Panasonic

An introduction to

WX5 Series

Digital IGBT AC/DC TIG Welding Machine

Panasonic Welding Systems (Tangshan) Co., Ltd.

PWST New Machine ranking TOP 3

No.1

350/500 **WX5**

Full-Digital

205units

No.2

350/500/630 **FR2**

High Grade Inverter

103units

No.3

400 **TX4**

Full-Digital

85units

Product Positioning

1

1. High end machine offering excellent quality welding suitable for various nonferrous materials
2. An advanced model with abundant functions and outstanding performance especially designed for aluminum welding
3. Digital control and communication and digital panel for parameter adjustment and status display
4. The remote controller, photosensitive pedal controller, IoT module, RFID card reader, RS485 and robot interfaces are extendable.

Applicable Materials and Plate Thicknesses

Welding methods	Materials	Thickness ranges
AC TIG	•Aluminum •Magnesium •Brass	Plate thickness 350WX5: 0.8mm-6.0mm 500WX5: 0.8mm-12.0mm
DC TIG	•Stainless steel •Alloy steel •Brass	Plate thickness 350WX5: 0.5mm-6.0mm 500WX5: 0.5mm-12.0mm
MMAW	•Mild steel •Stainless steel	Stick Φ2.0mm - φ6.0mm

Product Overview 2

A variety of welding methods and modes for your selection

10+ Modes

AC Waveforms
Mix TIG
Square (AC standard TIG)
Sine (AC soft TIG)
Hard (AC hard TIG)
Soft square
Triangular
Pulsed TIG

AC TIG

Mix
Standard
Soft
Hard

+

Parameters settings
AC pulse frequency (low-frequency pulse)
AC pulse duty ratio
Bias current
Mix mode frequency
Cleaning width

4 welding modes with various fine tuning parameters covering all requirements of Al welding

DC
TIG
Pulsed TIG
SPF (Spcial frequency)

DC TIG

1. DC TIG, DC pulse (low-frequency pulse)
2. Pulse duty adjustment (ratio of pulse to base time)
3. EN and EP are used for arc start.

DC/AC MMA

Voltage reduction device
(Electric shock prevention function)

350/500WX5 Ratings

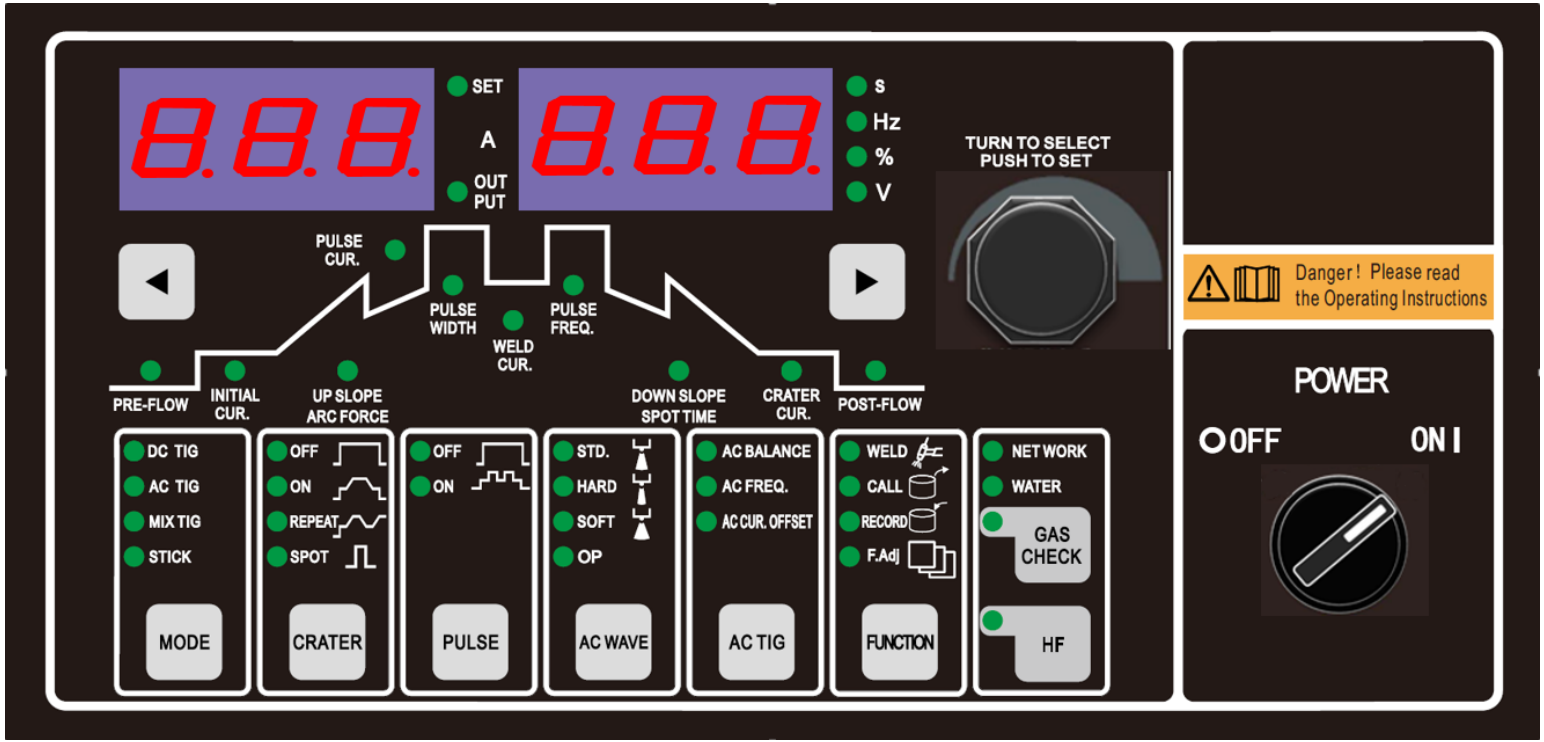
Model number			YC-350WX5HGY	YC-500WX5HGY
Rated input voltage		V	AC380/415V	AC380/415V
Number of phases		-	3	3
Iput voltage range			304 ~ 456	304 ~ 456
Rated frequency		Hz	50/60	50/60
Rated input		kVA	16.6	29.5
		kW	13.5	22.5
Rated No-Load Voltage		V	62	70
Output current adjustable range	DC TIG	A	4 ~ 350	5 ~ 500
	AC TIG	A	10-350	20-500
	STICK	A	10 ~ 300	20-400
Output voltage adjustable range*	DC TIG	V	10.2 ~ 24	10.2 ~ 30
	AC TIG	V	10.4 ~ 24	10.8 ~ 30
	STICK	V	20.4 ~ 32	20.8 ~ 36
Rated Duty Cycle		%	35	60
Control method			IGBT Inverter type	
Cooling method			Forced air-cooling	
High-frequency generator			Spark-oscillation type	

