

PATON

USER MANUAL
INSTRUKCJA OBSŁUGI
РУКОВОДСТВО ПОЛЬЗОВАТЕЛЯ

MINI
/MINI-C

ECO-160
/ECO-160-C

ECO-200
/ECO-200-C

ECO-250
/ECO-250-C

ECO-315-400V





ENGLISH

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Connection to the mains/power distribution panel (at 25°C):
CAUTION! Please, pay attention to wall wires and other extension cords!

Used electrode	Set current value	Cross-section of each core of the mains wire, sq. mm	Maximum wire length, m
1x 220/230V – MINI, ECO-160, ECO-200, ECO-250			
Ø2 mm	not more than 80 A	1.0	75
		1.5	115
		2.0	155
		2.5	195
		4.0	310
		6.0	465
Ø3 mm	not more than 120 A	1.5	75
		2.0	105
		2.5	130
		4.0	205
		6.0	310
Ø4 mm	not more than 160 A	2.0	75
		2.5	95
		4.0	155
		6.0	230
Ø5 mm fusible	not more than 200 A	2.5	75
		4.0	125
		6.0	185
Ø5 mm refractory	up to 250 A	2.5	60
		4.0	100
		6.0	150
3 x 380/400V – ECO-315-400V			
Ø2 mm	not more than 80 A	0.75	100
		1.0	135
		1.5	205
Ø3 mm	not more than 120 A	1.0	90
		1.5	135
		2.5	220
Ø4 mm	not more than 160 A	1.5	95
		2.5	160
		4.0	260
Ø5 mm	not more than 220 A	1.5	70
		2.5	115
		4.0	180
Ø6 mm	not more than 315 A	1.5	45
		2.5	75
		4.0	115

CAUTION! The mains button on the back of the MINI and ECO-160/200/250 models is not a power button, therefore, when the unit is turned off, it does not de-energize all internal electronics completely. For this reason, be sure to disconnect the plug from the mains after completing welding work, for safety reasons.

1. GENERAL

PATON MINI, ECO-160, ECO-200, ECO-250, ECO-315-400V inverter rectifiers are designed for direct-current manual metal arc (MMA) welding. The ECO series is designed for demanding users who need the most compact and functional unit at its full rated current of 150A/160A/200A/250A/315A, respectively. This is enough to work with any electrodes from $\varnothing 1.6\text{mm}$ to $\varnothing 6\text{mm}$, including refractory ones (for ECO-315-400V), while the load duration is at least 40%, which will allow solving most of the tasks with plenty to spare not only in the domestic sector (workshops, auto services, etc.).

All PATON MINI and ECO branded models are equipped with an under-voltage protection unit.

By increasing the frequency of the applied voltage to the transformer, it decreases tens of times, which is why the unit has several times less weight and overall dimensions with the same output parameters in comparison with conventional equipment.

Main advantages:

1. In addition to protection against voltage surges, a stabilization system is installed for operation with **significant long-term** voltage drops in the supply mains from 170V to 260V (for MINI, ECO-160/200/250) and from 320V to 440V (for ECO-315-400V);
2. The unit is adapted to a standard power supply. Due to its high efficiency, the source provides **half the power consumption** compared to conventional sources;
3. Convenient work due to good load duration (LD) **at rated current**, which allows you to weld **continuously** with $\varnothing 3\text{mm}$ electrodes even with the weakest unit in the range (at an ambient temperature of 25C);
4. Increased reliability of the unit in dusty production conditions;
5. All unit's electronics are impregnated with **two layers** of high-quality varnish, which ensures the reliability of the product throughout its entire service life;
6. Smooth adjustment of the welding current;
7. Improved arc stability.

