Student _____ Group _____

Laboratory work № 1 **«Resistance spot welding»**

Technical data of the machine MT-1606

Materials to be welded and its thickness: _____

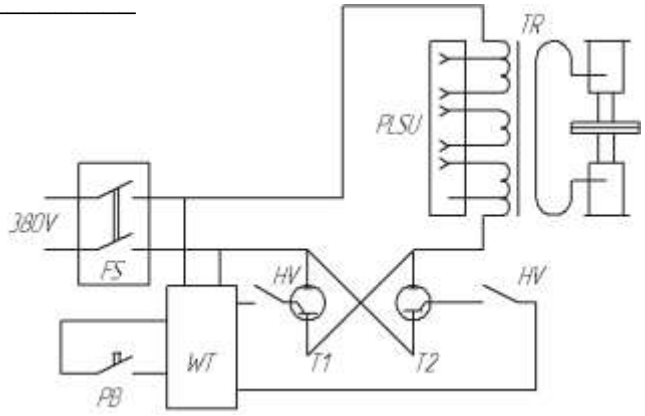
_____

_____

Maximum power of the machine is _____ kW, rated welding current is _____ kA.

The electric circuit of the machine MT-1606

PLSU – _____



TR – _____;

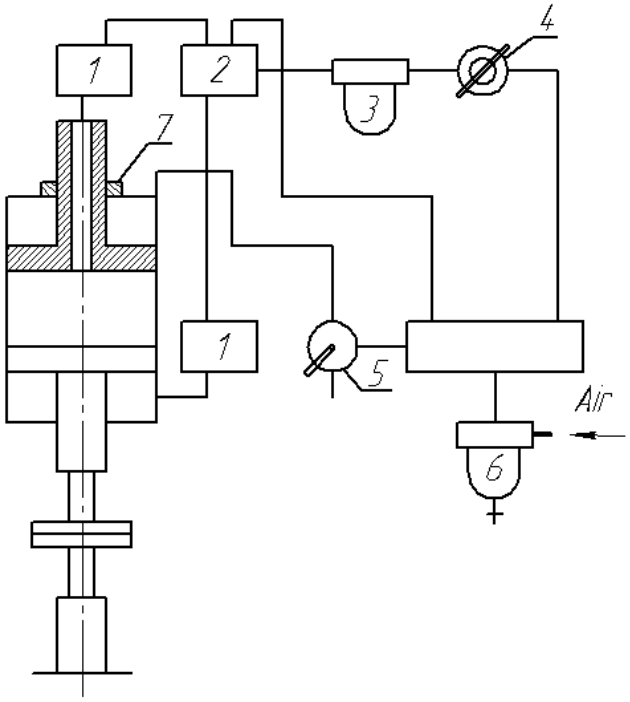
PB – _____;

HV – _____;

T_1,T_2 – _____;

FS – _____; WT - _____;

The pneumatic system of the machine MT-1606



1 – _____;

2 – _____;

3 – _____;

4 – _____;

5 – _____;

6 – _____;

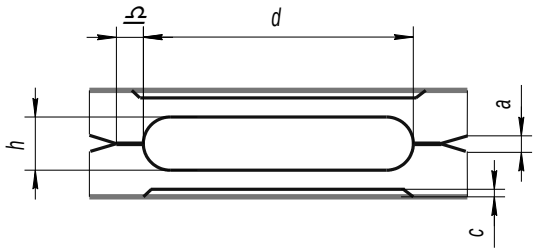
7 – _____;

The main parameters of the spot welding process are I_w - _____,

t_w - _____, P - _____,

d_e - _____

The parameters of welded spot are:



d -_____;

h - _____;

a - _____;

c - _____; δ - _____.

Protocol of the sample's testing

Experiment number	Material - _____; Sheet thickness, S, mm - _____+_____ Electrode contact spot diameter, mm -, d_c, mm - _____					
	Pressure, atm	Pressing force, P, kN	Power Level	Welding time, t_w, sec	Distractive force, F_d, kN	Nature of destruction
1.						
2.						
3.						
4.						
5.						

