ENGLISH

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Introduction

Dear Customer, Thank you for your trust and the purchase of our product.



Before starting up, please read all the instructions in this manual carefully to let you know about this device.

It is also necessary to read all the safety regulations in the enclosed document „Safety instructions and maintenance".

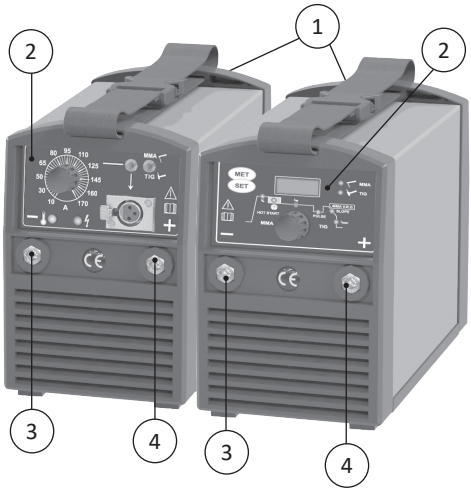
For the most optimal and long-term use, you must follow the instructions for use and maintenance listed here. In your interest, we recommend that you entrust maintenance and repairs to our service organization, which has the appropriate equipment and specially trained staff. All of our machines and equipment are subject to long-term development. Therefore, we reserve the right to change during production.

Description

150 and 170 is the welding machine based on the inverter technology. Advanced materials and components have been used to design and produce it. Machines TIG LA are equipped with functions HOT START - adjustable, ARC FORCE, ANTI STICK, TIG PULS, TIG DOWN SLOPE, TIG end current, safety system V.R.D.
Machines are designed mainly for production, maintenance, for assemblies or for utility rooms.

Table 1

Technical data		150/150 TIG LA	170/170 TIG LA
Supply voltage 50/60 Hz	[V]	1x230	1x230
Adjustment field	[A]	10 - 150	10 - 170
Secondary voltage	[V]	88	88
Usable current 45 %	[A]	150	170
Usable current 60 %	[A]	140	140
Usable current 100 %	[A]	125	125
Nominal current	[A]	16	20
Input at no load	[W]	≤ 40	≤ 40
Efficiency - max. Power	[%]	≥ 80	≥ 80
Protection class		IP 23 S	IP 23 S
Dimensions	[mm]	330x143x220	
Weight	[kg]	5.5	5.9



Picture 1

Position 1 Supply switch. In the „O“ position the welder is off.
Position 2 Control panel, pic. 2 and 3.
Position 3 Negative quick connector.
Position 4 Positive quick connector.

Installation

The installation site for the system must be carefully chosen in order to ensure its satisfactory and safe use. The user is responsible for the installation and use of the system in accordance with the producer's instructions contained in this manual.

Before installing the system the user must take into consideration the potential electromagnetic problems in the work area. In particular, we suggest that you should avoid installing the system close to:

- Signalling, control and telephone cables
- Radio and television transmitters and receivers
- Computers and control and measurement instruments
- Security and protection instruments

Persons fitted with pace-makers, hearing aids and similar equipment must consult their doctor before going near a machine in operation. The equipment's installation environment must comply to the protecttion level of the frame i.e. IP 23 S. The system is cooled by means of the forced circulation of air, and must therefore be placed in such a way that the air may be easily sucked in and expelled through the apertures made in the frame.

Connection to the electrical supply

Before connecting the welder to the electrical supply, check that the machines plate rating correspondds to the supply voltage and frequency and that the line switch of the welder is in the „0“ position. Only connect the welder to power supplies with grounded neutral.

This system has been designed for nominal voltage 230 V 50/60 Hz. It can however work at 220 V and 230 V 50/60 Hz without any problem. Connection to the power supply must be carried out using the four polar cable supplied with the system, of which:

- 2 conducting wires are needed for connecting the machine to the supply
- the fourth, which is YELLOW GREEN in colour is used for making the „EARTH“ connection
- Connect a suitable load of normalised plug to the power cable and provide for an electrical socket complete with fuses or an automatic switch. The earth terminal must be connected to the earth conducting wire (YELLOW-GREEN) of the supply.