350/500 WX5 Ratings

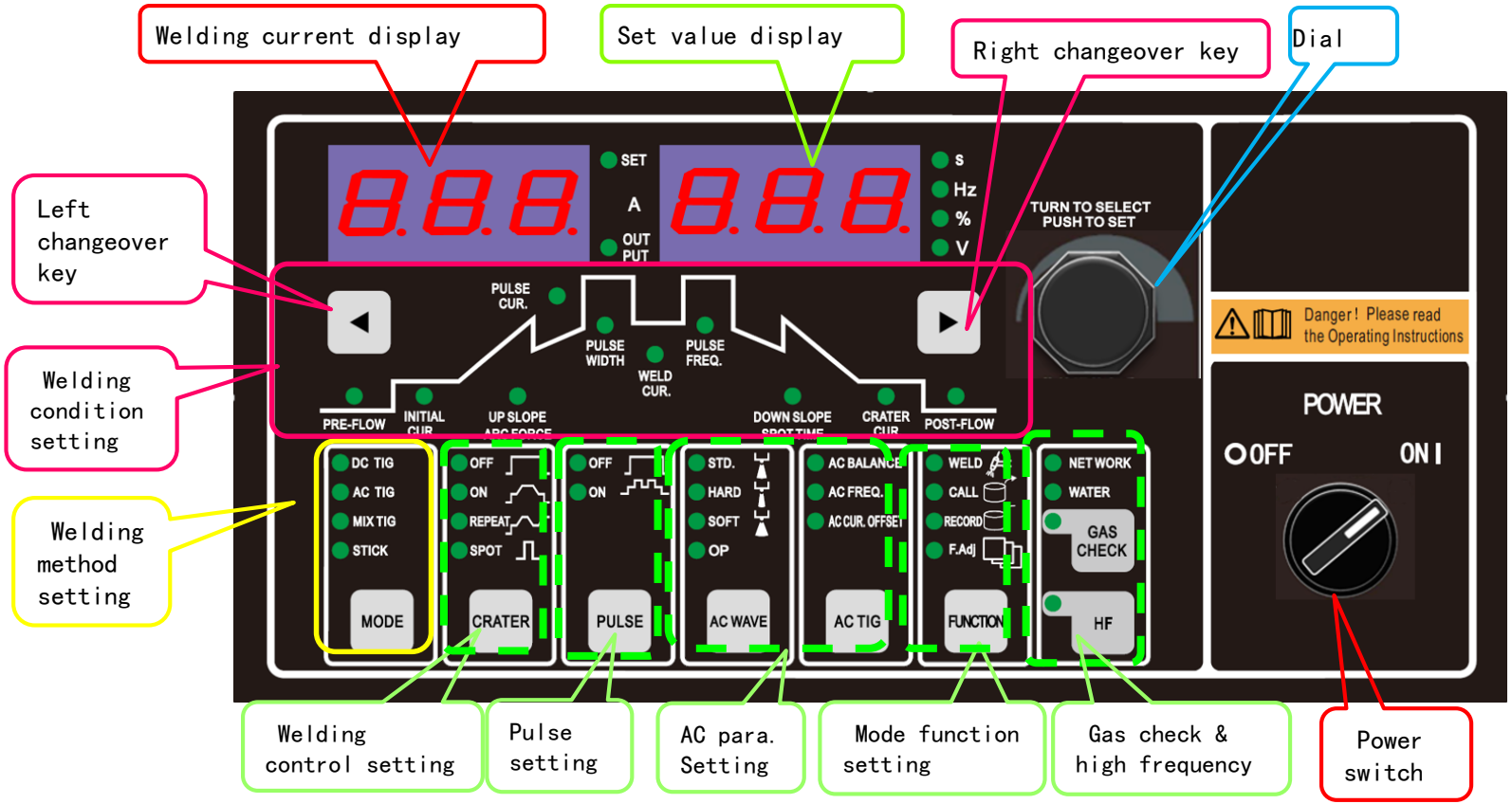
Model number		YC-350WX5HGY	YC-500WX5HGY
Pre-flow time	s	0～90	
Post-flow time	s	0～90	
Up-slope time	s	0～20	
Down-slope time	s	0～20	
Arc spot time	s	0.1～30	
Pulse frequency	Hz	0.1～500	
Pulse width	%	5～95	
Crater control process		Three mode(ON,OFF,REPEAT)	
Insulation class		200 ℃	
EMC classification		A	
IP code		IP23S	
Dimensions (W×D×H)	mm	560×380×730	730×380×875
Mass	kg	74	128
Output termina		Coupling device	Link terminal

Product Overview 3

Operation panel



Product Overview 3



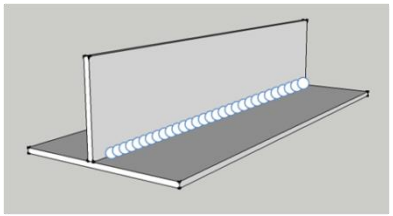
Product Overview

4

High Quality TIG Welding can be Achieved without efforts!

Thin aluminum plates

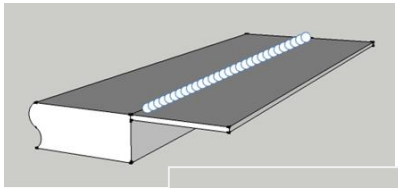
AC hard mode

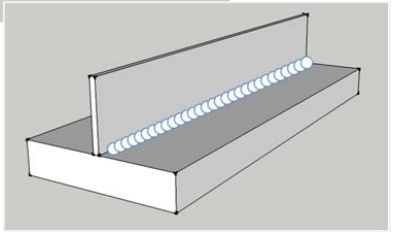


The concentrated arc can enhance metal fusion.

Different thicknesses

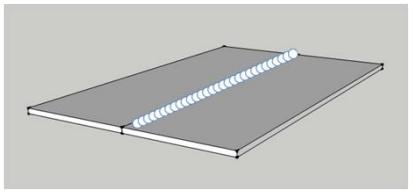
AC Standard + Low Pulse





Fish scale parttens

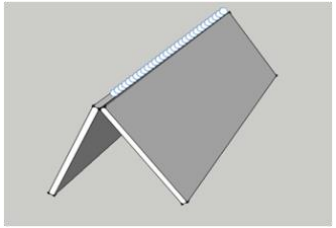
Stainless steel



DC TIG, low or intermediate frequency pulse

Aluminum

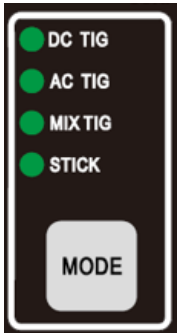
MIX mode available



- Building materials — Door Frame, Truss, Pipe
- Transpo rtation — Automobile and bicycle parts
- Container and cooking utensil — Water tank
- Decoration — Aluminium display shelf
- Furniture etc. — Chair, cart, Al case

10 Features

F 1 High-quality aluminum welding



Four patterns for aluminum welding

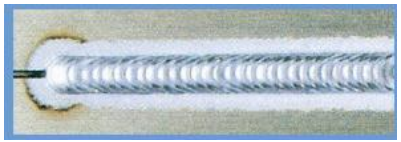
1)MIX TIG ---------- fillet and vertical welds
2)AC Standard TIG ----------various shapes from thin to thick (most common)
3)AC Hard TIG ---------- thin plate butt joint with gap
4)AC Soft TIG ---------- result of wide weld