Strength diagram

F_d, kN

t_w, sec

Conclusions:_____

_____

_____

Rating _____ Instructor's signature _____

Student _____ Group _____

Laboratory work № 2 **«Resistance butt welding and soldering»**

Upset (butt resistance) welding is used for _____

The main parameters of the upset welding are _____

_____

_____

_____

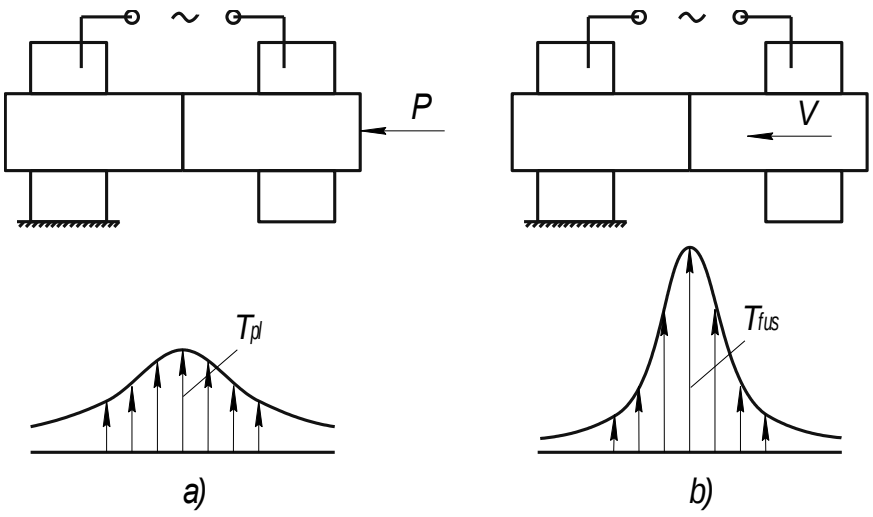
Flash welding is suitable for _____

The main parameters of the flash welding are _____

_____

_____

_____



a) _____ b) _____

Technical data of the machine MC-301

1. Nominal power – _____ kW; 2. Supply voltage – _____ V.

3. Cross-section welded: steel – _____ mm^2; copper alloys – _____ mm^2.

4. Maximum of squeezing force – _____ kN. 5. Number of power level – _____.

6. Secondary voltage – _____ V. 7. Welding current – _____ kA.

Electric circuit of the machine MC-301

PS1, PS2 – _____;

RU – _____; TR – _____;

AB – _____; SB – _____;

LS – _____; 1 – _____;

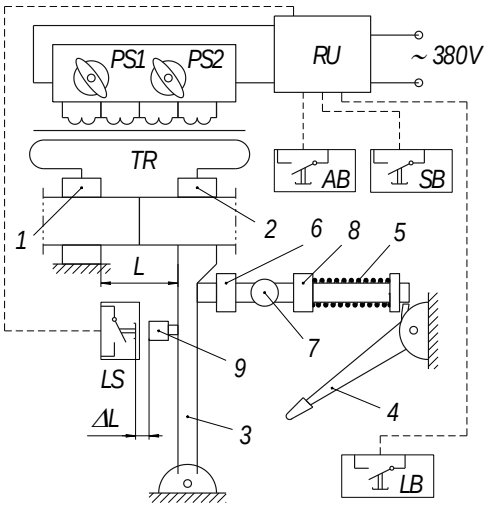
2 – _____; 3 – _____;

4 - _____; 5 –

_____; 6 – _____; 7

– _____; 8 – _____; 9

– _____;

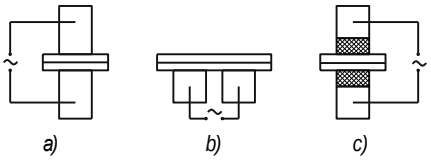


Process of resistance brazing

a) _____

b) _____

c) _____



Protocol of the sample testing

Material – _____				Brazier – _____			
Cross-section area, mm^2 - _____				Flux - _____			
№	Type of process	Pressing force, kN	Power level	Upset distance, mm	Welding time, sec	Distractive force, P, kN	Nature of disruption
1	Welding						
2	Welding						
3	Welding						
4	Soldering						
5	Soldering						

Conclusion: _____

_____

_____

_____

Rating _____ Instructor's signature _____

Student _____ Group _____

Laboratory work № 3 «**Machine submerged welding**»

Process of machine submerged welding

The process uses _____, which is completely hidden under _____.