NOTE: Any extensions to the power cable must be ofa suitable diameter, and absolutely not of a smaller diameter than the special cable supplied with the machine.

WARNING: While using the machine 170 on higher welding current, the power take off may exceeds 16 A. In this case it is necessary to change the default supply plug for industrial plug with 20 A protection. At the same time this protection must be in accordance with implementation and protection in the distribution of electricity.

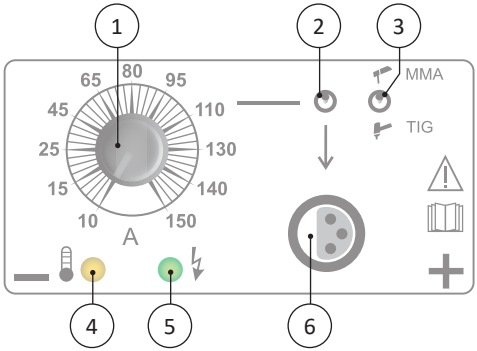
Other methods of connection are fixed connection to separate circuit (such circuit must be protected by circuit-breaker or fuse max. 25 A), or connection to three-phase network 3x 400 / 230 V TN-C-S (TN-S).

In case of connection to three-phase network, the 5-pin plug 32 A must be used. Phase conductor - black (brown) connect in the plug to one of clamp marked L1, L2 or L3. Null conductor - blue - connect to clamp marked (N), white/green conductor connect to clamp marked (Pe). This way modified supply cable of the machine can be pluged to the three-phase socket outlet, which must be protected by circuit-breaker or fuse max. 25 A.

WARNING! Machine may not be connected to interlinked voltage (i.e. voltage between two phases). In this case the machine may be demaged. Such modifications could be made only by competent person with electrotechnical qualification.

Control panels

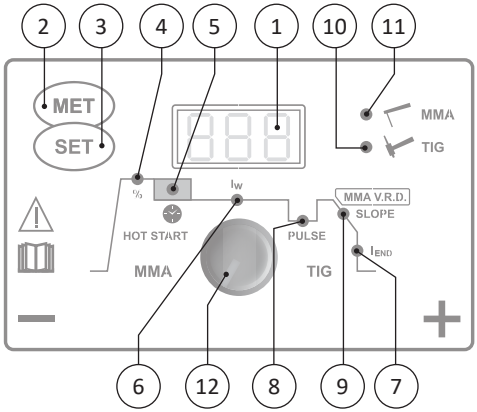
Picture 2 – Control panel 150 and 170



Position 1 Potentiometer of welding current.
Position 2 Switcher of remote control.
Position 3 MMA/TIG method switcher.
Position 4 THERMOSTAT yellow signal light. When this light comes it means that the overheat cut-off has come on, because the work cycle limit has been exceeded. Wait for a few minutes before starting to weld again. The welder is ready for use again after the yellow signal light turns itself off.
Position 5 Green signal ON light. When this light comes, the machine is ON.
Position 6 Connector of remote control.

NOTICE! The welding machines 150, 170 provide the possibility of connecting a remote control. For connecting the remote control turn the switch on (pic. 2, pos. 2). For welding without a remote control (the remote control is not connected to the machine) is necessary to have the switch on the front panel off.

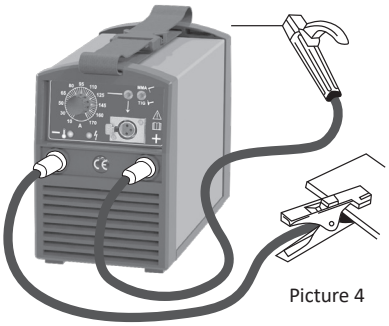
Picture 3 – Control panel 150 TIG LA and 170 TIG LA



