

wilkinsonstar.com



MIG Series

MIG/MAG/MMA Separate wire feed welding machine
Order code JM-400S (MIG 400S)



OPERATOR MANUAL

Your new product

Thank you for selecting this Jasic Technology, Wilkinson Star product.

This product manual has been designed to ensure that you get the most from your new product. Please ensure that you are fully conversant with the information provided paying particular attention to the safety precautions. The information will help protect yourself and others against the potential hazards that you may come across.

Please ensure that you carry out daily and periodic maintenance checks to ensure years of reliable and trouble free operation.

Wilkinson Star Limited are a leading supplier of equipment in the UK and our products are supported by our extensive service network. Call your distributor in the unlikely event of a problem occurring. Please record below the details from your product as these will be required for warranty purposes and to ensure you get the correct information should you require assistance or spare parts.

Date purchased _____

From where _____

Serial Number _____

(The serial number will normally be located on the equipment data plate on the underside of the machine or on the rear panel)

Please note products are subject to continual development and may be subject to change without notice

1

Safety Precautions



These general safety norms cover both arc welding machines and plasma cutting machines unless otherwise noted.

The equipment must only be used for the purpose it was designed for. Using it in any other way could result in damage or injury and in breach of the safety rules.

Only suitably trained and competent persons should use the equipment. Operators should respect the safety of other persons.



Prevention against electric shock

The equipment should be installed by a qualified person and in accordance with current standards in operation. It is the users responsibility to ensure that the equipment is connected to a suitable power supply. Consult with your utility supplier if required

If earth grounding of the work piece is required, ground it directly with a separate cable.

Do not use the equipment with the covers removed.

Do not touch live electrical parts or parts which are electrically charged.

Turn off all equipment when not in use.

Cables (both primary supply and welding) should be regularly checked for damage and overheating. Do not use worn, damaged, under sized, or poorly jointed cables.

Ensure that you wear the correct protective clothing, gloves, head and eye protection.

Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work ground.

Never touch the electrode if you are in contact with the work ground, or another electrode from a different machine.

Do not wrap cables over your body.

Ensure that you take additional safety precautions when you are welding in electrically hazardous conditions such as damp environments, wearing wet clothing, and metal structures. Try to avoid welding in cramped or restricted positions.

Ensure that the equipment is well maintained. Repair or replace damaged or defective parts immediately. Carry out any regular maintenance in accordance with the manufacturers instructions.



Safety against fumes and welding gases

Locate the equipment in a well-ventilated position.

Keep your head out of the fumes. Do not breathe the fumes.

Ensure the welding zone is in a well-ventilated area. If this is not possible provision should be made for suitable fume extraction.

If ventilation is poor, wear an approved respirator.

Read and understand the Material Safety Data Sheets (MSDS's) and the manufacturer's instructions for metals, consumable, coatings, cleaners, and de-greasers.

Do not weld in locations near any de-greasing, cleaning, or spraying operations. Be aware that heat and rays of the arc can react with vapours to form highly toxic and irritating gases.

Do not weld on coated metals, unless the coating is removed from the weld area, the area is well ventilated, and while wearing an air-supplied respirator. The coatings on many metals can give off toxic fumes if welded.



Prevention against burns and radiation

Arc rays from the welding process produce intense, visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin.

Wear an approved welding helmet fitted with a proper shade of filter lens to protect your face and eyes when welding or watching

Wear approved safety glasses with side shields under your helmet.

Never use broken or faulty welding helmets.

Always ensure there are adequate protective screens or barriers to protect others from flash, glare and sparks from the welding area. Ensure that there are adequate warnings that welding or cutting is taking place.

Wear suitable protective flame resistant clothing.

The sparks and spatter from welding, hot work pieces, and hot equipment can cause fires and burns

Welding on closed containers, such as tanks, drums, or pipes, can cause them to explode.

Accidental contact of electrode to metal objects can cause arcs, explosion, overheating, or fire.

Check and be sure the area is safe and clear of inflammable material before carrying out any welding.



