

Operator's Manual

The Respectable User:

The detailed information provided below, which contains about the installation, trial run, operation and maintenance of “410-PROTIG20 IGBT Portable Inverter DC TIG and Stick Welder, **410-PROTIG20 IGBT Portable Inverter DC TIG Welder**, is intended for your kind perusal to help you minimize the operational problems so that the product can work as smoothly as it is expected.



WARNING! * IT IS STRONGLY RECOMMENDED THAT THE QUALIFIED PEOPLE USE AND MAINTAIN THIS WELDER.

* TO REPAIR THE WELDING MACHINE ONLY THE SKILLED PERSONNEL ARE ALLOWED.

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1. Product Description

410-PROTIG20 Stick/TIG welder applies inert gases (Argon) as protective medium of arc. In TIG process, high melting point tungsten or tungsten oxide is a electrode, work piece is another electrode, the inert gases in the welding area are ionized by HF or high pressure pulse, and ionized gases will generate arc、melt metal between the tungsten electrode and the work piece. The series welder applied advanced IGBT(insulated gate bipolar transistor) and rapid recovery diode as main control and transfer parts, assisted with specially designed control circuit, as result of smooth welding current adjustment and good welding procedure. The series welder built-in the function of compensation for power fluctuation, so it features soft arc、little splash、manageable welding line. Users can get the high quality welding line in welding mild steel、stainless steel、hard steel and alloy steel.

410-PROTIG20 Stick/TIG welder feature is presented as below:

- Small、light and suitable for fitment、repairing and operation on field.
- Excellent high voltage high frequency arc pilot. Low voltage controlling and high voltage outputting, the arc-pilot circuit attributes to convenient non-contact arc pilot and 99.9% arc pilot successful ratio.
- Perfect Protection function. Featured with overheating、over/lack voltage、over current protection, the power supply net compensation which boosts up along with the current decreasing is not less than $\pm 15\%$. Anti-jamming function of controlling system is enlarged, and it can keep stable current output with 1ms speed in answer to the variety of the power net、work piece、electrode holder and manual operation.
- Convenient connection function. Exterior connection result in quick、safe、simple、reliable operation.
- 410-PROTIG20 feature with excellent arc pilot and metal transfer.

No notification will be given if the contents or function of the welder in this book change; Our company reserves the right to update the manual without notification.

2. Safety Operation

Operator's Self-protection

- * Please always follow the rules that conform to safety and hygiene. Wear protective garments to avoid injuries to eyes and skins.
- * Use the welding helmet to cover your head while working with the welding machine. Only by viewing through the filter lens on the welding helmet can you watch your operation.
- * Under no circumstance can you allow any part of your body to touch the welder's output bipolarity.
- * Do not operate under water or more humid place.

Attention

- * 410-PROTIG20 Welder are electric product whose spare parts is very tender, do not change or adjust with a rush otherwise the switch will be damaged.
- * Check the connection to see if the welder input and output cables are well connected, whether **the earth (ground) connection is reliable, etc.**
- * Inflammable or explosive materials are prohibited to access the job site.
- * Fumes and gases produced when welding are hazardous to health. Make sure to work in places where

there are exhaust or ventilation facilities to keep fumes or emissions away from the breathing zone.

- * Please remember to keep arc rays away from the other nearby people when welding. This is only due to the interference from arc rays.
- * Never allow anybody else other than the operator himself to dislocate or modulate the welding machine.
- * Welders have strong electromagnetism and frequency interference, so keep away people with heart pace or the articles which can be interfered by electromagnetism and frequency.
- * The welding cable can not be pressed or stressed by apparatus, and the puckering angle can not be too small, otherwise the inside cable will be damaged which may result into accident.
- * No touching on the output connection or any other electrification parts while welding.
- * Do not use the welder to ice-out the pipelines.
- * Use forklift truck and stock to convey. Using Handles to lift is prohibited .
- * Notice the rated duty cycle when welding. The overload using is prohibited.