Position 1 Display which shows adjusted values.
Position 2 Button MET for selection of welding method MMA (stick electrode) or TIG.
Position 3 Button SET for selection from single functions (check of adjusted values or their changing).
Position 4 LED shows adjustment of values of HOT START function (only with MMA method) - percentage increase of welding current at the begining of welding process. Function HOT START can be regulated within range of 0 (function is off) up to maximum increase of welding current by 70 % (maximum 150 A or 170 A according to type of machine).
Position 5 LED shows adjustment of values of HOT START function (only with MMA method) - time of run-out of HOT START function.
Position 6 LED shows adjustment of welding current values (shared for methods MMA and TIG).
Position 7 LED shows adjustment of end welding current values (only with TIG method).
Position 8 LED shows adjustment of values of frequency pulse of welding current (only with TIG method).
Position 9 For TIG method this diode signals setting values of welding current run-out; for MMA method signals activetion of safety function V.R.D.
Position 10 LED signalling method of welding - TIG.
Position 11 LED signalling method of welding - MMA.
Position 12 Potentiometer for adjustment of welding parameters.

Connection of the welding cables for method MMA

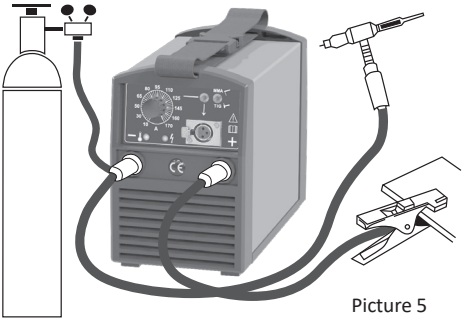
With the machine disconnected from the supply, connect the welding cables to the out terminals (positive and negative) of the welder, connecting them to the gripper and the earth, with the correct polarity provided for the type of electrode to be used (pic. 4). Choosing the indications supplied by the electrode manufacturer, the welding cables must be as short as possible, close to one other, and positioned at floor or close to it.



Picture 4

Connecting the welding torch and the cable for method TIG

Connect the welding torch to the minus pole and the ground wire to the plus pole - direct polarity (pic. 5).



Picture 5

Welding part

The part to be welded must always be connected to earth in order to reduce electromagnetic emission. Much attention must be afforded so that the earth connection of the part to be welded does not increase the risk of accident to the user or the risk of damage to other electric equipment. When it is necessary to connect the part to be welded to earth, you should make a direct connection between the part and the earth shaft. In thouse countries in which such a connection is not allowed, connect the part to be welded to earth using suitable capacitors, in compliance with the national regulations.

Welding parameters adjustment for machines 150 a 170

Method MMA

1. Setting the welding method - with a switch (pic. 2, pos. 3) set the required method. If the switch is in the upper position the machine is switched on method MMA (welding by stick electrode).
2. Toggle the switch (pic. 2, pos. 2) into the upper position for local operating (in case of no remote control).
3. By potentiometer (pic. 2, pos. 1) set on scale required welding current according to the thickness of material and electrode diameter (approximately table 4 and 5). While using a remote control regulation of the welding current is carried out with a potentiometer on the remote control. Switch (pic. 2, pos. 2) must be in lower position.
4. Thus the machine is ready for welding with method MMA.
5. Function HOT START is active in position for wel-ding with method MMA, which secures an increase of welding current at the beginning of welding. If any welding through the thin materials occurs during arc ignition it is recommended to switch the switch of the method into position TIG which switches HOT START function off.

Method TIG

1. Setting the welding method - with a switch (pic. 2, pos. 3) set the required method. If the switch is in low position the machine is switched onto method TIG.
2. Toggle the switch (pic. 2, pos. 2) into the upper position for local operating (it is effective in case of no remote control).
3. Set the required welding current with a potentiometer (pic. 2, pos. 1) according to the thickness of material and diameter of the used electrode (approximately table 4 and 5). While using a remote control regulation of the welding current is carried out with a potentiometer on the remote control. Switch (pic. 2, pos. 2) must be in the down position.
4. Connect the welding torch with a gas valve into the minus quick coupler.
5. Connect the gas hose of welding torch over the pressure regulator into the bottle with protective gas.
6. Connect the grounding cable into the plus quick coupler.
7. Set the required gas flow with a pressure control valve and the valve on the torch.
8. Thus the machine is ready for welding with method TIG.