The flux includes _____

and other components. _____ is used as bonding agent.

Scheme of machine submerged arc welding

1 – _____;

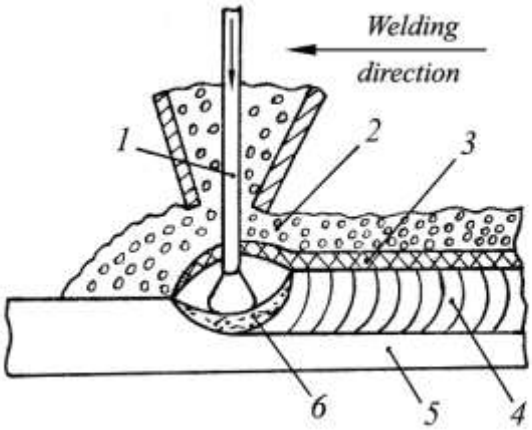
2 – _____;

3 – _____;

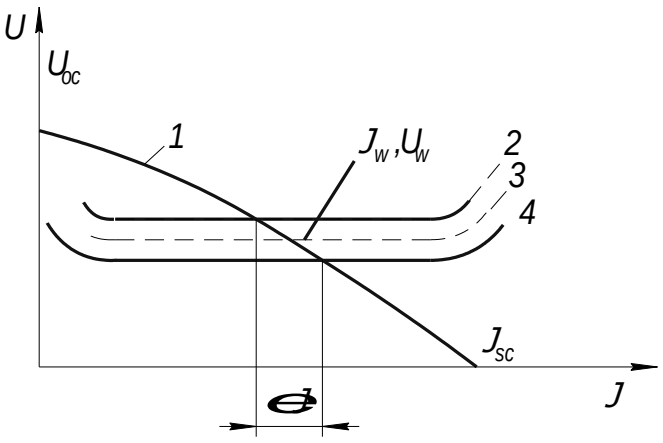
4 – _____;

5 – _____;

6 – _____;



Output characteristic of power source must be _____. Such type of output characteristic guarantees that in case of the arc length _____ the welding current will have a considerable _____, the electrode will be fused _____ and the arc length will _____.



The main parameters of the process are:

1. _____;

2. _____; 3. _____;

4. _____; 5. _____.

Main units of the machine ABC

1 – _____;

2 – _____;

3 – _____;

4 – _____;

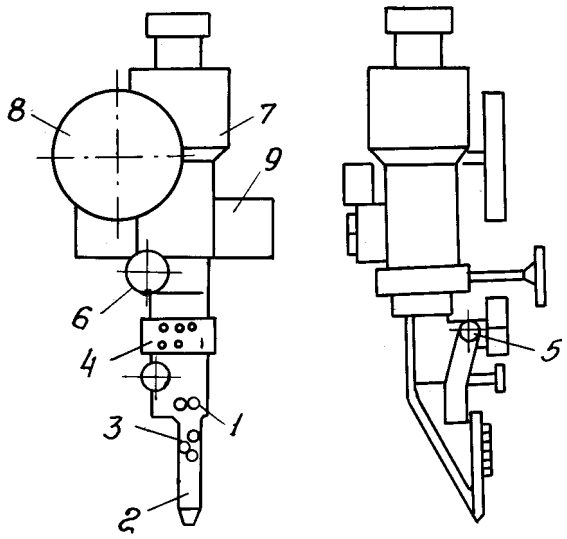
5 – _____;

6 – _____;

7 – _____;

8 – _____;

9 – _____;



Welding operational specification of the machine ABC

1. Speed of welding – _____ m/min.
2. Filler wire feed speed – _____ m/min.
3. Diameter of filler wire – _____ mm.
4. Welding current – _____ A.
5. Welded metal thickness – _____ mm.