Al 2.0t fillet joint

Mix TIG

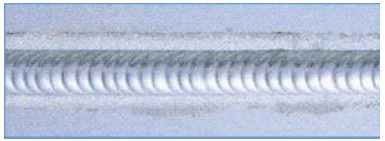
Al 6.0t butt

AC standard TIG



Al 2.0t butt
Clearance 1.2mm

AC hard TIG

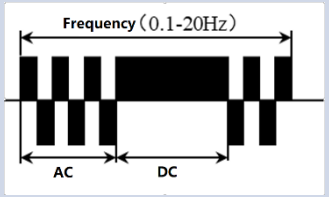


Al 4.0 t butt

AC soft TIG

F 2

AC TIG - Welding Modes

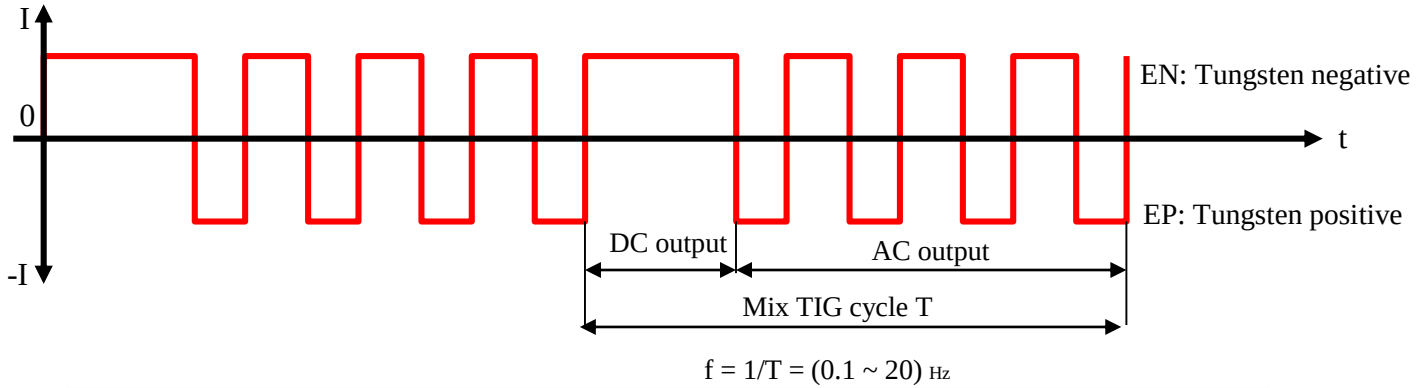
Waveform modes	Mix	AC Standard	AC Hard	AC Soft
Output waveforms (Sketch)				
Features	• Output AC DC alternatively • Facilitate control of heat input • During AC section, it's easy to fill wire	• A rectangular wave current with equal amplitudes of positive half waves (EN) and negative half waves (EP)	• Concentrated arc as DC TIG • Arc noise is slightly higher than standard TIG.	• Sine wave of positive and negative current • A gentle arc sound
Application	• Suitable for fillet welds on thin plates • Suitable for standing welding	• Widely used methods from thin to thick plate	• Suitable for fillet welding of thin plate with clearance and middle plate • When a narrow weld is required	• Suitable for butting middle plate • Suitable for wide welds
350WX5 Output Range	10 ~ 350A	10 ~ 350A	10 ~ 350A	10 ~ 250A
500WX5 Output Range	20 ~ 500A	20 ~ 500A	20 ~ 500A	20 ~ 330A
Notes	• Please select a frequency suitable for the job first. • Please use it in "pulse OFF" mode.	• Use low pulse for pulsed welding. • Unsuitable for medium frequency pulse	• The output current differs from the set value. • Regulation of output current by reference to ammeter values	• Limited maximum current • The output current differs from the set value. • Regulation of output current by reference to ammeter values
Applicable materials	Aluminium, Magnesium, Brass			

F 2

AC TIG – Mixed (MIX TIG) Mode

MIX TIG Feature

•In MIX TIG welding, the arc concentration is deep and the tungsten loss is low. The welding machine alternately outputs AC current and DC current (Low arc sound during DC output and high at AC output). The Mix frequency is presetable (0.1 ~ 20 Hz).
•The frequency should be adjusted to 1 ~ 3 Hz if wire filling is required. Wire can be filled during AC for better results.



f = 1/T = (0.1 ~ 20) Hz

Note: For MIX TIG welding, please set pulse "OFF".

F 2

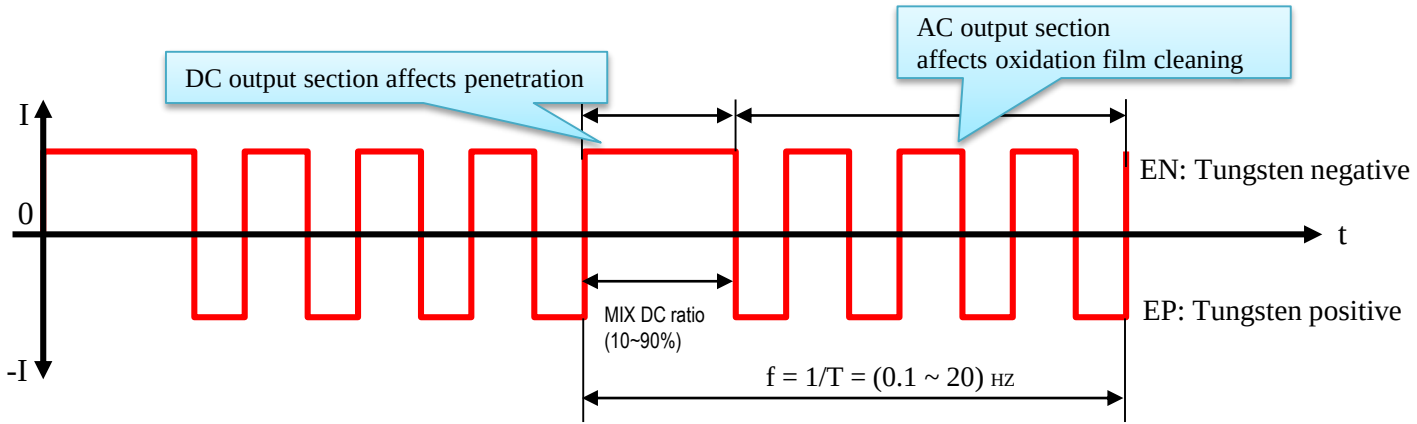
AC TIG – Mixed (MIX TIG) Mode

Application of MIX TIG

- Suitable for welding of aluminum and its alloys
- Arc concentration is deep, suitable for deep V-groove and aluminum thin plate fillet welding.
- The loss of a tungsten electrode is greatly reduced.
- Compared with AC TIG welding arc, the arc noise is reduced.
- AC plus DC TIG makes penetration deeper.
- Filling the welding wire during AC makes the operation better.
- Because of the difference in heat between AC and DC, a good-looking bead can be obtained.
- Suitable for joining aluminum plates with different thickness.

Main Parameters for MIX TIG

- Welding current
- AC Frequency (30 ~ 100 Hz)
- Clean width (10 ~ 50%)
- Offset current (-70 ~ 70%)
- MIX frequency (0.1 ~ 20 Hz, adjustable P menu P20)
- MIX DC ratio (10 ~ 90%, P21)

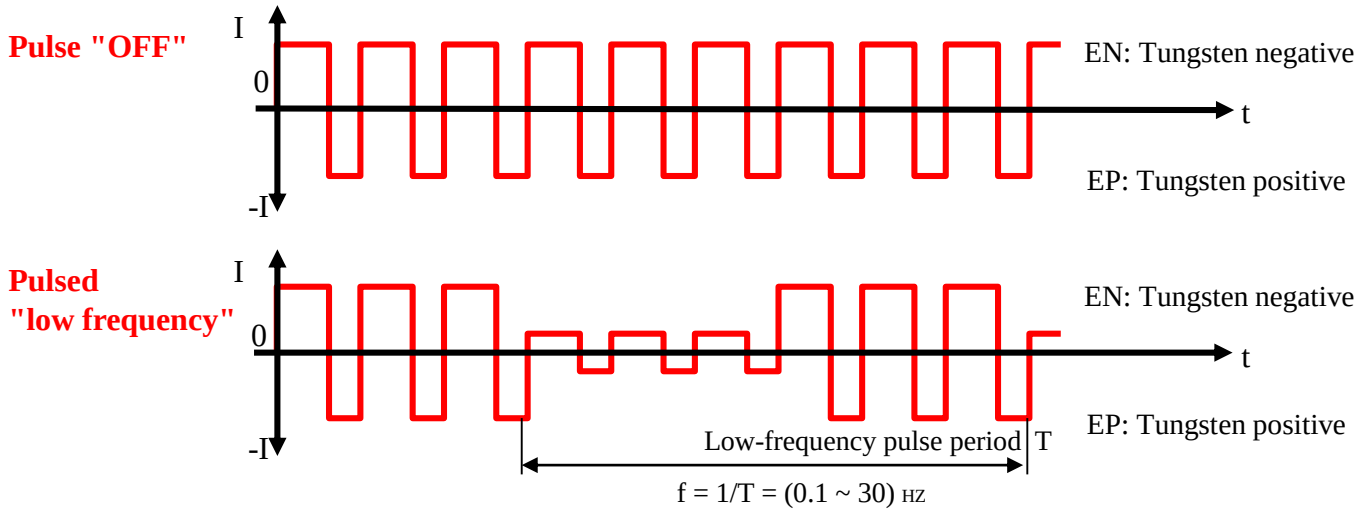


F 2

AC TIG – AC Standard Mode

Features of AC Standard TIG Welding

AC standard TIG welding is ordinary AC TIG welding for thin and thick plate can be. Low frequency pulse can be added to weld thick plate and thin plate joints with different heat capacity. The following figure shows the welding current waveform without pulse and low frequency pulsed:

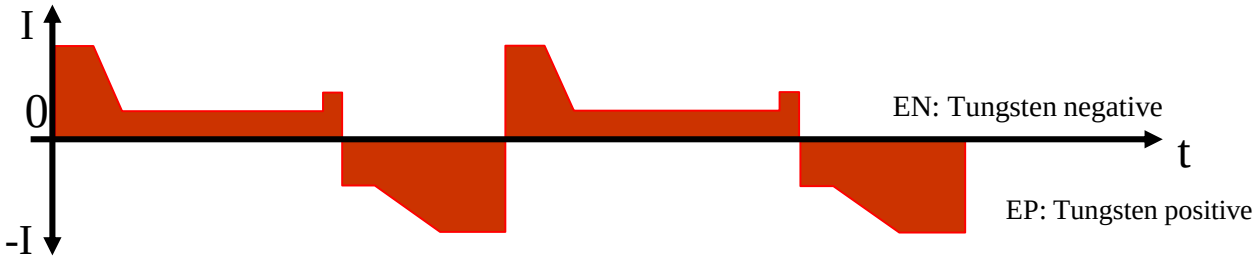


F 2

AC TIG – AC Hard Mode

Characteristics of AC Hard TIG Welding

AC hard TIG welding features high arc heat, concentrated arc and deep penetration, suitable for the fillet welding and grooved butt welding with root gap. An additional pulse is overlapped on waveform as shown here:

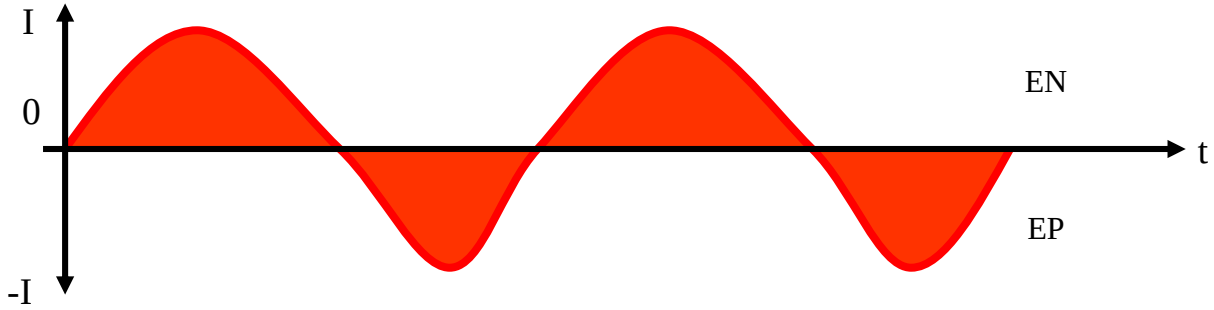


F 2

AC TIG – AC Soft Mode

Characteristics of AC Soft TIG Welding

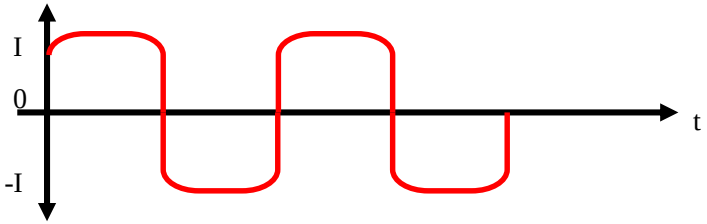
AC soft TIG welding features soft arc and shallow penetration, suitable for thin plate and gapped butt welding. The shape of output current waveform is sine, as shown in the following figure:



350WX5 10 ~ 250A, 500WX5 20 ~ 330A for AC soft TIG

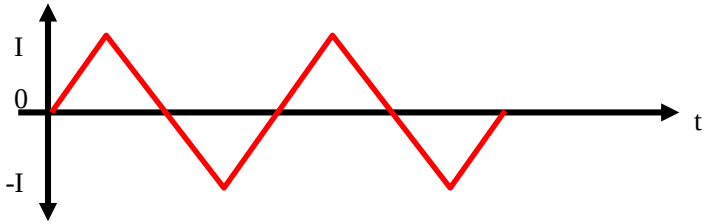
F 2 AC TIG - Soft Square and Triangular Wave

Soft square wave

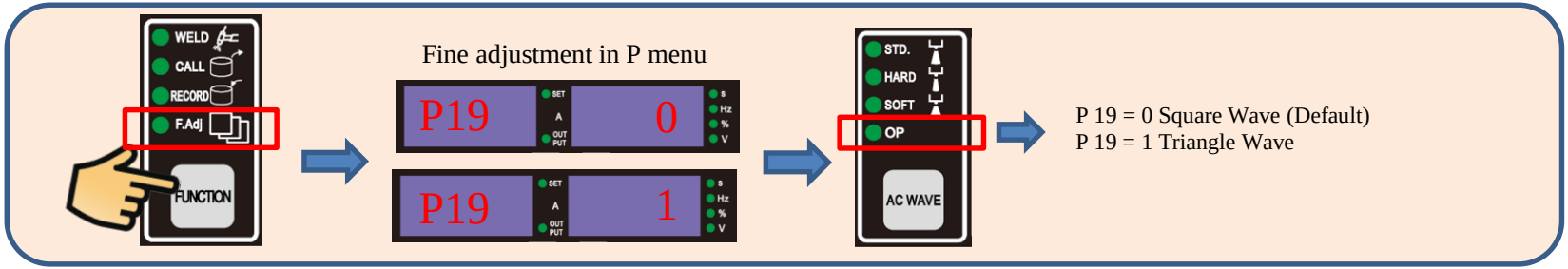


- The soft square wave has a sine-like waveform and produces a softer arc and smoother weld pool compared to the standard square wave, with significantly less noise.
- The soft square wave can be selected by setting F.Adj P19 as 0.

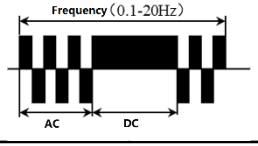
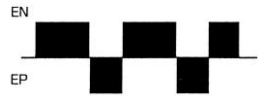
triangular wave



- Triangular wave can significantly reduce overall heat input, rapidly cool down the melting metal and minimize deformation, suitable for thin plate.
- The waveform can be selected by setting P19 as 1.
- In the triangular wave mode, the welding current adjustment range of 350WX5 is 10 ~ 200A, 500WX5 20 ~ 250A.



F 2 AC TIG – Comparison of Waveform Patterns

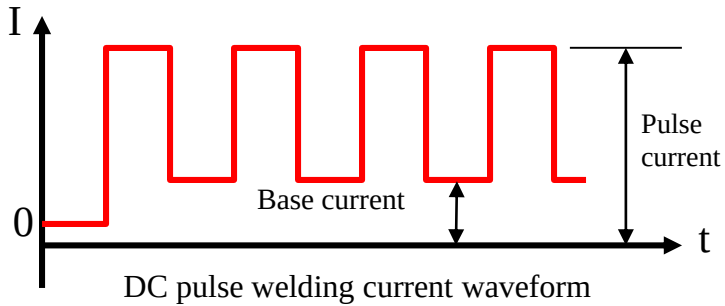
Welding mode	Output waveforms (concept)	Appearance Width	Speed	Arc noise	Thin plate butt	Thin plate fillet	Thick plate butt	Thick plate fillet	Vary in thicknesses	Vertical butt	Wire filling	Electrode life
Mix TIG		○ Medium	△	○	◎	○	○	○	○	◎	◎	◎
Standard TIG		◎ Medium	◎	○	○	○	◎	◎	○	○	◎	○
Hard TIG		○ Narrow	○	△	◎	◎	○	◎	◎	○	○	○
Soft TIG		○ Wide	◎	◎	○	△	○	○	△	○	○	○