Welding parameter adjustment for machines 150 TIG LA and 170 TIG LA

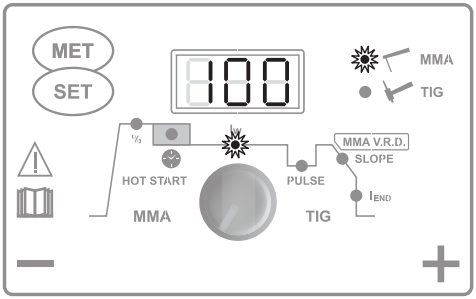
Setting of welding method

After switching the machine on, one from diodes of welding method light up (the last you set before switching off). By pressing button MET (pic. 3, pos. 2), you can choose the other method.

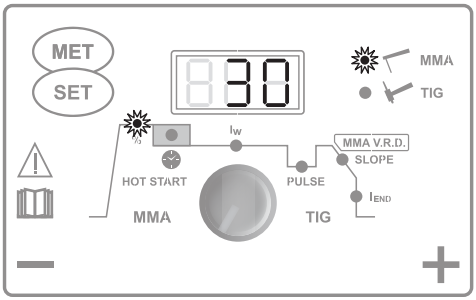
Setting parameters for MMA method are the following:

- Welding current 10-150 A (series 150), 10-170 A (series 170).
- Value of „increase of welding current“ HOT START 0 (HOT START switched off) up to 70 % of welding current, max. 150 A (series 150), 170 A (series 170).
- Time of run-out of „starting current“ 0.1 - 1 s.

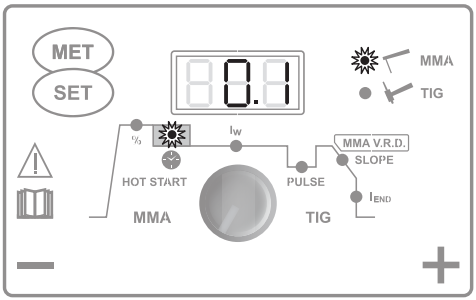
Method MMA - setting of welding current
Set up required value of welding current with a potentiometer (pic. 3, pos. 12).



Method MMA - setting of value HOT START
Press button SET (pic. 3, pos. 3) until LED „%“ (pic. 3, pos. 4) is on as in the picture. Set up required value of current increase in % with a potentiometer (pic. 3, pos. 12). If there is value 30 on the display it means increase of start current by 30 %.



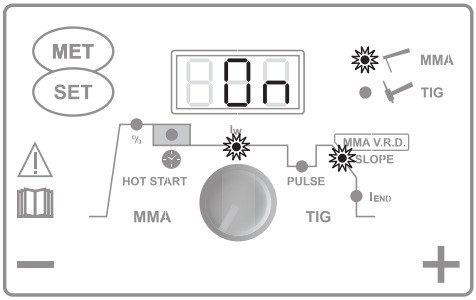
Method MMA - setting of time value HOT START
Press button SET (pic. 3, pos. 3) until there is the same LED „t“ (pic. 3, pos. 5) on as in the picture. Set up required value of HOT START duration time with a potentiometer (pic. 3, pos. 12).



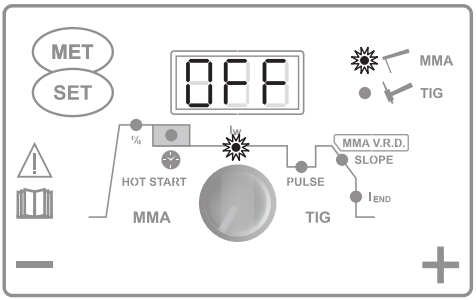
EXAMPLE:
1. When you set up welding current for 100 A (LED „I_w” lights, pic. 3, pos. 6, and LED „MMA“ pic. 3, pos. 11), display shows 100 (100 A).
2. When you press button SET, LED „%” lights up (pic. 3, pos. 4). It is possible to set the value of welding current - HOT START for example by 50 % higher (we set it with a potentiometer on display 50). Final „starting current“ is 150 A. Function HOT START can be switched off if you set 0 %.
3. If you press button SET again, LED „t” lights up (pic. 3, pos. 5). It is possible to set the value of run-out time of welding current by potentiometer - for example 0.2 s (we shall set it with a potentiometer on display 0.2). Time of run-out of welding current is 0.2 s.