Protection against noise

Some welding and cutting operations may produce noise.

Wear safety ear protection to protect your hearing.



Protection from moving parts

When the machine is in operation keep away from moving parts such as motors and fans. Moving parts, such as the fan, may cut fingers and hands and snag garments.

Protections and coverings may be removed for maintenance and controls only by qualified personnel, after first disconnecting the power supply cable.

Replace the coverings and protections and close all doors when the intervention is finished, and before starting the equipment.

Take care to avoid getting fingers trapped when loading and feeding wire during set up and operation.

When feeding wire be careful to avoid pointing it at other people or toward your body.

Always ensure machine covers and protective devices are in operation.



Precautions against fire and explosion

Avoid causing fires due to sparks and hot waste or molten metal

Ensure that appropriate fire safety devices are available near the cutting / welding area.

Remove all flammable and combustible materials from the cutting / welding zone and surrounding areas

Do not cut/weld fuel and lubricant containers, even if empty. These must be carefully cleaned before they can be cut/welded.

Always allow the cut/welded material to cool before touching it or placing it in contact with combustible or flammable material.

Do not work in atmospheres with high concentrations of combustible fumes, flammable gases and dust.

Always check the work area half an hour after cutting to make sure that no fires have begun.



Risks due to magnetic fields

The magnetic fields created by high currents may affect the operation of pacemakers or electronically controlled medical equipment.

Wearers of vital electronic equipment should consult their physician before beginning any arc welding, cutting, gouging or spot welding operations.

Do not go near welding equipment with any sensitive electronic equipment as the magnetic fields may cause damage.

RF Declaration

Equipment that complies with directive 2004/108/EC concerning electromagnetic compatibility (EMC) and the technical requirements of EN60974-10 is designed for use in industrial buildings and not those for domestic use where electricity is provided via the low voltage public distribution system. Difficulties may arise in assuring class A electromagnetic compatibility for systems installed in domestic locations due to conducted and radiated emissions.

In the case of electromagnetic problems, it is the responsibility of the user to resolve the situation. It may be necessary to shield the equipment and fit suitable filters on the mains supply.

LF Declaration

Consult the data plate on the equipment for the power supply requirements.

Due to the elevated absorbance of the primary current from the power supply network, high power systems affect the quality of power provided by the network. Consequently, connection restrictions or maximum impedance requirements permitted by the network at the public network connection point must be applied to these systems.

In this case the installer or the user is responsible for ensuring the equipment can be connected, consulting the electricity provider if necessary.



Materials and their disposal



The equipment is manufactured with materials, which do not contain any toxic or poisonous materials dangerous to the operator.

When the equipment is scrapped, it should be dismantled separating components according to the type of materials.

Do not dispose of the equipment with normal waste. The European Directive 2002/96/EC on Waste Electrical and Electronic Equipment states the electrical equipment that has reached its end of life must be collected separately and returned to an environmentally compatible recycling facility.



Handling of Compressed gas cylinders and regulators

All cylinders and pressure regulators used in welding operations should be handled with care.

Never allow the electrode, electrode holder or any other electrically “hot” parts to touch a cylinder.

Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

Always secure the cylinder safely

Never deface or alter any cylinder

2

Product Overview

The MIG 400 is an inverter power source that can provide MIG, MMA and gas less self- shielded welding options. With its wire feed interconnections it can be used to weld in a wide radius.

Its IGBT power device with unique control mode provides excellent reliability with a high duty cycle.

The system has a closed loop feedback control, constant voltage output, which allows it to operate with a wide tolerance to mains fluctuation, within $\pm 15\%$.

It has continuously adjustable welding voltage and current, to provide excellent welding characteristics.

Adopting a unique welding dynamic characteristic control circuit in MIG, provides a stable arc, low spatter, excellent weld appearance and high welding efficiency.

By removing the ball at the end of the wire after welding, a high no-load voltage, and slow wire feed at the start presents exceptional arc starting.

The machine also has a very stable welding current in MMA, excellent arc ignition, and can be used with a wide variety of welding electrodes.