Safety Measures to be Taken to Assure the Correct Installation and Position

- * Precaution must be taken to keep the operator and the machine from the foreign materials falling from up above.
- * The dust, acid and erodible dirt in the air at the job site can not exceed the amount required by the norm (excluding the emission from the welder).
- * Inflammable or explosive materials are prohibited to access the job site.
- * The welder must be installed in the place where it can not be exposed to sun and rain. Also it must be stored in less humid place with the temperature range at -10~ 40°C.
- * There should be 50cm space about for the welding machine to have good ventilation.
- * Make sure that there is no metal-like foreign body to enter the welding machine.
- * No violent vibration in the welder's surrounding area.
- * Make sure that there is no interference with the surrounding area at the installation site.
- * Take measures to prevent wind while operating in the strong wind since the welder is gas shielded.
- * If the welder is placed on the declining 10° plane , pay attention to dumpage .

Safety Check

Each item listed below must be carefully checked before operation:

- * Make sure that the welding machine has reliable earth connection.
- * Make sure that there is always sound output and input wire connection instead of exposing it outside.
Regular check needs to be conducted by the qualified personnel after the welder has been installed over a period of six months, which involves as follows:
 - * Routine cleaning needs to be done to make sure that there is no abnormal condition happening in the tightened places such as the loose and slipped magnetic core, regulating screw, connecting wire happening in the welding machine.
 - * The external parts installed with the welder must guarantee that the welder works properly.
 - * Check the welding cable to see if it can continue to be used before it is worn out.
 - * Replace the welder's input cable as soon as it is found to be broken or damaged.
 - * Make sure whether there is enough power supply to make the welding machine work properly.



Attention: Cut off the power supply before opening the case to check.

Please do not hesitate to contact us for technical assistance whenever you come across the problems you can not work out or you may deem difficult to fix.

3. Technical Specifications

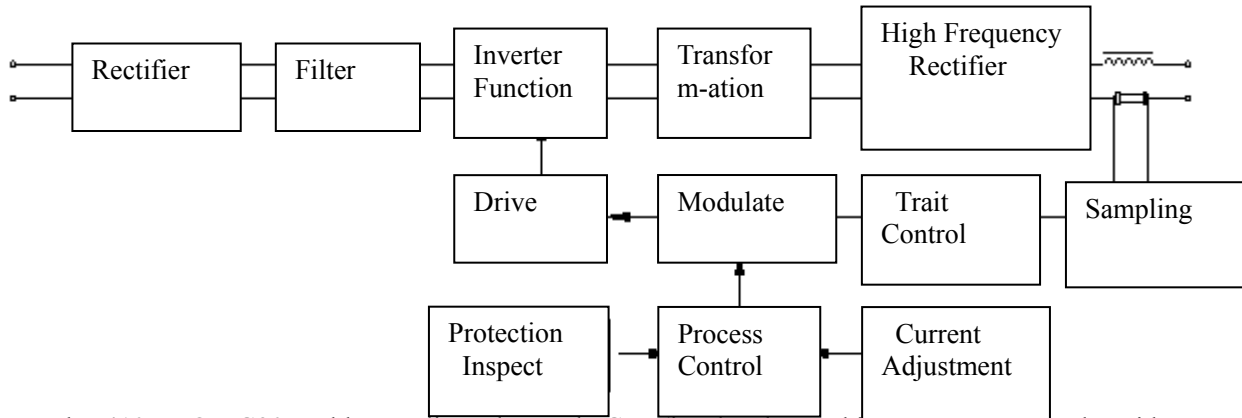
Environment to which the Product is Subject

- * The surrounding temperature range: When welding: -10~+40°C.
During transport or in storage: -25~+55°C.
- * Relative humidity: when at 40 °C: $\leq 50\%$.
when at 20 °C: $\leq 90\%$.
- * The dust, acid and erodible materials in the air can not exceed the amount required by the norm (apart from the emissions from the welder). No violent vibration at the job site.
- * Altitude no more than 1,000m.
- * Sound ventilation: Make sure of a more than 50cm space left near the welders.
- * Keep from raining when it is used outdoor.
- * The pressure of the water cooling should guarantee the required flow, the water quality should accord with the standard of the industry water.
- * The wind speed should no more than 1m/s around the operation places.

Requirement for Main Supply

- * The voltage oscillogram should display actual sine wave, the oscillation of the frequency should not exceed $\pm 1\%$ of the rated value.
- * The oscillation of the supplied voltage should not exceed $\pm 15\%$ of the rated value.