Types of butt joints

a) _____;

b) _____;

c) _____;

d) _____;

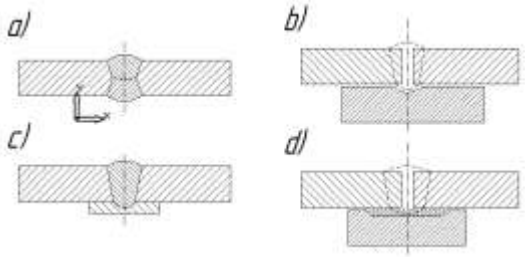


Table of welding conditions and test results.

Material and thickness S, mm	Type of joint	Current I, A	Voltage U, V	Welding speed V_c, m/h	Wire feeding rate V_n, m/h	Flux	Weld hardness HR	Base metal hardness HR	HAZ hardness HR

Conclusions: _____

_____

_____

Rating _____ Instructor's signature _____

Student _____ Group _____

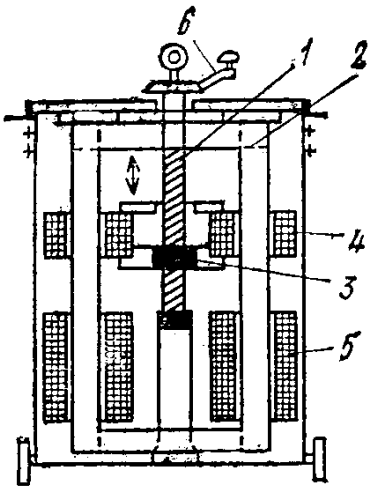
Laboratory work № 4 **«Manual arc welding with AC transformers»**

For manual arc welding open circuit voltage on the safety side shall be maximum _____ V for alternative current and _____ V for direct current. The slope shall be _____.

Performances of the transformer TD-500

1. Power consumed - _____ kW. 2. Supply voltage of power source - _____ or _____.
3. Open circuit voltage: at high currents range - _____ V; at low currents range - _____ V.
4. Rated current - _____ A. 5. Range of current regulation - _____ A.

Scheme of the welding transformer TD-500



1 – _____

2 – _____

3 – _____

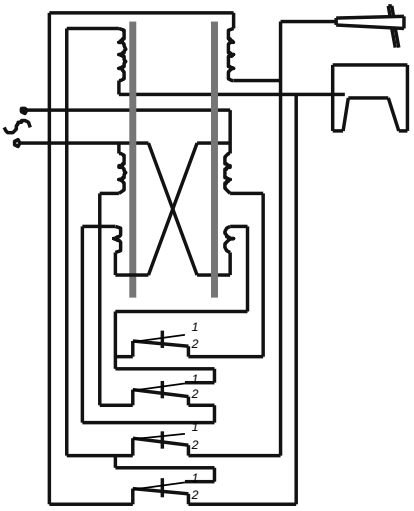
4 – _____

5 – _____

6 – _____

The bobbins of secondary winding are _____.

Electrical circuit of the transformer TD-500



The secondary winding consists of _____ coils and the primary winding consists of _____ coils, two of which are the _____ and the others are _____.