PARAMETERS	MINI	ECO-160	ECO-200	ECO-250	ECO-315-400V
Rated supply voltage 50Hz, V	220 230	220 230	220 230	220 230	3x380 3x400
Supply voltage variation limits, V	170 - 260	170 - 260	170 - 260	170 - 260	±15%
Rated current consumption from the mains phase, A	18.5	20	25	32	15.3
Rated welding current, A	150	160	200	250	315
Maximum operating current, A	180	190	240	300	390
Load duration (LD)	40% / at 150A 100% / at 94A	40% / at 160A 100% / at 101A	40% / at 200A 100% / at 126A	40% / at 250A 100% / at 158A	45% / at 315A 100% / at 210A
Limits of regulation of welding current, A	20 - 150	20 - 160	25 - 200	32 - 250	50 - 315
"Hot-Start" function	Automatic				
"Arc Force" function	Automatic				
"Anti-Stick" function	Automatic				
No-load voltage, V	up to 80	up to 80	up to 80	up to 80	up to 70
Arc striking voltage, V	110				115
Rated power consumption, kVA	4.0	4.4	5.5	7.0	10.1
Maximum power consumption, kVA	5.0	5.5	6.9	8.8	12.7
Efficiency, %	90				
Cooling	Forced				
Operating temperature range	-25 ... +45°C				
Overall dimensions (length, width, height), mm:	200 x 100 x 260	200 x 100 x 260	270 x 110 x 270	270 x 110 x 270	390 x 145 x 335
Weight without accessories, kg	3.3	3.7	4.00	4.35	9.3
Protection rating*	IP21	IP21	IP21	IP21	IP33

* IP21 housing prevents particles with a diameter of more than 5.5 mm from entering the product, and vertically dripping water does not interfere with the unit operation

* IP33 housing prevents particles with a diameter of more than 2.5 mm from entering the product, and also provides protection from rain when water falling down vertically or at an angle of 60° to the vertical line does not interfere with the operation of the unit

Recommended length of power welding cables when welding:

Maximum current	Cable length, m (one way)	Cross-section area, sq. mm	Cable brand
not more than 160 A	1 ... 4	8	KG 1x8
	2 ... 5	10	KG 1x10
	3 ... 8	16	KG 1x16
not more than 200 A	1 ... 4	10	KG 1x10
	2 ... 6,5	16	KG 1x16
	3 ... 10	25	KG 1x25
not more than 250A	1 ... 6	16	KG 1x16
	2 ... 9	25	KG 1x25
	3 ... 13	35	KG 1x35
up to 315A	1 ... 9	25	KG 1x25
	2 ... 12	35	KG 1x35
	3 ... 18	50	KG 1x50



Fig. 1. Control elements and indicators

- 1 – Digital seven-segment display
- 2 – Regulator of welding current, allowing to smoothly adjust the welding current.
- 3 – Power supply status indicator:
 - a) solid green – the unit is ready for operation;
 - b) off – no power supply or low voltage in the mains;
- 4 – Unit operation indicator:
 - a) off (green light for ECO-315-400V) – the unit is in a normal state;
 - b) red light (yellow light for ECO-315-400V) – overheating;
- 5 – Mains breaker (for ECO-315-400V) / switch (does not light up, the colour is adopted for design purposes).
 - A – Bayonet-type power current socket "+";
 - B – Bayonet-type power current socket "-".

2. START-UP

CAUTION! Please, read Section 11 "Safety instructions" before starting-up.

2.1 INTENDED USE

The welding unit is intended exclusively for: MMA welding.

Any other use of the unit is inappropriate. The manufacturer bears no liability for damage caused by using the unit for other purposes.

Proper use implies following the instructions in this operating manual.

2.2 SPACE REQUIREMENTS

The welding unit is protected against penetration of foreign particles with a diameter of more than 5.5 mm.

The welding unit can be located and operated outdoors. The internal electrical parts of the unit are protected from direct exposure to moisture.

CAUTION! After finishing welding in hot weather, or intensive welding in any weather, do not turn off the unit immediately! Wait 5 minutes to let the electronic components to cool down.

CAUTION! After an operation in the cold season, after switching off and subsequent cooling of the unit, condensation forms inside – do not switch the unit in less than 3 to 4 hours!!!

Therefore, do not turn off the unit during the cold season if you plan to turn it on in less than 4 hours.

CAUTION! The unit can be life-threatening after being dropped. Place the unit on a stable solid surface.

Place the unit so that cooling air can enter and exit freely through the vents on the front and rear panels. Make sure that no metal dust (e.g. when sanding) is sucked into the unit directly by the cooling fan.