Its high inverter frequency greatly reduces the volume and weight of the welder and the great reduction in magnetic and resistance loss obviously enhances the welding efficiency and energy saving effect.

Switching frequency is beyond audio range, which almost eliminates noise pollution.



3

Technical data

MODEL	JM-400S	
Rated input voltage	3-phase 400VAC, 50/60Hz	
Rated power supply capacity (KVA)	MMA: 17.8	MIG: 17.1
Efficiency	88.9%	
Power factor	0.91	
Recommended fuse capacity (A)	40	
Rated output	MMA: 400A/36V	MIG: 400A/34V
Wire feed speed range (MIG)	1~18m/min	
Welding voltage range (MIG)	15.5~40V	
Welding current range (MMA)	30~400A	
No-load voltage (V)	MMA: 62	MIG: 62
Wire diameter applicable (mm)	Φ0.8/1.0/1.2	
Rated duty cycle @ 40°C	MMA 80%	MIG 100%
Overall size (mm)	760×360×585	
Weight (kg)	41	
Protection class	IP21S	
Reference standard	IEC 60974-1	

Product design may vary due to customer requirements.

4

Controls

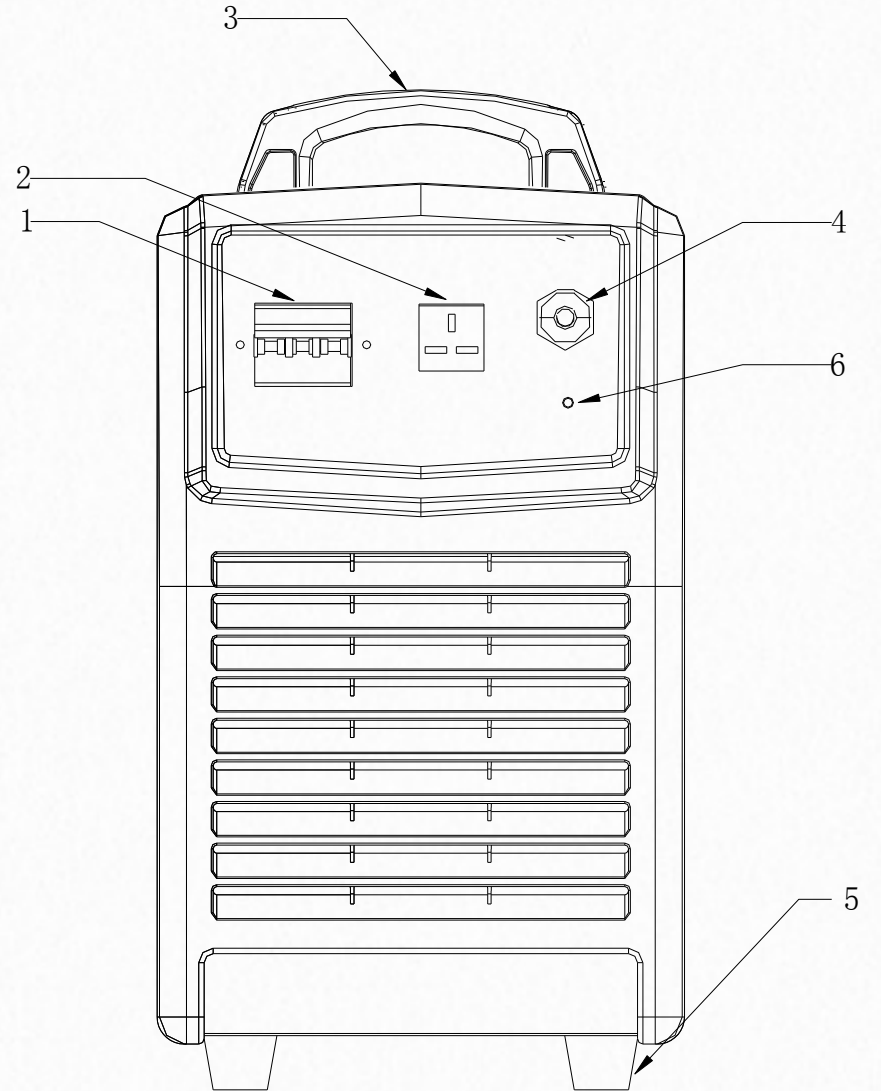
Front view

1. Crater voltage control knob (4T MIG)
2. Crater current control knob (4T MIG)
3. Overheat LED
4. Digital ammeter
5. Power LED
6. Handle
7. Digital Voltmeter
8. Inductance control knob
9. Current control (MMA)
10. Gas check/welding switch
11. 2T/4T switch
12. MIG/MMA switch
13. “-” output terminal
14. Interconnection socket
15. “+” output terminal



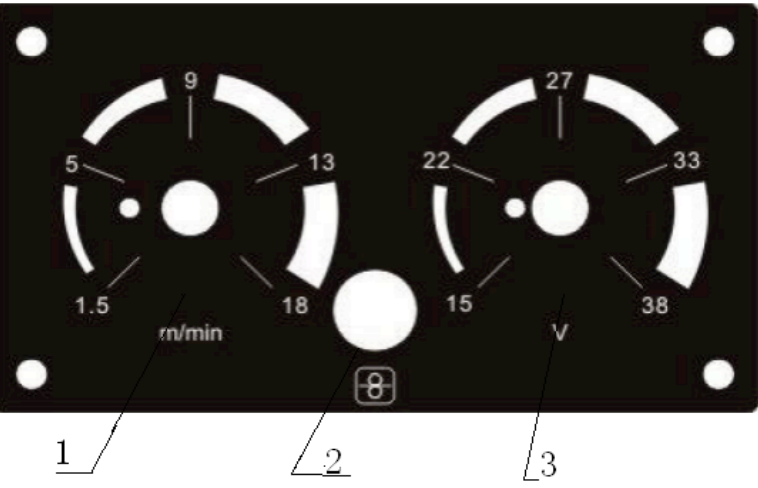
Rear View

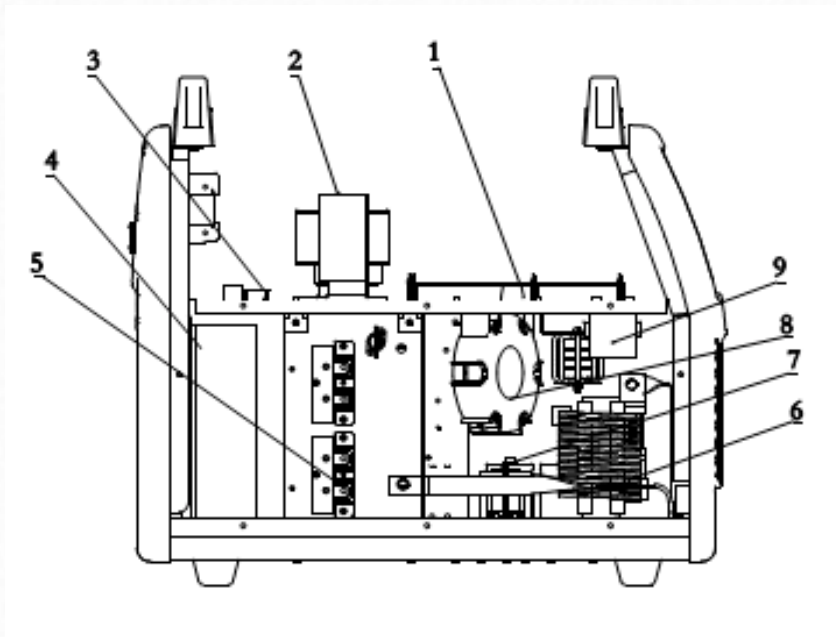
- 1. 3-phase power switch
- 2. AC 220V socket
- 3. Handle
- 4. Input power cord
- 5. Rubber foot
- 6. Burn back adjustment