◎Excellent ○Good △OK

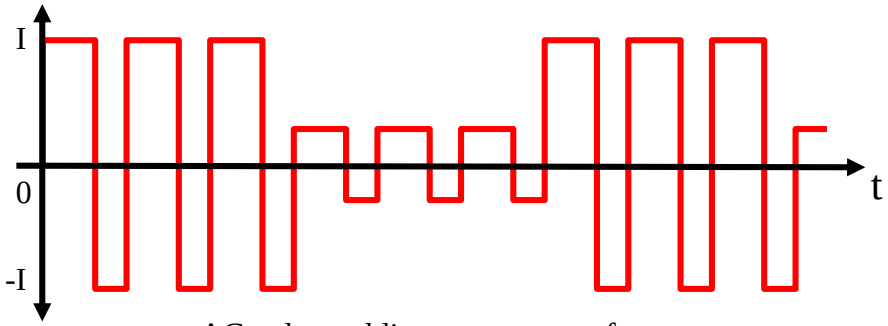
F 3

Heat input well controlled by adjusting pulse parameters

Pulsed GTAW uses a low-frequency modulated DC or AC pulse current to heat the workpiece. The current amplitude jumps periodically at a certain frequency. The molten pool is formed on the workpiece during the pulse current is applied; the molten pool is solidified during the base current. The seam is formed by overlapping a series of welding points.
AC GTAW-P is used for aluminum and magnesium and its alloys, on which surface the high melting point oxide film.
DC GTAW-P for the rest of them.



DC pulse welding current waveform



AC pulse welding current waveform

- LF Pulse Frequency: 0.1 ~ 30 Hz

The heat inputs are different between thick and thin plate, so the peak and base value should be applied.

- Intermediate pulse frequency: 10 ~ 500 Hz

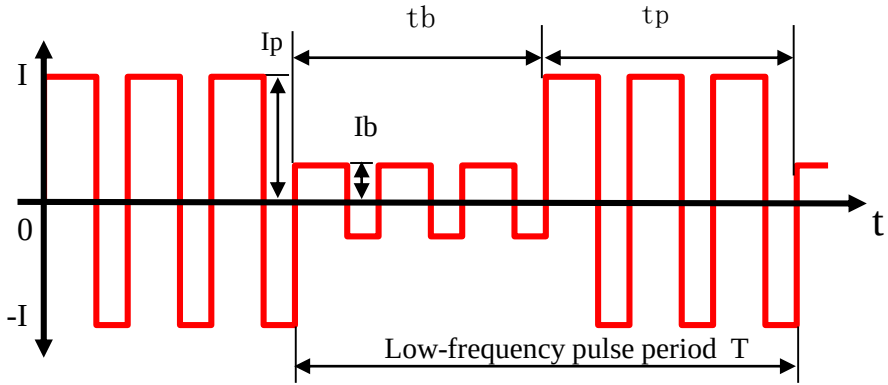
Suitable for thin plate, fillet weld, etc.

- Special frequency (SPF): 2 kHz (set P14 = 1)

- AC TIG pulse frequency range: 0.1 ~ 30 Hz

F 3 Heat input well controlled by adjusting pulse parameters

AC pulse parameter setting



Pulse width ratio = tp/T , frequency = 1/T.

Example of 5A03 Aluminum Pulse TIG Welding Parameters

Thickness mm	Dia. mm	Ip (A)	Ib (A)	Pulse width ratio %	Frequency Hz	Arc volt V	Gas flow rate L/min
1.5	2.5	80	45	33	1.7	14	5
2.5	2.5	95	50	33	2	15	5

F4 Instantaneous arc ignition

AC/DC pulse TIG

Selectable arc start levels

Strong	For long extension cable and the thick electrode
Weak	For standard length cable

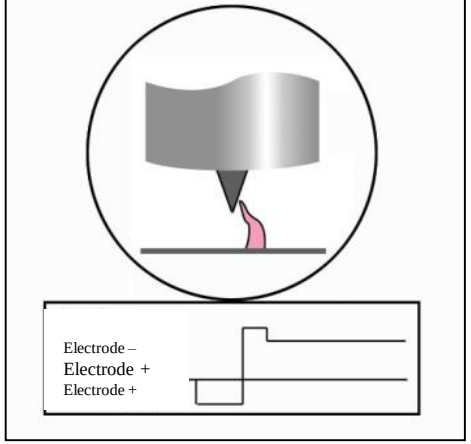
P menu P02 settings:
0: Very weak
1: Weak
2: Standard (factory default)
3: Strong

2 kind of arc start methods

1. High frequency
2. Touch and lift

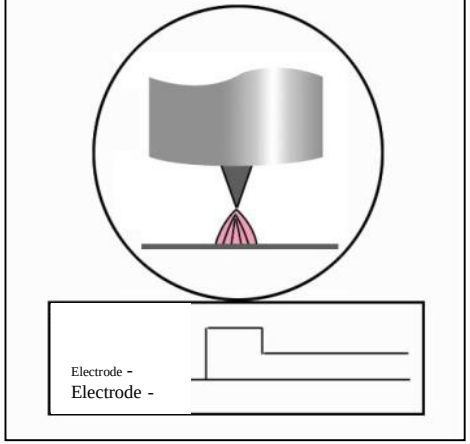
DC TIG

EP (electrode positive) arc start



Only at the moment of arc striking, the tungsten electrode is positive. In this way, climbing can be eliminated. So EP arc start is suitable for intermittent welding

EN (electrode negative) arc start



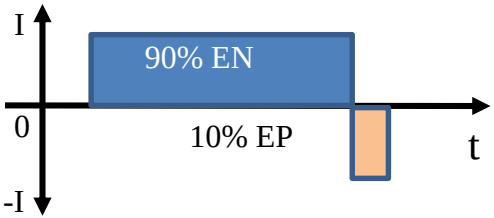
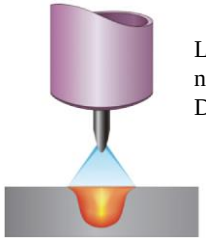
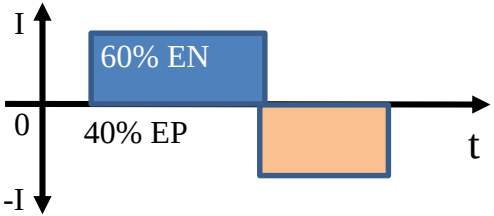
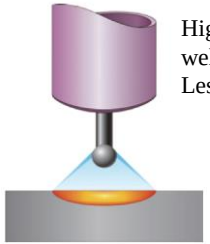
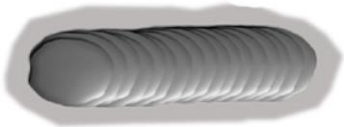
The traditional method is suitable for continuous welding.

P15 = 0, EN start; P15 = 1, EP

F 5

The ideal appearance can be obtained by adjusting cleaning width

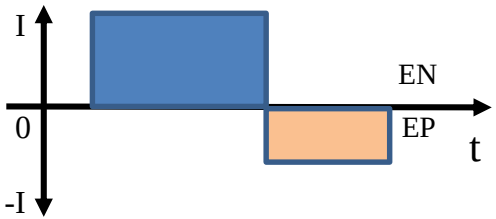
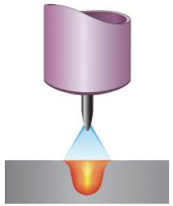
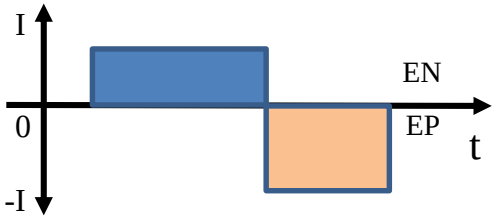
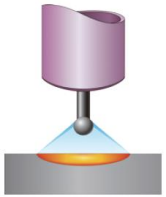
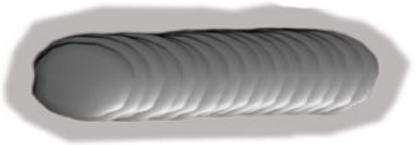
In AC TIG aluminum welding, the cleaning width can be changed by adjusting the percentage of EP. The range of EP adjustment is 10 to 50%. The larger the EP, the wider the cleaning width, the shallower the penetration depth, and the general cleaning width (EP Value) is set at about 30%.