Welder's Principle (see following picture)



The 410-PROTIG20 welder applies advanced IGBT(insulated gate bipolar transistor)and rapid recovery diode as it's the main power piece of the power transformation and transfer, with which the arc can be minutely controlled. It is also assisted with gas pre-flow、 gas post-flow and non-contact high frequency pilot, all which contribute to the machine with the feature of high reliability and fast dynamic response speed and stable arc.

Welding machine by air switch SW - SPST single-phase 220 v alternating current (ac) power frequency, the BD1 single-phase rectifier bridge rectifier and capacitor C1 C2 C3 filtering into direct current (dc), via the IGBT (Q1, Q2 Q3 Q4) consisting of a full bridge inverter ac inverter into to 36 KHZ, then through intermediate frequency transformer T1 transformer, the quick restore tube D1, D2 D3 D4 D5 D6 D7 D8 rectifier, output steady dc power supply for welding in the output at the same time, via high pressure of coupling transformer T2 arc with high frequency pulse coupled to the output of the negative side, is very convenient. For non-contact arc argon arc welding.

Welder's Structure

Portable 410-PROTIG20 products adopt can use portable box structure: the upper part on the front panel is equipped with digital display table welding current adjustment knob 410-PROTIG20 with argon arc welding and hand welding switch unusual light (yellow); The lower part is equipped with output current + very quickly - very fast output current socket Gas electricity integral whole joint welding gun control switch socket; Rear panel is equipped with cooling fan power input lead gas input interface; Open the casing can be seen on the body of the upper mounting plate with 1 piece of printed circuit board control, floor is equipped with the main transformer coupling transformer; Radiator with power device installed in the middle of the body.

Main Technical Data

Item	Unit	410-PROTIG20
Rated Input Voltage	V	220
Frequency	Hz	50/60
Phase	Phase	1
Rated Input Capacitance	KVA	6.6
Rated Input Current	A	30
Rated No-load Voltage	V	58
Rated Working Voltage	V	18
Current Adjustment Range (TIG)	A	10~200
Current Adjustment Range (STICK)	A	10~160
Rated Duty Cycle	%	50
Cooling Type		Fan-cooled
TIG welding arc striking way		HF arc pilot
Selected Welding Type		TIG Welding / Stick
Efficiency	η	85%
Power Factor	$\text{Cos}\varphi$	0.73
Insulating Degree	Degree	F
Case Protection Degree	IP	IP21S
Dimension L×W×H	mm	360×150×270
Weight	kg	5.7

Welder Standard

* EN60974-1	Arc Welding Equipment Safety Standard Part 1: Welding Power Source
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HF Arc Pilot Description

There is distinctive difference between the high frequency pilot and traditional pilot way. There is no need to pilot by through the connection between the Tungsten electrode and the work piece, instead, it ionizes the air by high voltage and high frequency pulse, then conducted by the ionized air so as to form arc.

Illustration of Signs

Welding machine grounding symbol.

IG weld.

SAMW.

Power supply symbol and ac single-phase symbol.

Single phase static- frequency converter -transformer- rectifier.

— Direct Current

+ : “+” Current Output

— : “-” Current Output

X: Duty Cycle

I_{1max} ...A: Rated Maximum Input Current

I_{1eff} ...A: Rated Virtual Input Current

I_2 : Rated Welding Current

U_0 : Rated No-load Voltage

U_1 : Rated Input Voltage

U_2 : Conventional Load Voltage

~50/60Hz: AC, Rated Frequency 50Hz, Usable Frequency 60Hz

...V: Conventional Load Voltage (Volt)

...A: Rated Welding Current (ampere)。

...%: Duty Cycle Unit

...A/...V~...A/...V: Output Range. Rated Maximum and Minimum Welding Current and its Load Voltage

