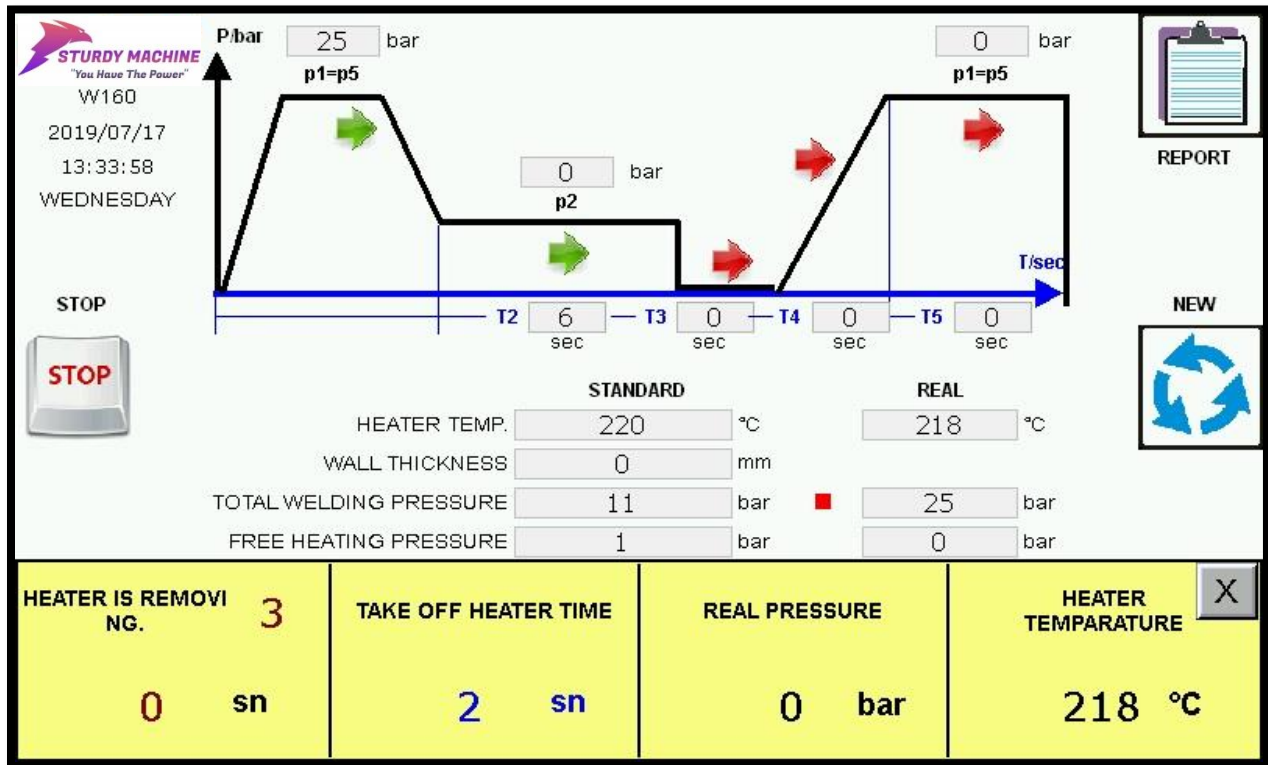


14- When the lip height is visually checked and reached to the standard value, the pressure is reduced to zero by pressing the drain button in the hand control to switch to non-pressure heating operation.

15-Non-presure heating time is controlled from the screen and get ready to remove the heating plate.