Cleaning width adjustment	Electrode consumption and penetration	Weld appearance
	 Low electrode loss narrow seam Deep penetration	Smaller clean zone around weld 
	 High electrode loss weld width Less penetration	Large cleaning area around weld seam 

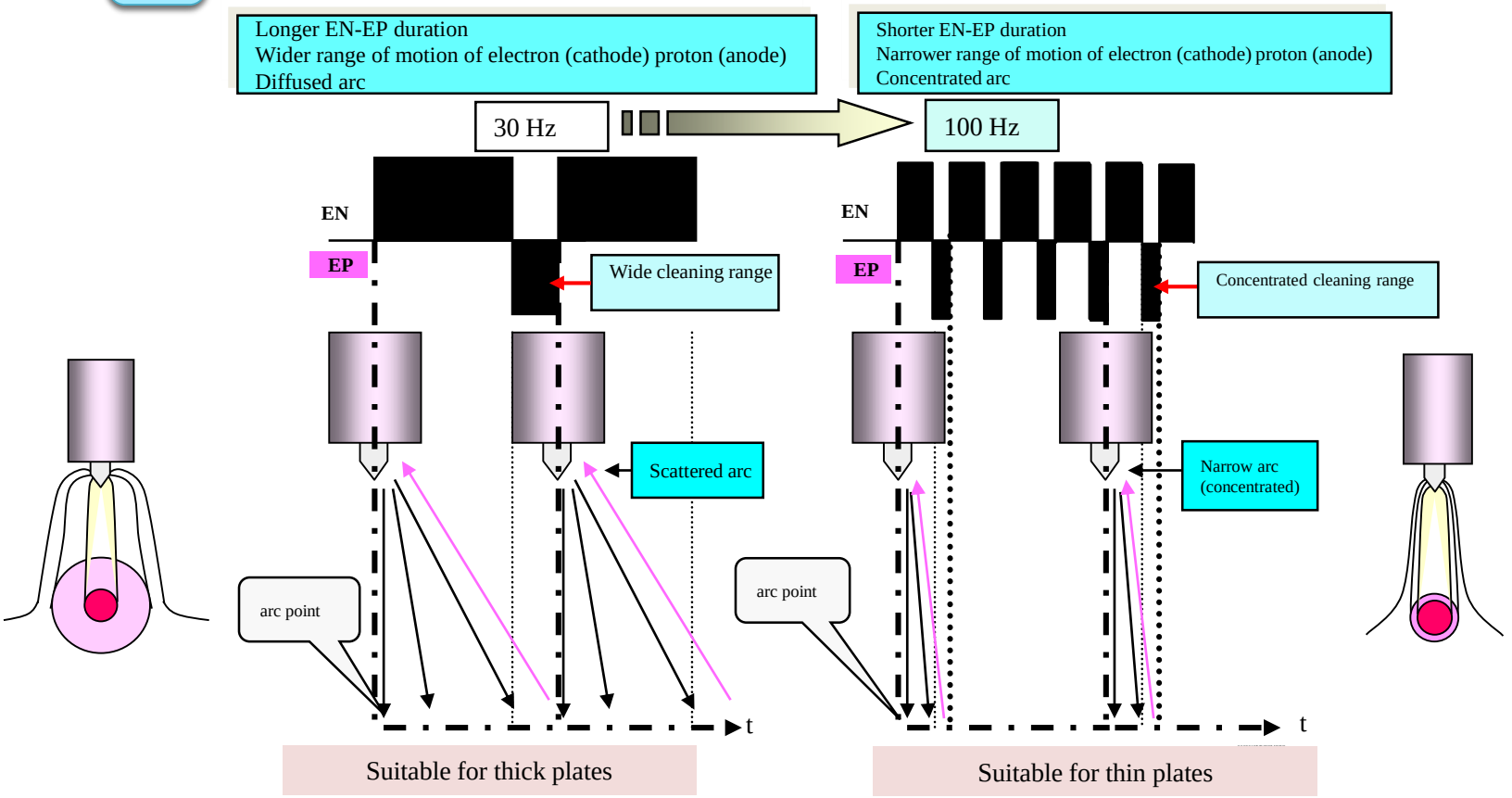
F 6

Welding speed and penetration can be increased by adjusting bias current

In AC TIG aluminum welding, the bias current (Adjust the amplitude of EP and EN simultaneously) is adjusted to obtain a positive and negative half-wave asymmetric current. Adjusting bias current can change the oxide film cleaning intensity, adjust weld depth and width. The factory default bias current is 0. Increasing bias current will brighten the weld surface, increase the penetration and welding speed.
The maximum adjustment range of the bias current is -70% to 70% of the set welding current, and the maximum adjusted current does not exceed the rated current value. For example, a welding current is set to 100A, a bias current regulation range is -70% to 70%, a welding current 220A regulates a bias current -59% to 59%, and a welding current 280A regulates a bias current -25% to 25%.

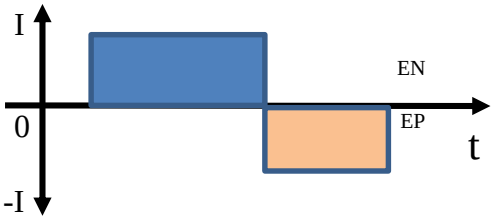
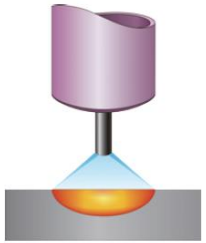
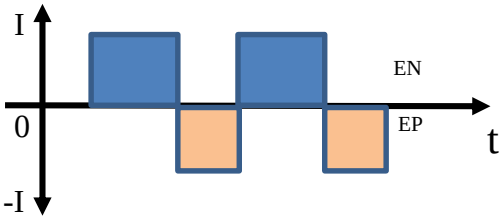
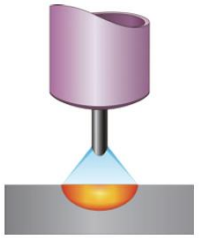
Bias current regulation	Electrode loss and penetration	Appearance
Offset current **30%** 	 Low electrode loss Narrow seam Deep penetration	Smaller cleaning zone around seam 
Offset current **-30%** 	 High electrode loss Wide seam Less deep penetration	Larger cleaning area around seam 

F 7 Full-range Adjustment on AC Output Frequency 30-100Hz



F 7 Full-range Adjustment on AC Output Frequency 30-100Hz

The arc concentration and stiffness are controlled by adjusting the AC frequency (Adjustment range: 30 ~ 100 Hz). The higher the frequency, the stronger the arc concentration and the lower the heat output.

AC current frequency	Electrode and penetration	Appearance
Low-frequency 	 High electrode loss Wide seam Shallow penetration	
Higer frequency 	 Less electrode loss Narrow seam Deep penetration	

F 8 DC/AC MMA Function

Built-in Voltage Reduction Device for MMA

Electric shock prevention function
(After setting P menu P18 to 1, machine outputs a safe low no-load voltage.)