2.3 POWER CONNECTION

The welding machine of series design is rated for:

1. Mains voltage is 220V (-27% + 18%) - for MINI, ECO-160/200/250;
2. Three-phase mains voltage is 3x380V or 3x400V (for ECO-315-400V); three wires are dedicated for this. Safety rules when working with welding equipment require grounding of the unit housing. There are two ways to do this: 1) by using the fourth wire in the mains yellow-green cable (international marking standard); 2) by using a bolted terminal on the rear wall of the unit (a stricter grounding standard, used in the CIS countries).

Caution! When the unit is connected to a mains voltage higher than 270V (for MINI, ECO-160/200/250) or 450V (for ECO-315-400V), all manufacturer's warranty obligations become invalid! The manufacturer's warranty obligations also become invalid in case of an erroneous connection of the mains phase to the source ground.

The mains connector, the cross-sections of the mains cables, as well as the mains fuses need to be selected based on the unit technical data.

2.4 CONNECTING THE MAINS PLUG

CAUTION! The mains plug needs to match the supply voltage and current consumption of the welding unit (see the technical data). According to safety rules, please, use the sockets with guaranteed grounding!!!

3. MANUAL METAL ARC (MMA) WELDING

- insert the electrode cable into the socket of the source A "+";
- insert the grounding cable into the socket of the source B "-";
- connect the grounding cable to the product;
- connect the mains plug to the power supply;
- turn the power switch 5 to the "I" position.

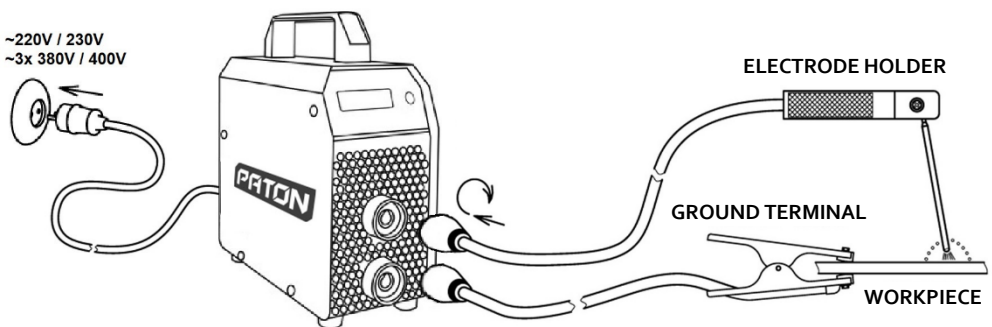


Fig. 2. Connection diagram of the MMA unit

CAUTION! After the main switch 3 is switched to the "I" position, the MMA electrode is energized. Do not touch conductive or grounded objects such as, e.g., the housing of the welding unit, etc. with the electrode.

3.1 "HOT-START" FUNCTION

Advantages:

- improved striking even when using poorly ignited electrodes;
- better penetration of the base material during striking, therefore, less lack of penetration;
- prevention of slag inclusions.

What helps to achieve this: for a short time at the moment of arc striking, the welding current increases by 33% of the set value of the welding current (Fig. 3).

Example: welding with $\varnothing 3\text{mm}$ electrode

The value of the welding current set by the regulator is 90A.

The hot start current is $90\text{A} + 33\% = 120\text{A}$.

3.2 "ARC FORCE" FUNCTION

Advantages:

- increasing the stability of short-arc welding;
- improvement of the drop of metal transfer into the weld pool;
- improved arc striking;
- reduces the likelihood of electrode sticking.

What helps to achieve this:

when the voltage on the arc drops below the minimum allowable for stable arcing, the welding current increases by 30% of the set one (Fig. 4).