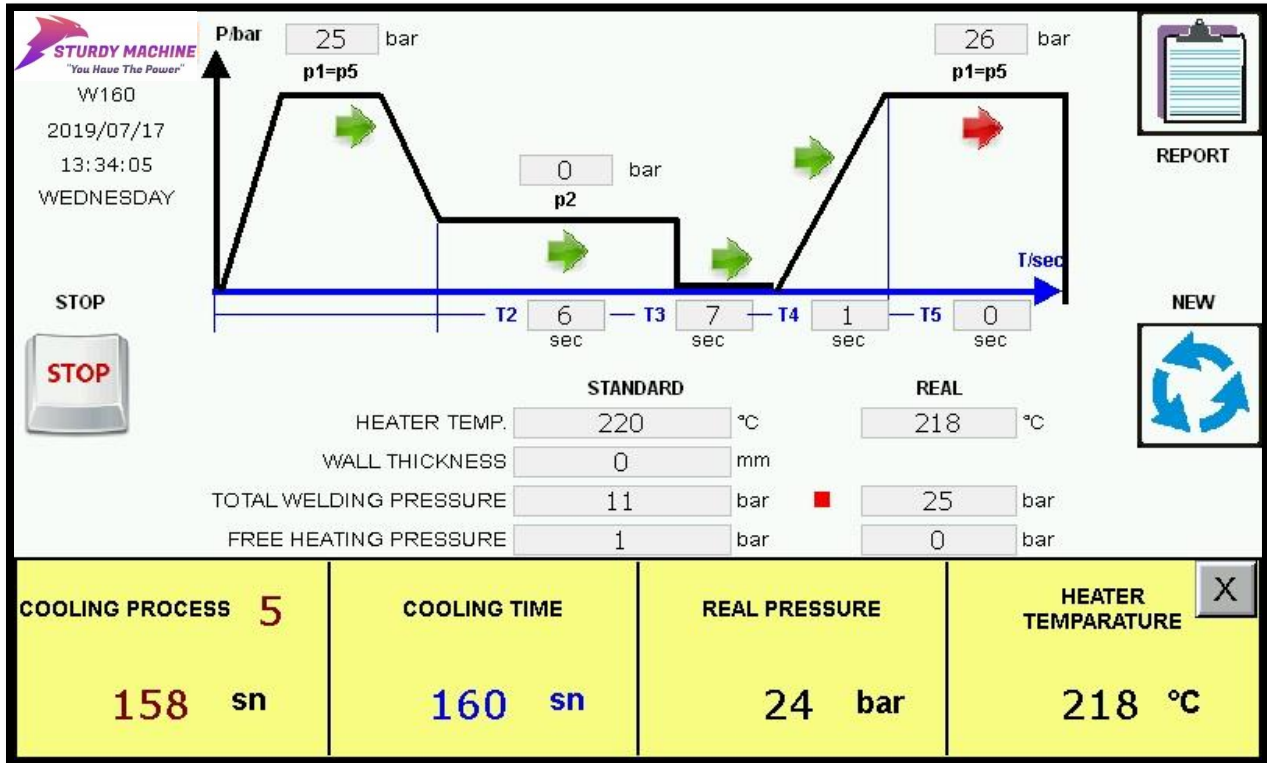


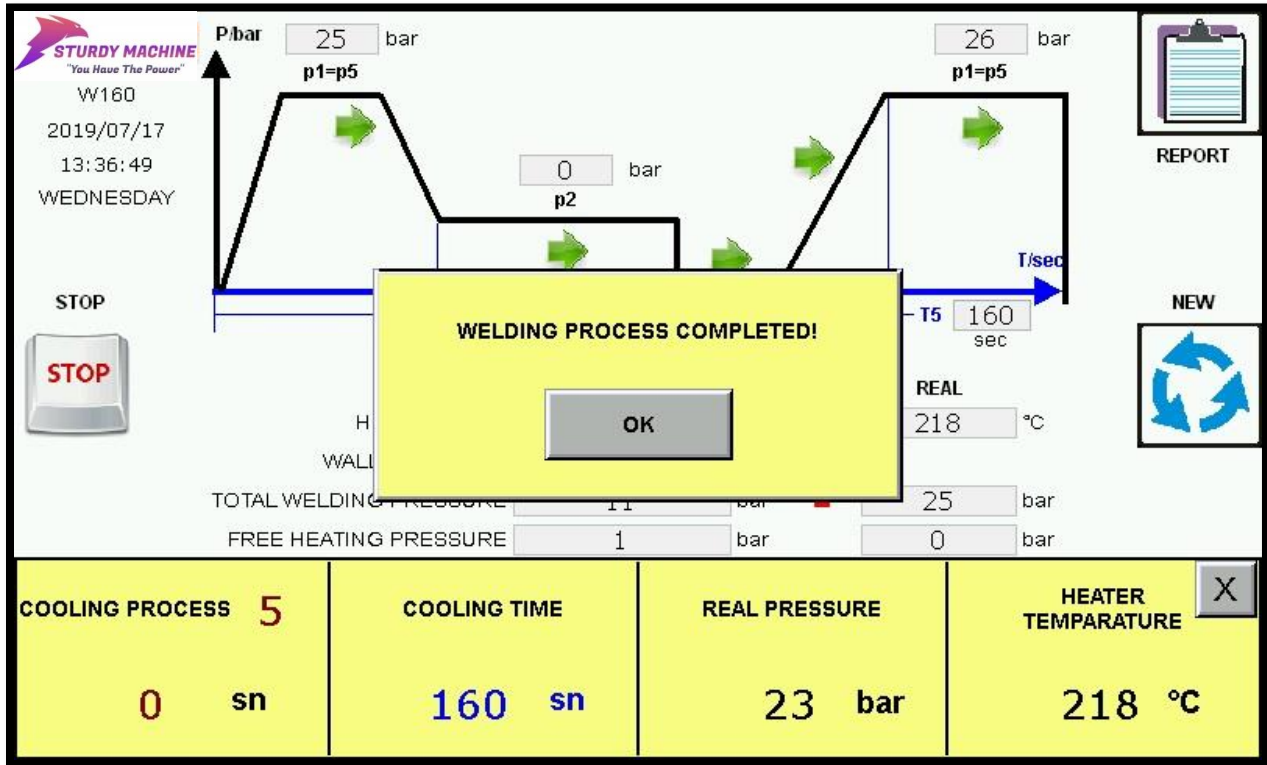
16-Once the non-pressure heating time is over, press the 'Yes' button on the screen. The clamps are opened and the heating plate is removed as soon as possible. Then the clamps are closed again to start the welding process and cooling time is started.