- ✓Welding site is over 2m above ground, and there exists the danger of falling down
- ✓Welding within a limited space in electrical conductive steel structure.
- ✓In metal container
- ✓Moist place

Applicable to various electrodes

DC/AC MMA
(Set P32 as 0: DC, 1: AC)

Electrode types
Ferrotitanium type electrode
Calcium titanium oxide electrode
Low hydrogen type electrode
Stainless steel electrode

Relation between Electrode Diameter and Plate Thickness

Thickness mm	2	3	4~5	6~12	>13
Diameter mm	2	3.2	3.2~4	4~5	4~6

Relation between Electrode Diameter and Welding Current

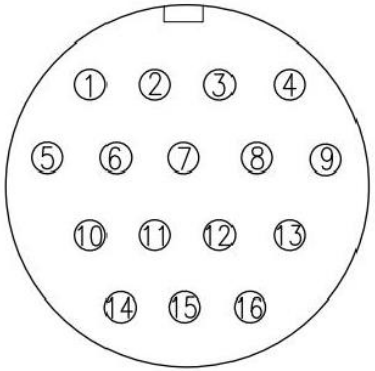
Dia. mm	**1.6**	**2**	**2.5**	**3.2**	**4**	**5.0**	**5.8**
Current A	25~40	40~65	50~80	100~130	160~210	200~270	260~300

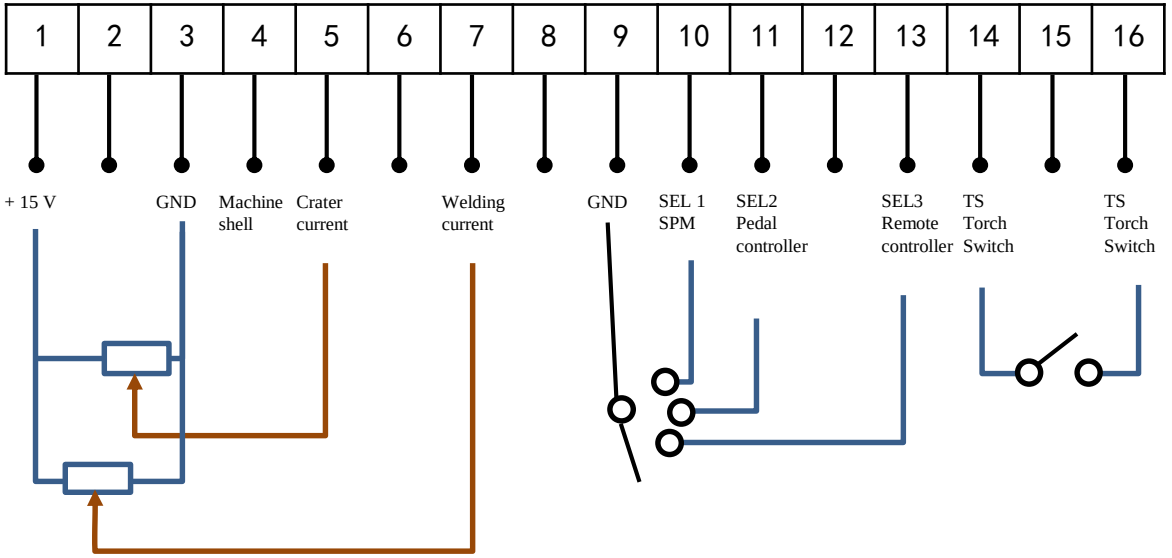
Notice: Maximum output current of 350WX5 is 250A and 500WX5 is 400A for MMA.

F 9

Standard analog communication interface

16 Core Socket Arrangment

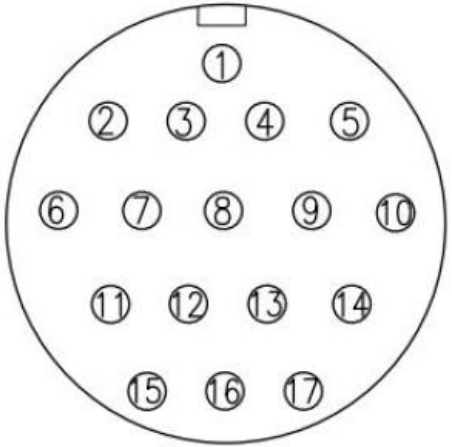


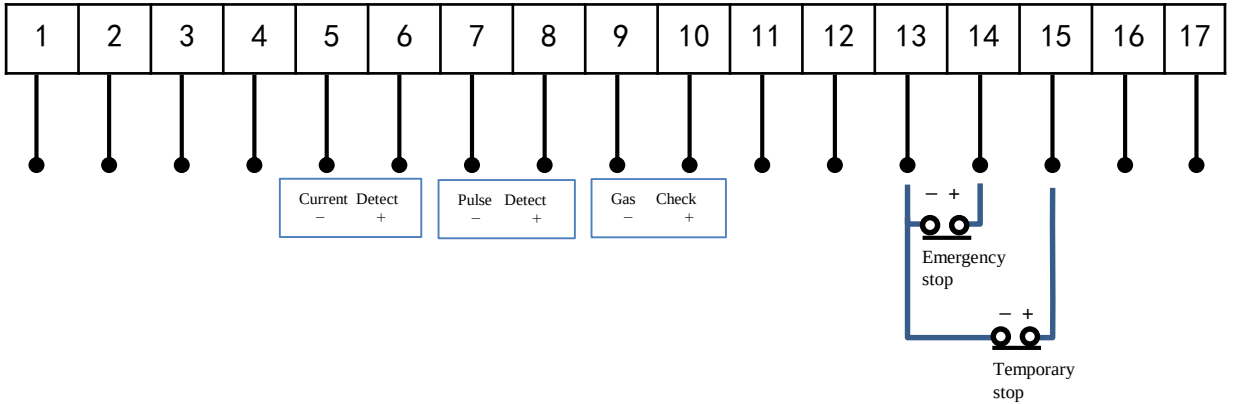


F 9

Standard analog communication interface

17 Core Socket Arrangment

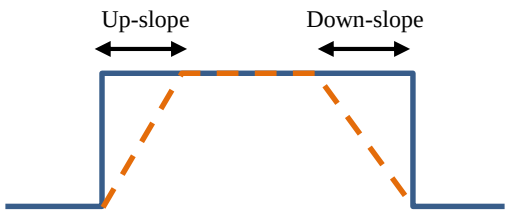




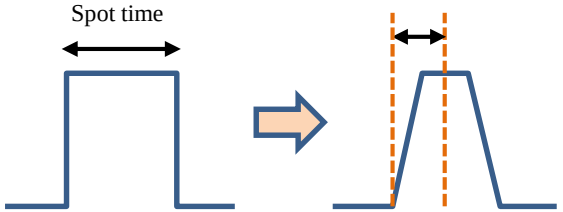
F 10

More Features

- Multiple modes: [Crater], [Crater OFF], [Repeat] and [Spot welding]
- [Crater OFF] and [Spot welding] modes are equipped with up- and down- slope function.



Up- and down- slope (Crater OFF)