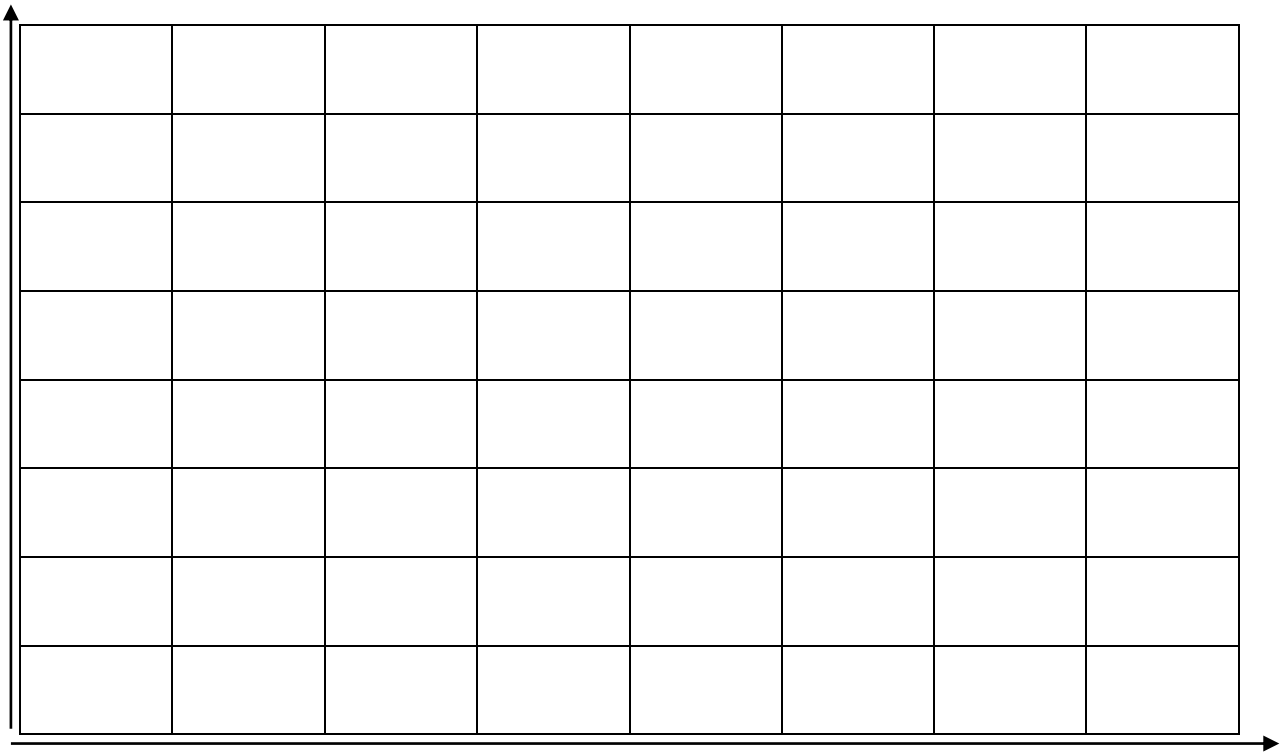
_____ connection of bobbins gives low inductive resistance and the range of high currents and the _____ connection gives high inductive resistance and the range of low current.

If _____ connection of coils the additional sections of primary winding are _____

Protocol of the test of transformer TD-500

Number	Current on the scale	Measurement				K
		Open circuit, U, V	Short circuit, I, A	Operating mode		
				Current, I, A	Voltage, U, V	
1	90					
2	150					
3	240					
4	240					
5	300					
6	350					

Graf of the TD-500`s external characteristics



Conclusions: _____

_____

_____

_____

Rating _____ Instructor's signature _____

Student _____ Group _____

Laboratory work № 5 **«Analysis of electric arc characteristics and equipment for TIG welding»**

Argon is an _____, _____ gas; it does not _____ with metals and does not _____ in them;

There are two types of argon arc welding: _____ and _____.

_____ is usually used as the material of non-consumable electrode. The electrode can resist high _____, and has _____ thermal emission. Arc remains stable even when the current _____.

Only _____ output characteristic can guarantee steady-state arc under TIG welding.