Wire feed control

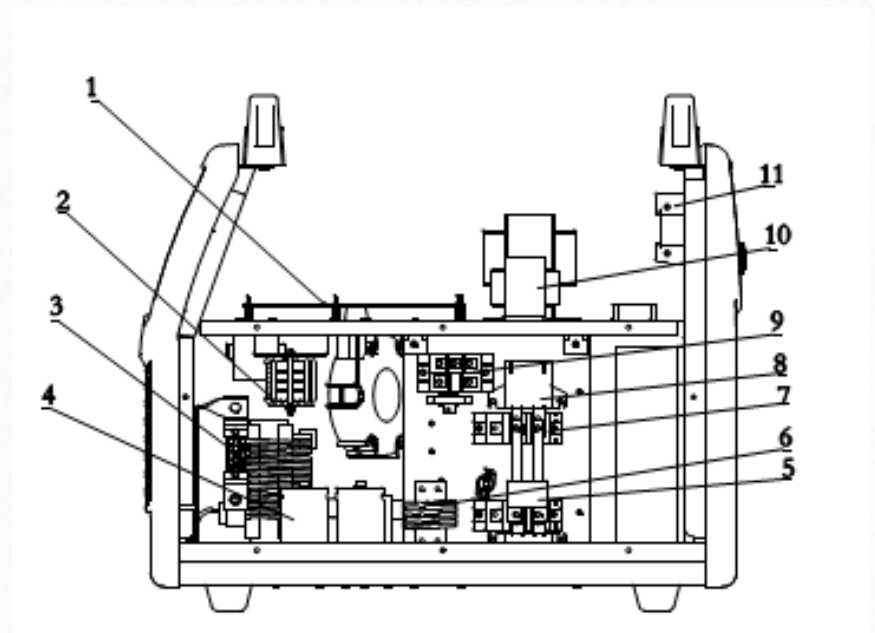
- 1. Welding current control knob
- 2. Manual wire feeding switch
- 3. Welding voltage control knob





Internal component layout - Left side

1. Wire feed PCB
2. IF transformer
3. EMC board
4. Fan
5. Secondary rectifier module
6. Reactor
7. Power inductor
8. Main transformer
9. Blocking capacitor



Internal component layout - Right side

1. Main control PCB
2. Saturable inductor
3. Shunt
4. Filter capacitor
5. Resonant capacitor
6. Filter inductor
7. IGBT module
8. HF filter capacitor
9. 3-phase rectifier module
10. IF transformer
11. Switch

5

Installation

Unpacking

Check the packaging for any signs of damage.

Carefully remove the machine and retain the packaging until the installation is complete.

Location

The machine should be located in a suitable position and environment. Care should be taken to avoid moisture, dust, steam, oil or corrosive gases

Place on a secure level surface and ensure that there is adequate clearance around the machine to ensure natural airflow.

Input connection

Before connecting the machine you should ensure that the correct supply is available. Details of the machine requirements can be found on the data plate of the machine or in the technical parameters shown in the manual.

The equipment should be connected by a suitably qualified competent person. Always ensure the equipment has a proper grounding.

Never connect the machine to the mains supply with the panels removed.

Output connections

Electrode polarity

In general when using manual arc welding electrodes the electrode holder is connected to the positive terminal and the work return to the negative terminal. Always consult the electrode manufacturer's data sheet if you have any doubts.

When using the machine for TIG welding the TIG torch should be connected to the negative terminal and the work return to the positive terminal

MMA welding

Insert the cable plug with electrode holder into the “+” socket on the front panel of the welding machine, and tighten it clockwise.