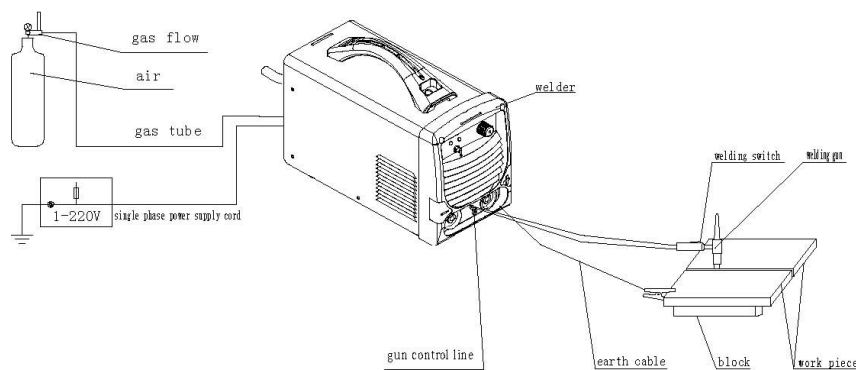
IP21S: IP Protection grade is a code letter (International Protection International Protection) 2 refers to prevent people close to the dangerous parts with finger; Prevent not less than 12.5 mm diameter solid foreign body into the shell 1 refers to prevent vertical drop of water; Vertical drop of water should be no harmful effects S refers to the moving parts of the waterproof test on the device (such as a rotary motor rotor) at rest.

F: F class insulation class。

4. Installation

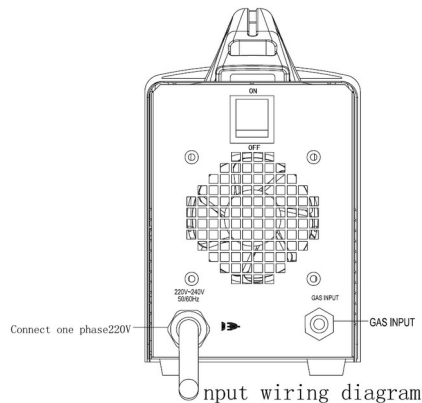
Placement

- * The welder should be placed in the dry and clean environment which there is no chemical corrosive articles or flammable、explosive gas.
- * The welder must be installed in the place where it can not be exposed to sun and rain. Also it must be stored in less humid place with the temperature range at -10~40°C.
- * There should be 50cm space about for the cutting machine to have good ventilation.
- * Apparatus to exclude wind and smoke should be equipped if the inside aeration is not sound.



Connection between Welder and Power Supply (see input connection)

Input wiring diagram After welding machine panel of the power input line equipped with circuit breaker and grounding line access to the single-phase 220 v power supply (power grid); It is strictly prohibited to 380 v power supply access welder (380 v power supply which can seriously damage the welder), it is forbidden to the earth wire connected to the electricity grid, otherwise the consequence is proud. **Notice: the power supply earth connection is not zero connection.**



Distribution for Single Welder:

Project	410-PROTIG20
Air switch (A)	≥ 40
The fuse (rated current) A	40
Knife switch (A)	≥ 60
Power line (mm ²)	≥ 4

Note: the fuse melting current is two times of the rated welding current

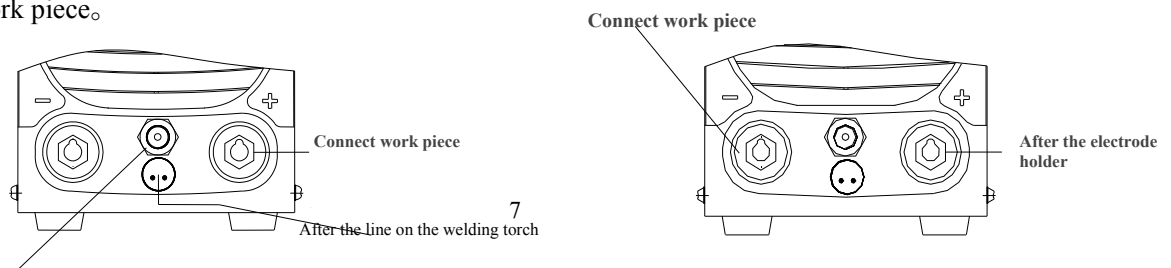
Connection between Welder and Argon (see input connection sketch)

Install the pressure reducing valve (argon) in argon gas bottle, provided with random trachea will perfectly on the pressure reducing valve gas interface with welding argon gas input on the rear panel interface Connect, interface with random provide hose hoops lock.

Connection between Welder and Work Piece (see output ConnectionSketch)

When using argon arc welding, with the rapid of the grounding cables plug into the socket on the front panel welding (current + very quick socket) And tighten the clockwise, grounding on the other end of the cable clamp work piece.

When using manual welding, the grounding cables with quick plug into the socket on the front panel welding (current - very quick socket) And tighten the clockwise, grounding on the other end of the cable clamp work piece.