Method MMA - security function V.R.D. (only 150/170 TIG LA)
The security system V.R.D. provides a low voltage at the output of the machine - 15 V. This safe value changes immediately after contacting the electrode with the welded material. When the welding process is finished the output voltage will automatically change to 15 V again. When the V.R.D. function is turned off the open circuit voltage is 88 V.

Method MMA - switching on function V.R.D.
Switch off the machine with the main switch. Press and hold button MET (pic. 3, pos. 2) on the front panel and switch on the machine with the main switch. Release button MET just after switching on. LED diode „MMA V.R.D.“ (pic. 3, pos. 9) is lit up on the panel and sign ON is displayed for about 1-2 s. Function V.R.D. is on (signaled by luminous LED diode - pic. 3, pos. 9).

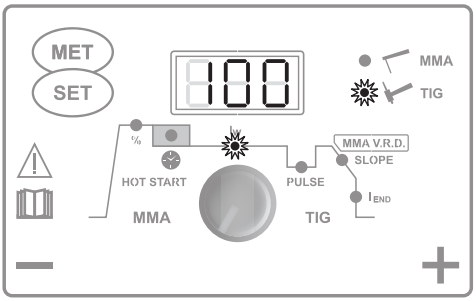


Method MMA - switching off function V.R.D.
Switch off the machine with the main switch. Press and hold button MET (pic. 3, pos. 2) on the front panel and switch on the machine with the main switch. Release button MET just after switching on. Indicator light LED „V.R.D." is switched off on the front panel and sign OFF is displayed for about 1-2 s. Function V.R.D. is switched off.

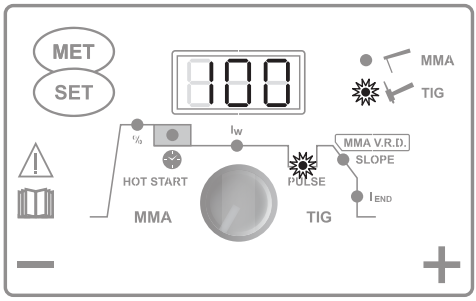


Setting parameters for TIG method are the following:
- Welding current 10-150 A (series 150), 10-170 A (series 170).
- Pulse frequency of welding current 0-500 Hz. Value of lower current (basic current) is appr. 35 % upper - welding current. Proportion of upper and lower currents in a period of pulse is 50 % to 50 %.
- Time of run-out of welding current 0-5 s.
- End current 10-150 A (series 150), 10-170 A (series 170).

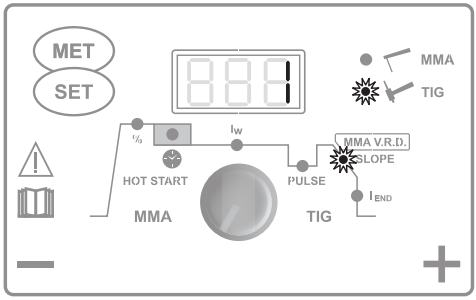
Method TIG - setting of welding current
Set up required value of welding current with a potentiometer (pic. 3, pos. 12).



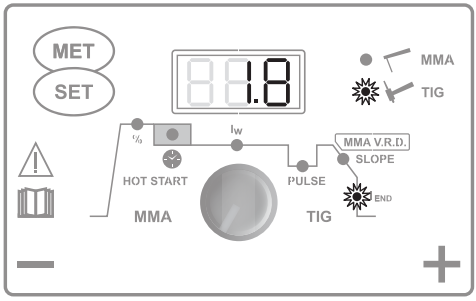
Method TIG - setting of pulse frequency of welding current
Press button SET (pic. 3, pos. 3) until LED „PULSE" (pic. 3, pos. 8) is on as in the picture. Set up required value of pulse frequency of welding current with a potentiometer. Pulse is switched off with setting-up „0".