Spot welding

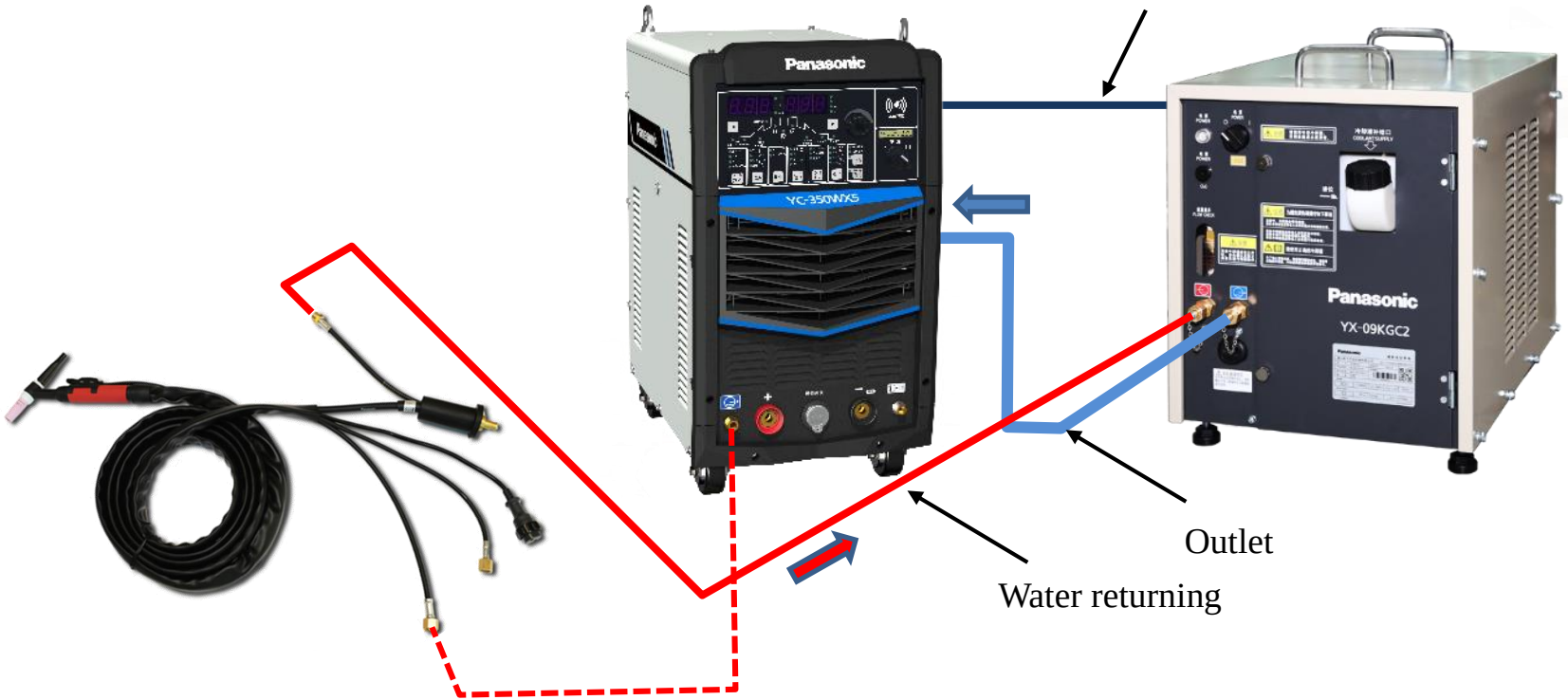
Up- and down- slope ratio
Range: 0% to 50%
(P Menu P22)

- Storage and recall 100 groups of welding conditions
- Welding current limits are presetable (P menu P07)
- Automatic matching post-flow adjustment (P08)
- Energy saving cooling fan and automatic gas saving control
- Mains fluctuation range ± 20%

Connection to external device

Liquid cooling unit

Flow Switch Control Wire
(Connection to [Temporary stop] terminal of welding machine)

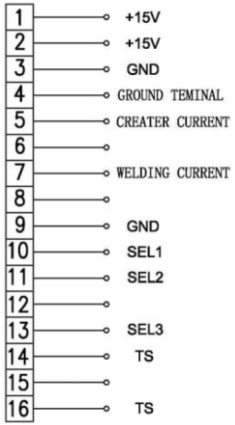


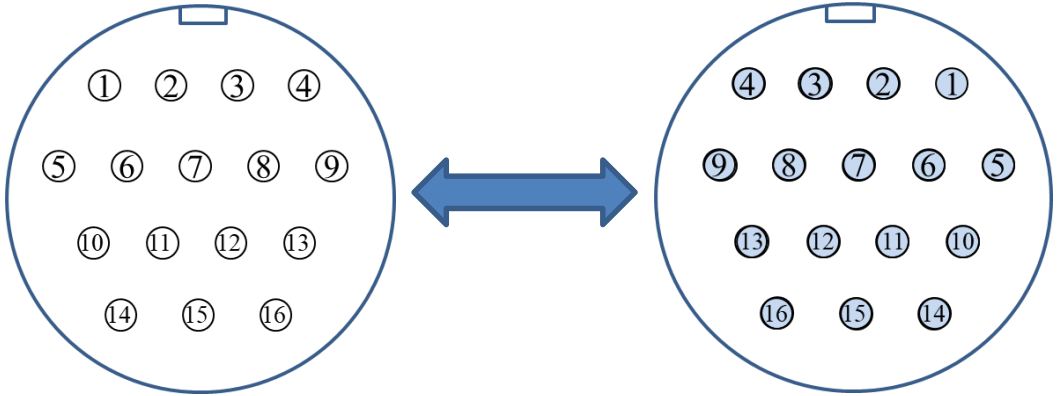
Connection to external device

Pedal controller

Welding current

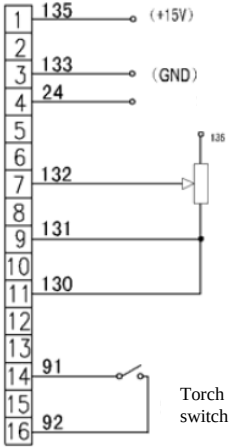
To limit the maximum current





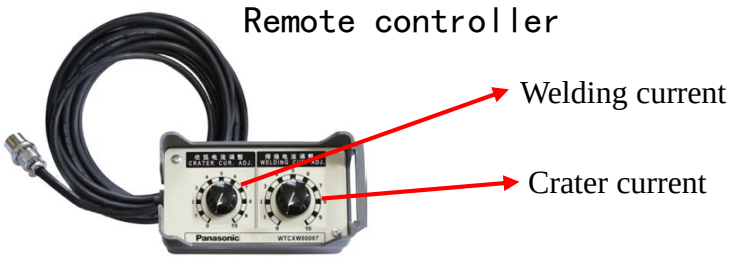
Socket for 16 core of welding power source

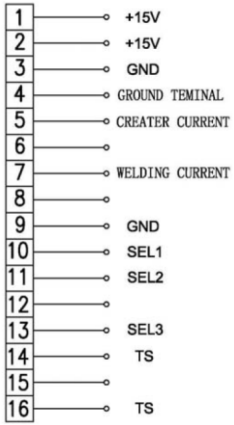
16 core plug of foot pedal controller

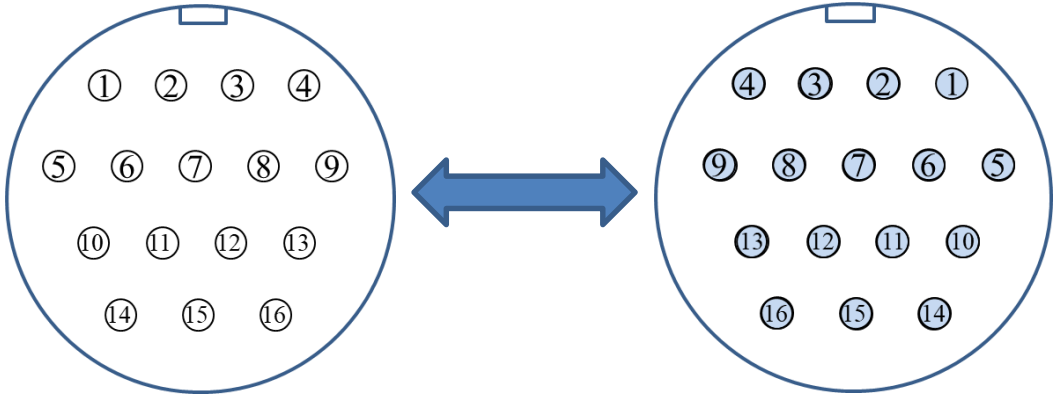


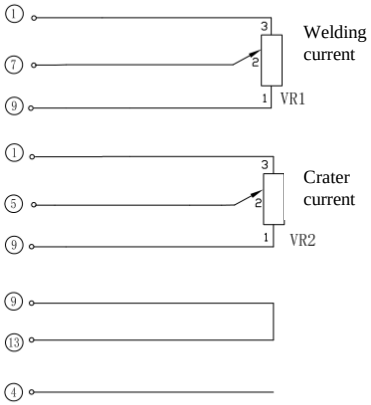
Connection to external device

Connection to remote control









Socket for 16 core of welding power source

16 core plug for remote controller