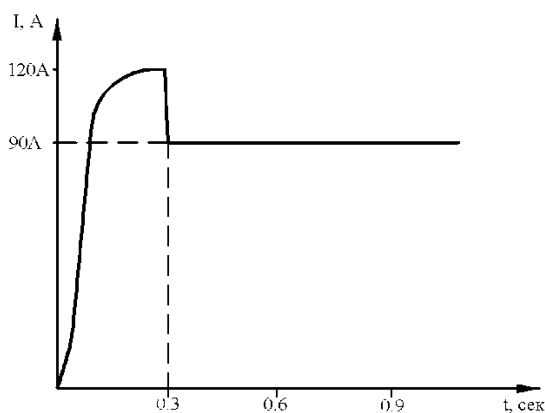


Fig. 3. "HOT-START" function

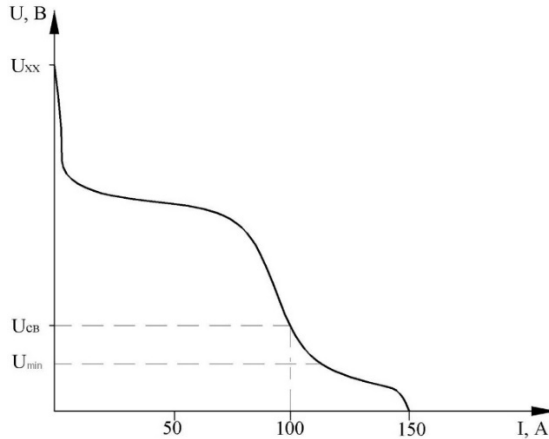


Fig. 4. "ARC-FORCE" function

3.3 "ANTI-STICK" FUNCTION

During the initial arc striking, the electrode can stick, tack to the workpiece, which in turn can lead to overheating and incandescence, and subsequently to the electrode damage.

If the electrode sticks to the workpiece, the unit decreases the welding current after 0.6 ... 0.8 sec. This makes it easier for the welder to separate (detach) the electrode from the workpiece without the risk of scalding the eyes by accidentally striking the arc. After the electrode is detached from the workpiece, the welding process can be continued unobstructed.

4. CARE AND MAINTENANCE

CAUTION! Before opening the unit, be sure to turn it off, remove the mains plug. Allow the internal circuits of the unit to discharge (about 5 minutes), and only then proceed to other actions. When leaving, install a sign prohibiting to start the unit.

In order to keep the unit operational for many years, be sure to follow several rules:

- carry out a safety inspection at specified intervals (see Section "Safety rules");
- with intensive use, we recommend that you blow the unit with dry compressed air every six months. **Caution!** Blowing from a short distance can result in damage to the electronic components;
- if there is a lot of dust, clean the cooling system ducts manually.

5. GENERATOR OPERATION

The power supply is suitable for generator operation, provided as follows:

When working with an electrode	Set current value	Minimum generator power
Ø2	not more than 80 A	3.0 kVA
Ø3	not more than 120 A	4.5 kVA
Ø4	not more than 160 A	6.0 kVA
Ø5 fusible	not more than 200 A	7.7 kVA
Ø5 refractory	not more than 250A	10 kVA
Ø6	up to 315A	13 kVA

CAUTION! For trouble-free operation, the generator output voltage should not go beyond the permissible limits of 170-260V (or 320-440V for ECO-315-400V)!

6. STORAGE

Store the conserved and packaged source under storage conditions 4 in accordance with GOST 15150-69 for a period of 5 years.

The de-conserved source should be stored in dry closed premises at an air temperature not lower than +5 °C. The premises should be free of acid vapours and other active substances.

7. TRANSPORTATION

The packed source is suitable to be transported by all transport means ensuring its safety in compliance with the transport rules established for the applicable type of transport.

8. TECHNICAL DATA

CAUTION! If the power supply is designed for a specific supply voltage, its technical data can be found on the identification plate on the top or rear panel. In this case, the mains plug, mains cable should be selected according to the voltage to be used.

Parameters	MINI	ECO-160	ECO-200	ECO-250	ECO-315
Rated mains voltage 50 / 60Hz, V	~ 220	~ 220	~ 220	~ 220	~ 3x380
Mains voltage variation limits, V	170 - 260	170 - 260	170 - 260	170 - 260	±15%
Efficiency, %	90	90	90	90	90
Limits of regulation of welding current, A	20 - 150	20 - 160	25 - 200	32 - 250	50 - 315
Welding current at:					
5 min / 45% LD	150 A	160 A	200 A	250 A	315 A
5 min / 100% LD	94 A	101 A	126 A	158 A	210 A

Max. power consumption, kVA	5.0	5.5	6.9	8.8	12.7
Normal operating voltage, V: - MMA electrode	20.4 - 25.5	20.4 - 26	20.4 - 26.5	20.4 - 27.0	23.4 - 29

9. SCOPE OF SUPPLY

1. Arc power source with mains cable - 1 pc;
2. Welding cable with electrode holder - 1 pc;
3. Welding cable with ground terminal ABICOR BINZEL - 1 pc;
4. Shoulder strap - 1 pc;
5. User manual - 1 pc;
6. Branded corrugated box / case * PATON - 1 pc.