Method TIG - setting of time of welding current run-out
Press button SET (pic. 3, pos. 3) until LED „SLOPE" (pic. 3, pos. 9) is on as in the picture. Set up required value of time duration of welding current run-out with a potentiometer.



Method TIG - setting of end current value
Press button SET (pic. 3, pos. 3) until „I_{END}" (pic. 3, pos. 7) is on as in the picture. Set up required value of end welding current with a potentiometer.

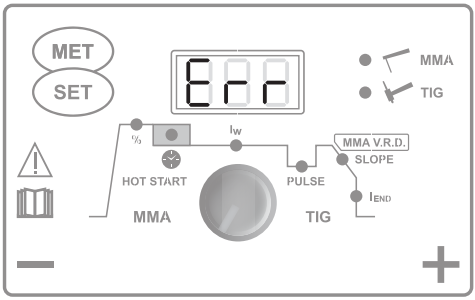


EXAMPLE:

1. When you set welding current on 100 A (LED „I_w“ , pic. 3, pos. 6 and LED „TIG“ pic. 3, pos. 10 lit), display shows 100 (100 A).
2. When you press button SET, LED „PULSE“ is lit up (pic. 3, pos. 8). It is possible to set the value of pulse frequency of welding currant within range 0 (pulse is switched off) up to value 500 Hz. Function PULSE can be switched off, if you set frequency on 0. If you press button SET again, LED „DOWN SLOPE“ is lit up (pic. 3, pos. 9). It is possible to set value of run-out time of welding current - for example 1 s (you can set it with a potentiometer on display value 1). Time of run-out of starting current is 1 s.
3. If you press button SET again, LED „I_{END}“ is lit up (pic. 3, pos. 7). It is possible to set value of end welding current - for example 10 A (it can be set with a potentiometer on display value 10). Time of end welding current is 10 A.

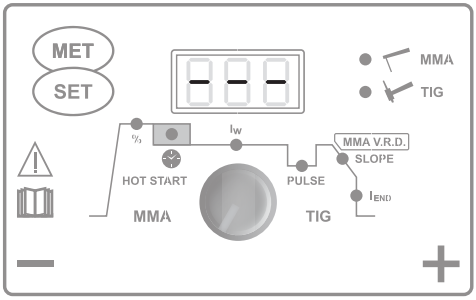
Overheating of the machine

„Err“ on display indicates overheating of the machine.



ANTISTICK

Symbols "- - -" on display signals activity of function ANTISTICK.



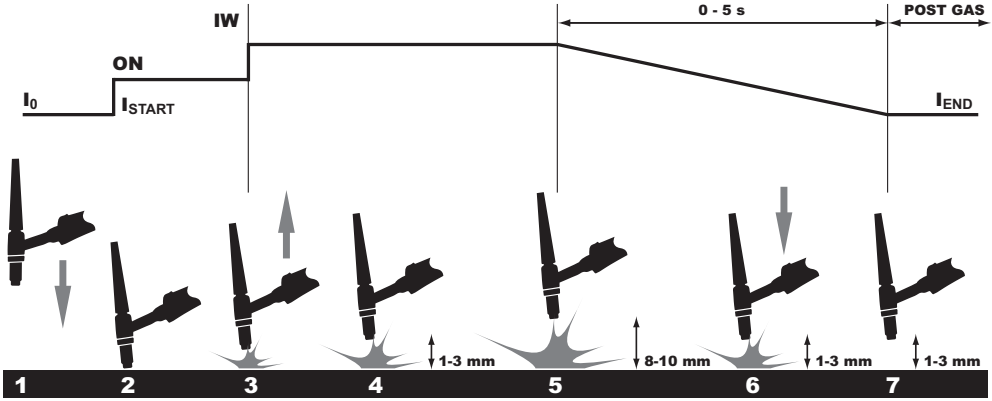
Welding in method TIG (pic. 6)

Starting the gas with a valve on the welding torch.