Scheme of TIG welding:

1 – _____,

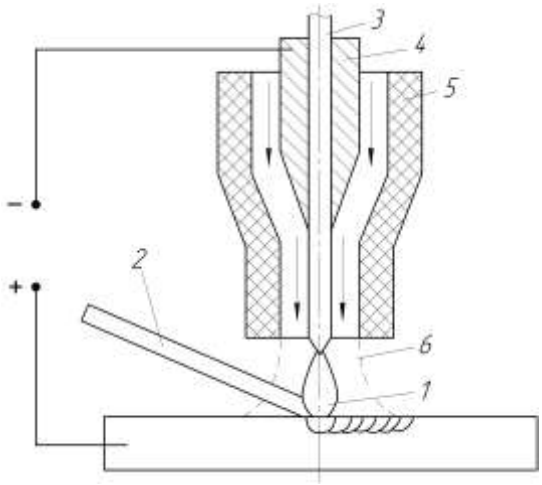
2 – _____,

3 – _____,

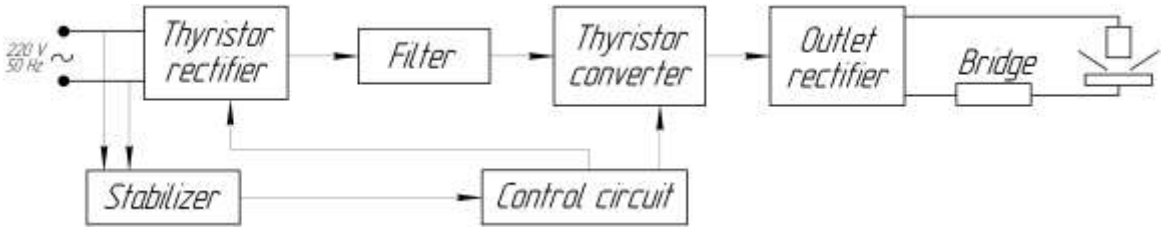
4 – _____,

5 – _____,

6 – _____



Schematic circuit of the IST-125 inverter



_____ current which comes to input terminal of thyristor rectifier, is transformed to _____ current, then – to the _____ current in thyristor converter, later the current is again rectified by the outlet rectifier to _____current and comes to output terminal of inverter.

Measured results to plot the output characteristic slope of IST-125

Arc length, L, mm	1	2	3	4	5
Arc voltage, U, V					
Current I, A					

Current, I, A	5	10	20	30	40	50
Voltage, U, V (L=2mm)						
Voltage, U, V (L=5mm)						

Sum of anode voltage drop and cathode voltage drop, $U_a+U_{к,}$ = _____

Voltage drop per arc length unit, U_o = _____

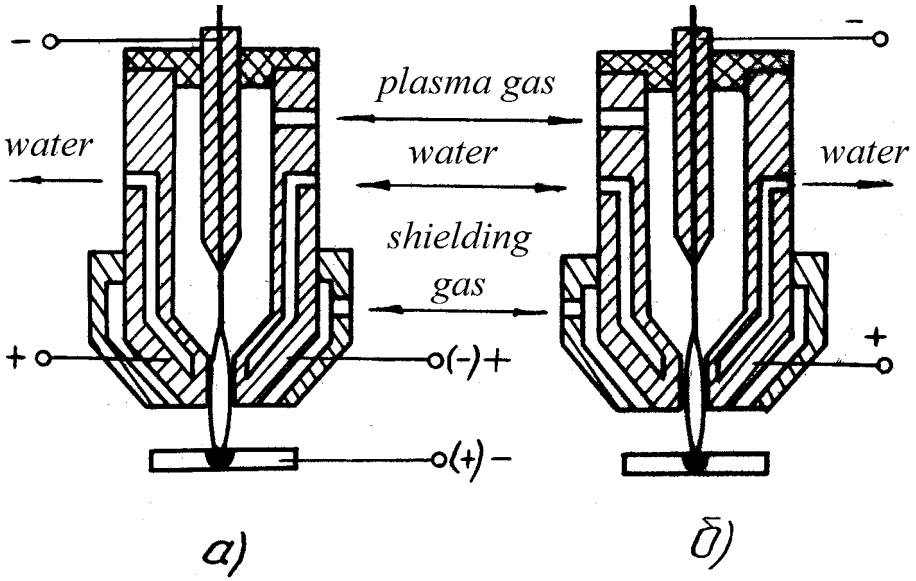
Conclusions: _____

_____

Rating _____ Instructor's signature _____

Student _____ Group _____

Laboratory work № 6 «**Microplasma arc welding**»



The _____ arc can be used at the plasmatrones, when the work metal is one of the arc electrode, and the _____ arc is used, when this metal isn't included in the current circuit.