* For MINI-C, ECO-160-C, ECO-200-C, ECO-250-C models

10. TROUBLESHOOTING

Fault	Reason	Solution
No welding current The mains switch is ON, the status indicator is OFF	Damaged mains cable	Check the mains cable.
	The supply voltage is below 155V (or one of the phases is failed for ECO-315-400V)	Disconnect the unit and connect to the mains with the appropriate supply voltage
	The internal power supply unit of the source is failed	Contact the service centre
No welding current The mains switch is ON, the source status indicator is green	Disconnected welding cables	Check the plug connections
	Ground is not connected or poorly connected	Establish good contact between the ground cable and the unit
No welding current The mains switch is ON, the source overheat status indicator is solid red	Thermal sensor triggered	Wait until the unit cools down; it will automatically turn on again afterwards
	Insufficient cooling air supply	Ensure sufficient air flow
	Defective thermal sensor	Contact the service centre
Poor MMA striking, source overheat status indicator flashes red for a short time	The supply voltage at the moment of striking is close to the minimum admissible value of 165V (or all phases are slumped to ~ 315V for ECO-315-400V)	If it is impossible to increase the cross-section of the supply wires, try decreasing the value of the set current, until the arc can be ignited. Then use the electrode according to the current value.

Continued on page 53

Fault	Reason	Solution
Arc extinction occurs sporadically during welding	The arc voltage of the electrode used is too high	If possible, use other electrodes or a welding unit of higher power
MMA electrode sticks to the workpiece	Welding current too low	Set a higher welding current
Poor weld quality (heavy spatter)	Wrong electrode polarity	Reverse the polarity of the electrode (according to the electrode manufacturer)
	Poor ground contact	Fix the ground terminal as close as possible to the welding area

11. SAFETY RULES

GENERAL

The welding unit is manufactured in accordance with technical standards and established safety rules. However, if handled incorrectly, there is a hazard of:

- injury to service personnel or a third party;
- damage to the unit itself or to the company's material assets;
- disruptions to an effective workflow.

All persons involved in the commissioning, operation, care and maintenance of the unit must

- be appropriately certified;
- have expertise in welding;
- strictly follow these instructions.

The malfunctions that could impair safety must be urgently rectified.

USER RESPONSIBILITIES

For personal protection, observe the following rules:

- wear protective footwear that retains insulating properties, even in wet conditions;
- protect hands with insulating gloves;
- protect eyes with a protective mask with an anti-UV filter that meets safety standards;
- use only suitable (highly inflammable) clothing.

PERSONAL PROTECTIVE EQUIPMENT

For personal protection, observe the following rules:

- wear protective footwear that retains insulating properties, even in wet conditions;
- protect hands with insulating gloves;

- protect eyes with a protective mask with an anti-UV filter that meets safety standards;
- use only suitable (highly inflammable) clothing.

HAZARD OF HARMFUL GASES AND VAPOURS

- remove generated smoke and harmful gases from the working area with special means;
- ensure sufficient supply of fresh air;
- vapours of solvents should not get into the radiation zone of the welding arc.

HAZARD OF SPARKLES

- remove flammable objects from the working area;
- do not perform welding works on containers where gases, fuel, oil products are or were stored. Potential explosion hazard for residues of these products;
- in fire and explosion hazardous areas, observe the special rules in accordance with national and international standards.

HAZARD OF MAINS AND WELDING CURRENT

- electric shock can be fatal;
- magnetic fields created by high current can have a negative effect on the performance of electrical devices (e.g., a pacemaker). Persons with such devices should seek the advice of a physician before approaching a welding area;
- the welding cable must be robust, undamaged and insulated. Loose connections and damaged cables must be replaced immediately. An electrician must systematically check the mains cables and cables of the welding unit for proper insulation;
- do not remove the outer casing of the unit during use.

INFORMAL PRECAUTIONS

- keep the instruction near the place of use of the welding unit at all times;
- in addition to the instructions, observe the applicable general and local safety and environmental regulations;
- keep all instructions on the welding unit legible.