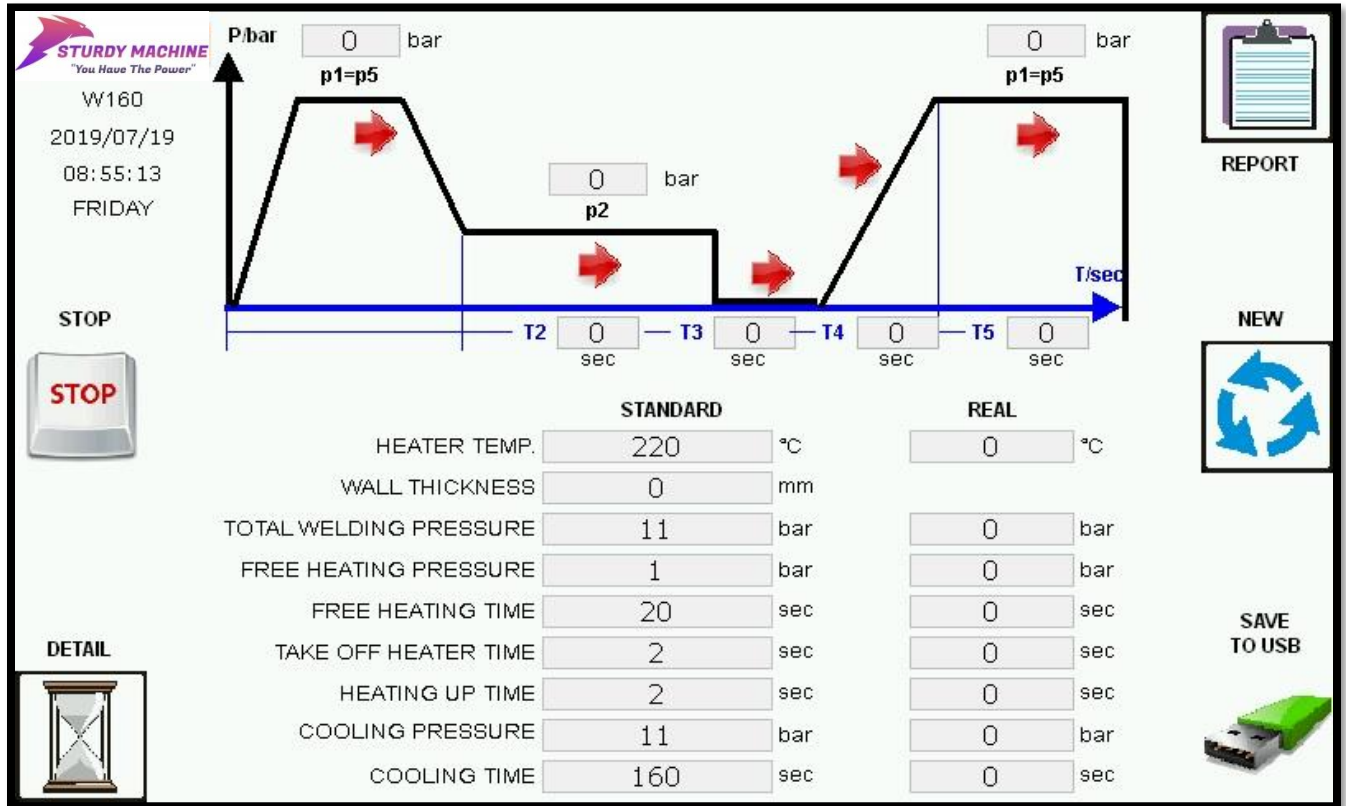


17-Once the cooling time is over, 'Welding proses completed' warning is displayed on the screen. The graphical report is saved into the USB by pressing the 'Save to USB' button. By pressing the SAVE button on the 'Welding Info', the detailed report can also be saved into USB.









 <b>W160</b> 2019/07/11 09:22:25 THURSDAY	STANDARD	DVS 2207-1		
	PLUG NO	W73- 83		
	COMPANY NAME	STURDY MACHINE GROUP	PROTECTION TYPE	UMBRELLA
	WELDER NAME	MARIA	WEATHER FORECAST	DRY
	PROJECT NAME	1600 OUTFALL	LOCATION	N N
	WELDING NO	56008		E E
	MACHINE SERIAL NO	01-1125		
	DRAWING NO	126-2019		
	MATERIAL	HDPE 100		
	PIPE DIAMETER	160	mm	
	SDR	SDR21		
	ENVIRON TEMP.	22.9	°C	
	MOVEMENT PRESSURE	10	bar	
	TEORICAL WELDING PRESSURE (P1)	8	bar	
	BE AD HEIGHT	1.0	mm	
WALL THICKNESS	7.7	mm		
	<b>STANDARD</b>		<b>REAL</b>	
HEATER TEMP.	220	°C	0 °C	
TOTAL WELDING PRESSURE	18	bar	0 bar	
FREE HEATING PRESSURE	1	bar	0 bar	
FREE HEATING TIME	77	sec	0 sec	
TAKE OFF HEATER TIME	6	sec	0 sec	
HEATING UP TIME	6	sec	0 sec	
COOLING PRESSURE	18	bar	0 bar	
COOLING TIME	650	sec	0 sec	
MISTAKE	YES			
MISTAKES.....	FOREMAN.....			
.....	SIGN.....			
.....				



**SAVE TO USB**