An pilot arc is struck between the electrode and the _____. Into the nozzle _____ gas is fed. The outer layers of the gas flow passing through the outlet have a _____. Those results in plasma concentrating, the temperature _____ in the _____.

The important characteristics of the heat source are $H_э$ (_____) and $\boldsymbol{q_э}$ (_____).

Protocol

Parameters of the mode. Results.	Number of the experiment			
	1	2	3	4
Grade of a material				
Sheet thickness, mm				
Type of joint				
Polarity				
Welding current for nontransferred arc, A				
Welding current for transferred arc, A				
Arc voltage ,V				
Open circuit voltage, V				
Impulse duration of arc current, s				
Pause between the welding current impulses, s				
Plasma gas consumption, l/min				
Shielding gas consumption, l/min				
Tungsten electrode diameter, mm				
Heat-flow rate, W/mm^2				

Conclusions

Rating _____ Instructor's signature _____

Student _____ Group _____

Laboratory work № 7 **«Resistance seam welding»**

Resistance seam welding use _____ as electrodes and

_____ for workpiece heating.

Main parameters of resistance seam welding are _____

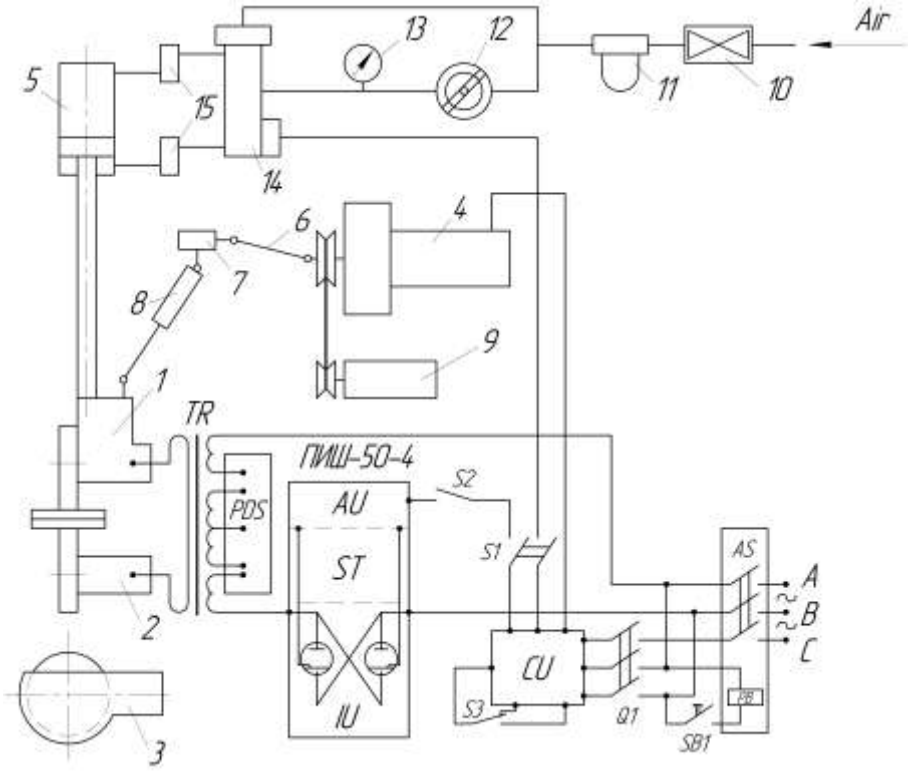
_____

_____

_____

Optimal values of the parameters depend on _____

_____



1 – 6 –

2 – 7 –

3 – 8 –

4 – 9 –

5 – 10 –

11 –

12 –

13 –

14 –

15 -

CU –

AS –

AU –

TR –

PoS -

Technical data of the МШ-1601 machine

– rating at 20% duty cycle – _____ kW,

– welding rate – _____ m/min,

– number of power levels – _____,

– welded sheet thickness – _____ mm,

– working stroke of the upper electrode – _____ mm,

– nominal outreach of electrodes – _____ mm.