1. Approaching the tungsten electrode to the welded material.
2. Light touch of tungsten electrode of welded material (no need to cut).
3. Removal of tungsten electrode and arcing of welding arc with LA - very low wear tungsten electrodes by touch.
4. Welding process.
5. Finishing the welding process and activating the DOWN SLOPE (crater filling) is performed by removing tungsten electrodes to about 8 - 10 mm from the welded material.
6. Re-approach - Welding current decreases after the set time to the end value set current (eg 10 A) - filling the crater.
7. End of the welding process. The digital control automatically switches off the welding process.

Switch off the gas with a valve on the welding torch.

Picture 6 - welding process at TIG LA



Basic rules for welding by MMA

Switch the machine to MMA mode - coated electrode. Table 2 lists the general values for the choice of the electrode, depending on its diameter and the thickness of the base material. These data are not absolute and are informative only. For exact selection, follow the instructions provided by the manufacturer of the electrodes. The current used depends on the position of the welding and the joint type and increases according to the thickness and dimensions of the part.

Table 2

Welding thickness (mm)	Electrode (mm)
1.5 - 3	2
3 - 5	2.5
5 - 12	3.25
> 12	4

Table 3: Setting the welding current for the given electrode diameter

Electrode (mm)	Welding current (A)
1.6	30 - 60
2	40 - 75
2.5	60 - 110
3.25	95 - 140
4	140 - 190
5	190 - 240
6	220 - 330

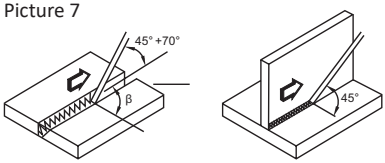
Proper values of welding current for the different diameters of welding electrodes are in table 3.
For different types of welding the values are:

- High for plane, frontal plane and vertical up-wards welding.
- Medium for overhead welding.
- Low for vertical downwards welding and for joining small pre-heated pieces.

A fairly approximate indication of the average cur-rent to use in the welding of electrodes for ordinary steel is given by the following formula: **I = 50 x (Øe – 1)**
WHERE:
I= intensity of the welding current
e= electrode diameter
EXAMPLE:
For electrode diameter 4 mm
I=50x(4-1)=50x3=150 A

Holding and position of the electrode during welding:

Picture 7



Preparation of basic material:
Table 4 shows values for preparation of material. Sizes are determined according to picture 8.

Picture 8

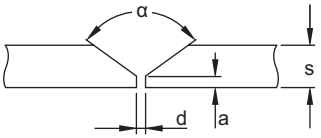


Table 4

s (mm)	a (mm)	d (mm)	α (°)
0 - 3	0	0	0
3 - 6	0	s/2 (max)	0
3 - 12	0 - 1.5	0 - 2	60

Basic rules for welding by TIG

Welding inverters allow TIG welding with touch-triggering. The TIG method is very effective for welding stainless steel. Switch the machine to TIG mode.

Selection and preparation of tungsten electrodes:
Table 5 shows the welding current and diameter values for tungsten electrodes with 2% thoria - red electrode markings.

Table 5

Diameter of electrode (mm)	Welding current (A)
1.0	15 - 75
1.6	60 - 150
2.4	130 - 240

Tungsten electrode shall be prepared according to the values in table 6 and picture number 9.

Picture 9

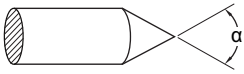


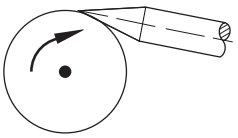
Table 6

α (°)	Welding current (A)
30	0 - 30
60 - 90	30 - 120
90 - 120	120 - 250

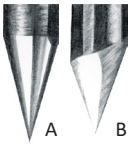
Sharpening of tungsten electrode:
By the right choice of tungsten electrode and its preparation we can influence qualities of welding arc, geometry of the weld and durability/service life of the electrode. It is necessary to sharpen the electrode softly in the traverse/horizontal direction according to picture 10.