After welding torch interface

Argon arc welding output wiring diagram

Manual welding output wiring diagram

Connection between Welder and Torch (see output connection sketch)

When argon arc welding, welding torch tail has two interfaces, the welding torch access interface of welding torch is on the front panel And tighten in a clockwise; Line connect the control cable interface And tighten.

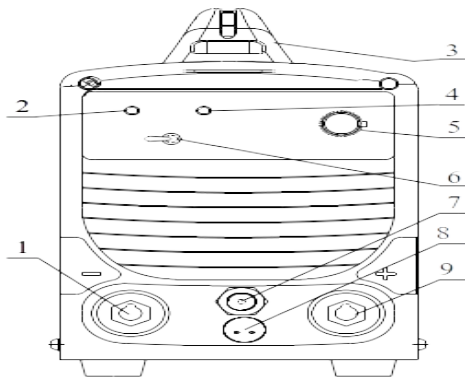
Connection between Welder and Electrode Holder (see output connection sketch)

Will meet with electrode holder welding cable quickly plug into the socket on the front panel welding(current + very quick socket) And tighten the clockwise.

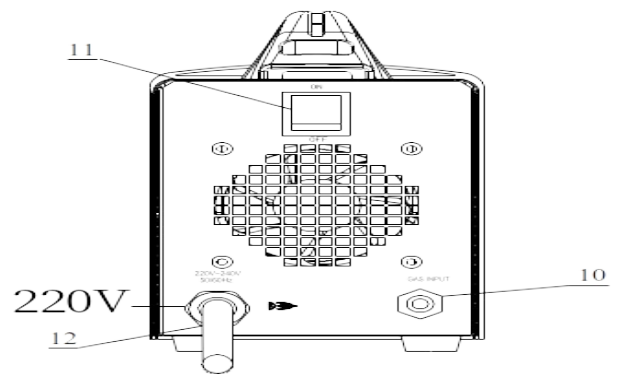
5. Operation (see panel sketch)



ATTENTION: The protection grade of 410-PROTIG20 Welder is IP21S. It is forbidden to put in a finger or insert a round bar less than 12.5mm (metal bar in particular) into the welder. No heavy force can be employed on the welder.



The former board schematic diagram



The after board schematic

1 “-” Current Output	2.Power Indicator	3welder’s handle	4Alarm Indicator
5.Welding Current Adjustment Knob	6 Button Switch	7 Gas Output	8Connector for Torch Control Line
9“+” Current Output	10 Gas Input	11 Power On/off Switch	12 Power Input Cable



Attention:

- * Welding machine continuous work time is too long, the protection of the panel light is bright, show that the temperature of the welding machine internal temperature rise has been more than design value, use after period of time shall be suspended at this time (standby inner cooled down, while protecting the lights go out) may continue to use;
- * Work done or temporary leave welding on site, should shut off the power switch and argon gas valve;
- * Welders should be worn denim overalls and welding mask, in order to prevent the arc and thermal radiation;
- * Job site should be placed around the screen, to prevent others affected by the arc;
- * Operations shall not be placed near the site flammable items;
- * Welder each interface must be accurate and reliable connection.

Welding basic steps

*** TIG welding**

a) Before welding modulation

Set the p Set the press of a welding torch switch, argon gas flow.

The welding mode selection switch when placing in the argon arc welding can use argon arc welding.

According to the needs of welding specification: adjust welding current adjustment knob, adjustment of welding current.

b) No-load running and function

The press of a welding torch switch, send out airflow, at the same time to hear the voice of the machine with high frequency pulsed arc discharge; Open the switch after discharge to immediately stop, air valve delay 2 seconds or stop to aspirate after 4 seconds.

c) TIG welding

Pick up the torch, weld, the press of a welding torch switch, can ignite arc argon arc welding.

*** Manual arc welding**

a) Modulation and functional confirmation before welding

The welding mode selection switch when placing in manual arc welding can be used as a manual electric arc welding.

According to the needs of welding specification adjustment welding current adjustment knob Set the welding current.

b) welding Picked up holder, weld, placing the electrode on the work piece to wipe, can ignite arc welding.



Attention: * At the beginning of the tungsten electrode argon arc welding flux before welding argon

(Ar) to blow air can be more conducive to welding pipe net.

* High frequency arc ignition arc pulse to work long hours and cannot, should check the gas path of tungsten electrode and welding wire for adverse factors Don't let the high frequency arc pulse to work long hours without arc ignition!