Protocol of samples testing

Number of experiment	Material – Sheet thickness – Roller width –							
	Welding conditions						Welding results	
	P, N	Power step	t_i, s	t_p, s	m	V_w, mmps	l, mm	Tightness test
1								
2								
3								
4								

Conclusions

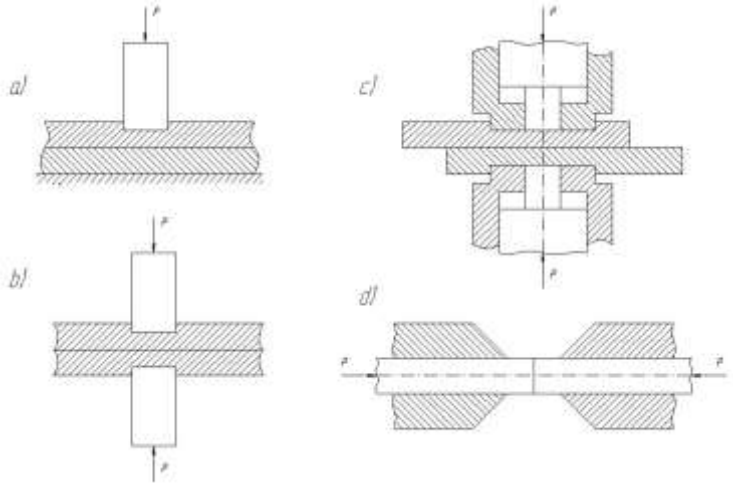
Rating _____ Instructor’s signature _____

Student _____ Group _____

Laboratory work № 8 **«Cold welding of plastic material»**

The main points of the pressure cold welding process.

Schemes of cold welding



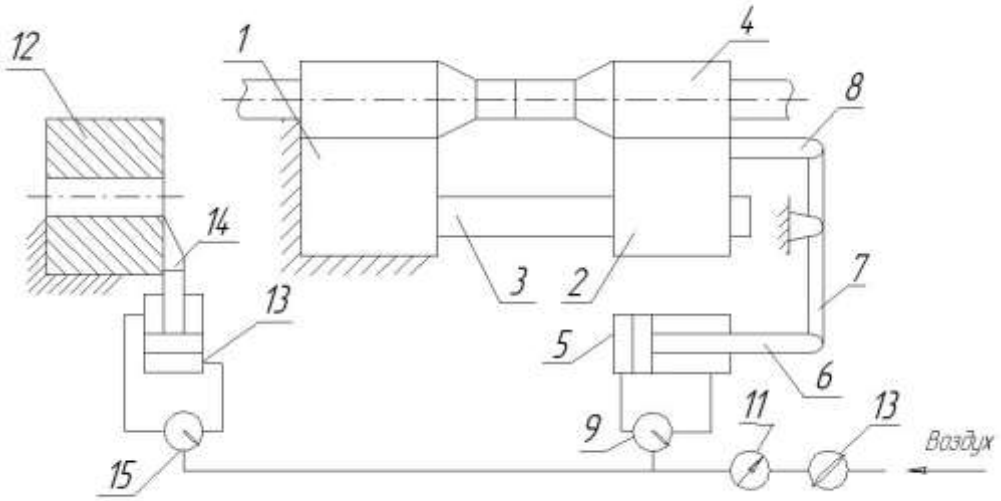
a) –

b) –

c) –

d) –

Scheme of the machine MCXC-5-3



1 –

2 –

3 –

4 –

5 –

6 –

7 –

8 –

9 –

1. Technical characteristics of the machine MCXC-5-3

2. Protocol of the sample's tests

Material – Wire cross-section area F, mm^2 –				
№	Stick-out distance	Force of fracture, P, kN	mode of fracture	Note
1 2 3 4				

3. Conclusions

Rating _____ Instructor's signature _____