Picture 11 shows the influence of sharpening the electrode on its durability/service life.

Picture 10



Picture 11



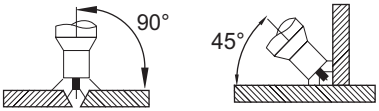
Picture 11A - soft and well-proportioned sharpening the electrode in traverse/horizontal direction - durability up to 17 hours.
Picture 11B - rough and irregular sharpening in vertical direction - durability up to 5 hours.
Parameters for comparing the influence of the way of sharpening the electored are given with the utilisation:
HF striking the el. arc, electrodes Ø 3.2 mm welding current 150 A and welding material pipe.

Protective gas:
For welding by method TIG it is necessary to use Argon with the purity 99.99 %. The amount of the flow shall be determined according to the table 7.

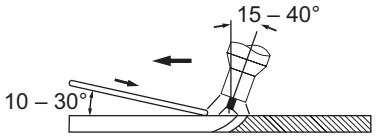
Table 7

Welding current (A)	Electrode diameter (mm)	Welding nozzle n (°)	Welding nozzle Ø (mm)	Gas flow (l/min)
6 - 70	1.0	4/5	6/8.0	5 - 6
60 - 140	1.6	4/5/6	6.5/8.0/9.5	6 - 7
120 - 240	2.4	6/7	9.5/11.0	7 - 8

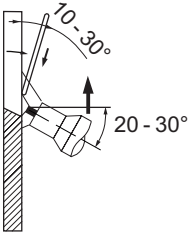
Holding of the welding torch during welding:



Position W (PA) Position H (PB)



Position S (PF)



Position S (PF)

Preparation of basic material:
In table 8 there are given values for preparing material. Sizes shall be determined according to picture 12.

Picture 12

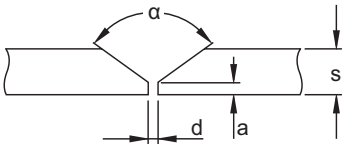


Table 8

s (mm)	a (mm)	d (mm)	α (°)
0 - 3	0	0	0
3	0	0.5 (max)	0
4 - 6	1 - 1.5	1 - 2	60

Basic rules during welding by TIG method:
1. Purity - grease, oil and other impurities must be removed from the weld during welding. It is also necessary to mind purity of additional material and clean gloves of the welder during welding.
2. Leading additional material - oxidation must be prevented. To do so, flashing end of additional material must be always under the protection of gas flowing from the hose.

3. Type and diameter of tungsten electrodes - it is necessary to choose them according to the values of the current, polarity, type of basic material and composition of protective gas.
4. Sharpening of tungsten electrodes - sharpening the tip of the electrode should be done in traverse/ horizontal direction. The tinier the roughness of the surface of the tip is, the calmer the burning of the el. arc is as well as the greater durability of the electrode is.
5. The amount of protective gas - it has to be adjusted according to the type of welding or according to the size of gas hose. After finishing the welding gas must flow sufficiently long to protect material and tungsten electrode against oxidation.

Typical TIG welding errors and their impact on weld quality:
The welding current is too -
Low: unstable welding arc
High: Tungsten electrode tip breaks lead to turbulent arcing.

Further, mistakes may be caused by poor welding torch guidance and poor addition of additive material.

The pointing out of any difficulties and their elimination

The supply line is attributed with the cause of the most common difficulties. In the case of breakdown, proceed as follows:
- Check the value of the supply voltage.
- Check that the power cable is perfectly connected to the plug and the supply switch.
- Check that the power fuses are not burned out or loose.

Check whether the following are defective:
- The switch that supplies the machine.
- The plug socket in the wall.
- The generator switch.

NOTE: Given the required technical skills necessary for the repair of the generator, in case of breakdown we advise you to contact skilled personnel or our technical service department.

Visual inspections include:
- Torch, welding current return clamp
- Power supply network
- Welding circuit
- Covers
- Controlling and indicating elements
- Apparatus condition in general