STRAY WELDING CURRENTS

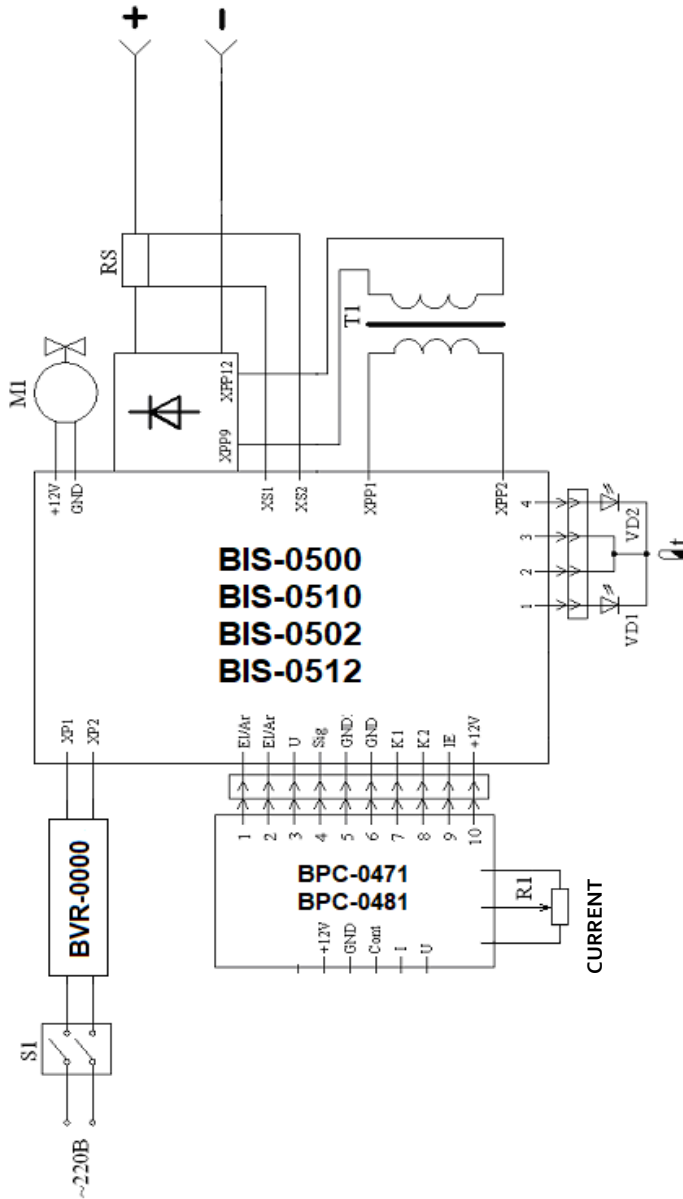
- make sure that the ground cable terminal is firmly connected to the unit;
- if possible, do not install the welding unit directly on an electrically conductive floor or work table, use insulating gaskets.