* In the tungsten electrode argon arc welding, when at the end of the welding, let go of the welding torch button should be completed when stagnant air end rear can remove the welding torch, or welding joint get good protection.

Welding Criterion Parameter (For Reference Only)

Name	Welding current A			
	3 ~ 20	15 ~ 80	70 ~ 160	100 ~ 200
Tungsten electrode diameter mm	Φ 0.5	Φ 1.0	Φ 1.6	Φ 2.0
Gas-flow L/min	4~5	5~7	6~8	8~12
Nozzle specifications mm	Φ 4、Φ 6、Φ 8	Φ 6、Φ 8、Φ 10	Φ 8、Φ 10	Φ 10、Φ 12
Filler wire diameter mm	≤ Φ 1.0	≤ Φ 1.6	Φ 1.0 ~ Φ 2.4	Φ 1.6 ~ Φ 3.0

Maintenance and Service

The most distinctive difference of 410-PROTIG20 Welder with the traditional welder is that it mostly adopt modern electric apparatus with high level technology. It is among the list of high-tech products, as a result higher technical requirement is asked for the maintenance personnel. However there are very few spare parts for that type machine, so maintenance is not required very often except the routine cleaning. Only the qualified people are allowed to be in charge of the repair job. It is strongly recommended that customers contact our company for the technical back-up or service when they feel unable to work out the technical hitch or problems.

The maintenance job mainly includes:

* Dust Removal

The professional maintenance personnel should use dry compressed air (air compression machine) to move the dust inside the machine regularly. Make sure there is no abnormal condition happening in the tightened places such as the loose and connecting wire. Eliminate the problem as soon as it occurs. In the case when the dust is easily to accumulate, it should be cleaned in time. Usually the machine should be cleaned once a year if the dust accumulation problem is not very serious, while it needs cleaning once or even twice every quarter if the dust accumulation problem is serious.

* Make sure that the connection of welding cable socket is in sound condition.

Regular check should be taken on the connection condition of the welding cable socket. The operator should check it at least once a month for the fixed machine, while the operator should check every time before using for the moveable machine.



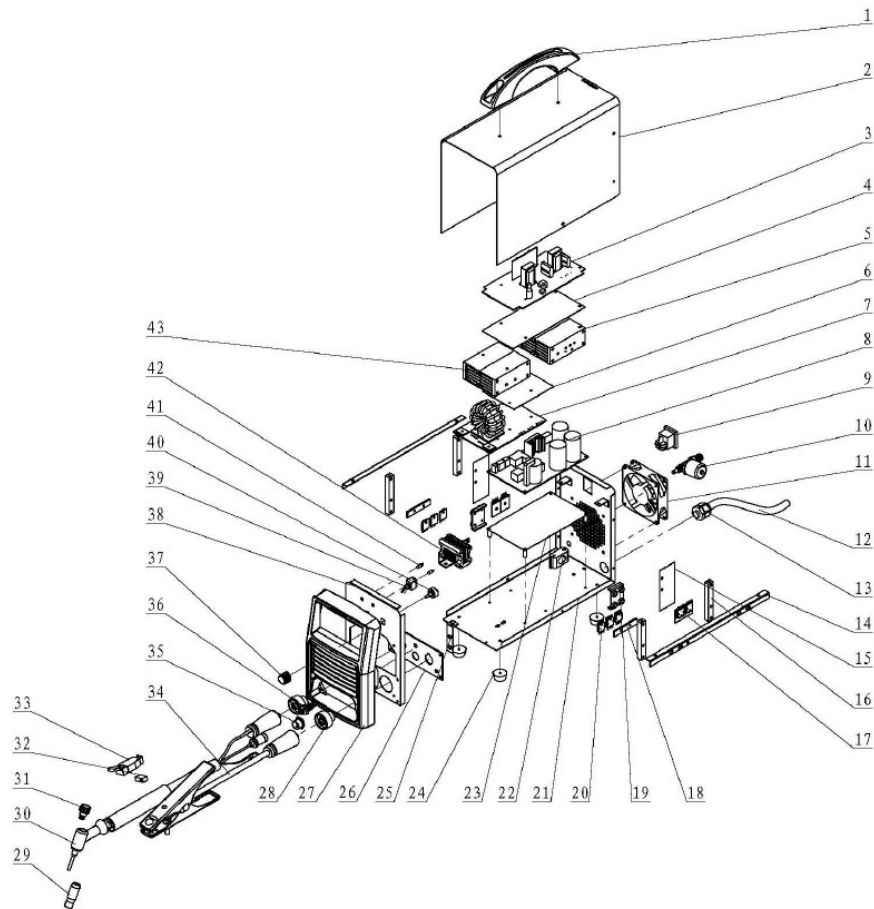
ATTENTION:

- * The welder main loop voltage is always higher, so the safety precaution should be taken before repairing to avoid accidental shock. Under no circumstance can anyone except the professionally trained personnel open the case of the machine.
- * Switch off the power source each time when removing dust.
- * Never tamper with inside cable or damage the component parts while removing dust.

6. Trouble Shooting

NO	Faults Phenomenon	Faults Cause Analysis	
1	Abnormal indicator light is on	Machine overheating	Go back to normal after temperature has dropped
2	Draught fan fails to work	Draught fan breaks down	Exchange draught fan
		Connect wire falls off (disconnection)	Find out the broken wire and reconnect it reliable
3	Non-high frequency for arc strike	welding gun switcher breaks down	Exchange welding gun switcher
		Connect wire falls off (disconnection)	Find out the broken wire and reconnect it reliable
4	No argon output	No argon input	Check flowmeter and air pipe and recover the air supply
		Electropneumatic valve breaks down	Exchange lectropneumatic valve
		Gas circuit blocks	Exclude foreign body and dredge gas path
5	Non-adjustable Electric current	Potionmeter breaks down	Exchange potionmeter
		Connect wire falls off (disconnection)	Find out the broken wire and reconnect it reliable
6	Arc strike obstruct	Connection between welding gun and main engine error	Check and correct it according to specification
		Argon is impurity	Use 99.99 percent pure argon
		Tungsten electrode is not good or the needle breaks down	Use qualified tungsten electrode
7	Power switch trip	The power capacity is not enough	Increase the power capacity
8	others		Please contact the manufacturer or distributor

7. List of Component Parts



No.	Material Code	Material Name	Specification and Type	PCS	Dosa ge	Vulner able
1	2.05.08.121	handle	HG2ZX7300K.1.2		1	★
9	2.07.80.211	Rocker Switch	R220-1C2N-BBZ-NN 16A/250V	PCS	1	★
11	1.2.07.02.3574	Draught Fan Wiring Harness	ZX7200TII.2.7 (V2.0)	PCS	1	★
13	2.04.30.108	Nylon Cable Gland	PG13.5 Black	PCS	1	★
27	2.05.05.099	Plastic Panel	HG2ZX7300K-1	PCS	1	★
28	2.07.57.967	European quick socket	DKJ10-25	PCS	2	★
37	2.07.11.016	Potentiometer Knob	KDJII23-16-6J	PCS	1	★

**Schematic of Portable410-PROTIG20 Welding Machine
(Figure for reference, any update without notification)**

9. Complete Set Specification

* Portable 410-PROTIG20 inverter DC arc welding machine	1 pcs
* Product Certificate	1 pcs
* Operator's Manual	1 pcs
Accessories and Consumable	
* Torch	1 pcs
* Pottery nozzle (with one on the torch)	3 pcs
* Tungsten electrode holder (with one on the torch)	3 pcs
* Earth Cable (with earth clamp and quick connector)	1 pcs

Remarks: a) No guarantee has been made yet to get the welding accessories repaired at any time because of its breakable attribute.
b) If there is any stipulation in the contract, then base on the contract.

10. Transport & Storage

- * This series is chest structure, hold the handle or the bottom to move it. The machines should be firmly fixed during the transportation.
- * The machines should be free from rain and snow. Keep notice of Attention sign on the packing box. The storage ware should keep dry and air circulation & free from corrosive gas or dust. The tolerable temperature ranges from -25% to +55%, and the relative humidity can not be more than 90%.
- * After the package has been opened, it is suggested to repack the product as per requirement for future storage and transport. (Cleaning job is required before storage and sealing the plastic bag for storage in the box.)
- * Users should keep the packing materials with the machines to keep well storage during the long transportation. If the machines need transfer during the transportation, then wooden box is required. Sign such as 'Lift' and 'Free of rain' should be labeled on the box.