REGULAR USE PRECAUTIONS

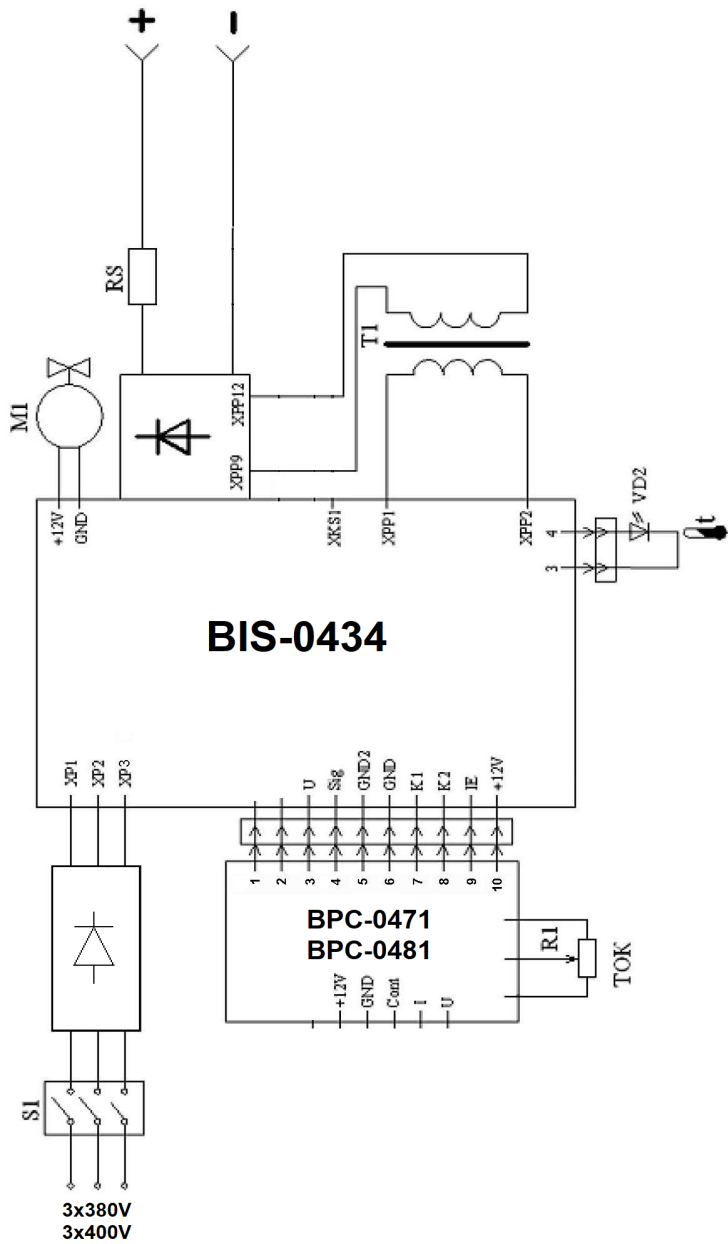
Check the unit at least once a week for external damage and the operation of the safety units.

12. SOURCE WIRING SCHEMATIC DIAGRAM

Wiring schematic diagram
PATON MINI, ECO-160/200/250 DC MMA



Wiring schematic diagram
PATON ECO-315-400V DC MMA



13. WARRANTY OBLIGATIONS

PATON INTERNATIONAL guarantees the correct operation of the power supply provided that the consumer observes the rules of operation, storage, and transportation.

CAUTION! There is no free warranty service for mechanical damage to the welding unit!

UNIT MODEL	WARRANTY PERIOD
MINI	3 years
ECO-315-400V	
ECO-160	5 years
ECO-200	
ECO-250	

The main warranty period starts from the date the inverter equipment is sold to the end customer.

During the main warranty period, the seller undertakes, free of charge for the owner of PATON inverter equipment:

- to make diagnostics and identify the cause of the malfunction,
- to provide assemblies and elements necessary for the repair,
- to carry out work to replace the failed elements and assemblies,
- to test the repaired equipment.

The main warranty obligations do not apply to the equipment:

- with mechanical damage that affected the performance of the unit (deformation of the housing and parts as a result of falling from a height or falling of heavy objects on the equipment, falling out of buttons and connectors),
- with traces of corrosion, which caused a malfunction,
- failed due to exposure of abundant moisture to its power and electronic elements,
- failed due to the accumulation of conductive dust inside (coal dust, metal shavings, etc.),
- in case of an attempt to independently repair its components and/or replace electronic elements,
- it is recommended to clean the internal elements and assemblies of this equipment, with compressed air, to remove the protective cover, depending on the operating conditions, once every six months, in order to avoid the breakdown of the unit. Cleaning should be done carefully, keeping the compressor hose at a sufficient distance to avoid damage to the soldering of the electronic components and mechanical parts.

Also, the main warranty obligations do not apply to failed external elements of the equipment exposed to physical contact, and related/consumable materials; the claims to the following are accepted no later than two weeks after the sale:

- on and off button,
- knobs for adjusting welding parameters,
- connectors for connecting cables and hoses,



- control connectors,
- mains cable and mains cable plug,
- carrying handle, shoulder strap, case, box,
- electrode holder, ground terminal, torch, welding cables and hoses.

In the event of warranty service, the customer must ship the welder at his own expense.

The seller reserves the right to refuse to provide warranty repairs, or to set the month and year of manufacture of the unit as the start date for the fulfilment of warranty obligations (established by the serial number):

- if the owner loses the data sheet,
- in the absence of correct or even any kind of entries in the data sheet by the seller when selling the unit,
- the warranty period is extended for the period of warranty service of the unit in the service center.