Insert the cable plug of the work return lead into the “-” socket on the front panel of the welding machine, and tighten it clockwise



MIG Welding

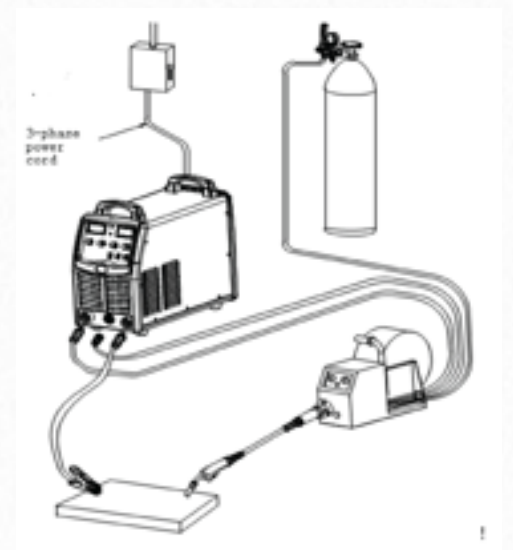
Insert the welding torch into the “Euro connector for torch in MIG” output socket on the front panel of the wire feed unit, and tighten it.

Install the wire spool on the spindle adapter of the wire feed unit.

Connect the cylinder equipped with the gas regulator to the gas inlet of the interconnection cable set.

Insert the cable plug with work clamp into the “-” output terminal on the front panel of the welding machine, and tighten it clockwise.

Insert the quick plug of the interconnection cable set into the “+” output terminal of the welding machine, and tighten it clockwise. Connect the other end connection on the rear of the wire feed unit



Insert the multi pin plug of the interconnection cable set into the control cable socket of the welding machine and connect the other connection into the rear of the wire feed unit

Ensuring that the groove size in the feeding position on the drive roll matches the contact tip size of the welding torch and the wire size being used. Release the pressure arm of the wire feeder to thread the wire through the guide tube, and into the drive roll groove. Adjust the pressure arm, ensuring no sliding of the wire. Too high pressure will lead to wire distortion, which will affect wire feeding. Press the wire inch button to thread the wire out of the torch contact tip.

TIG (Scratch start)

Insert the cable plug with work return clamp into the “+” socket on the front panel of the welding machine, and tighten it clockwise.

Insert the cable plug of the valve type TIG torch into the “-” socket on the front panel of the welding machine, and tighten it clockwise

Connect the gas hose of the valve type TIG torch to the cylinder regulator. Open the cylinder valve to check for leaks.

Open the TIG torch valve to set the shield gas flow.

The gas type used for TIG welding is ARGON.

Operation

Before starting any welding activity ensure that you have suitable eye protection and protective clothing. Also take the necessary steps to protect any persons within the area.

MMA

After connecting the welding leads as detailed you will need to switch on the machine. The power LED will be lit and the fan running.

Switch the MMA/MIG switch to MMA.

Set the amperage on the machine using the MMA current control knob to a value suitable for the electrode being used. Please see below a guide to amperages required. Ensure you check that you have the electrode polarity correct. Inductance can be adjusted using the inductance control on the front panel of the machine

Electrode Diameter (mm)	Recommended Welding Current (A)
1.0	20~60
1.6	44~84
2.0	60~100
2.5	80~120
3.2	108~148
4.0	140~180
5.0	180~220
6.0	220~260

MIG/MAG

- 1) After being installed according as above, and the power switch on the back panel being switched on, the machine is started. At this time, the ammeter displays the preset wire feed speed value, and the voltmeter displays the preset voltage value. Open the cylinder valve, and switch the gas check switch to the “GAS CHECK” position. Adjust the gas regulator to get the correct gas flow. After setting, switch the gas check switch to the “Welding” position.
- 2) Get the correct arc conditions by adjusting the inductance control knob. Turn the knob counterclockwise to get lower inductance and harder arc; turn it clockwise to get higher inductance and softer arc. Generally, select harder arc at lower current, while select softer arc at higher currents.
- 3) Select the correct welding current and welding voltage by adjusting the current control knob and voltage control knob on the wire feeder.
- 4) Select 2T or 4T operation mode. In 2T mode, arc is ignited by pushing the torch trigger, and arc stops by releasing the torch trigger. In 4T mode, welding can be continued when releasing the torch trigger after arc is ignited, and at this time, welding instructions should be set by adjusting the current control knob and voltage control knob on the

wire feeder. When pushing the torch trigger again, the machine enters into crater welding, and at this time. Crater parameters should be set by adjusting the crater/welding current control knob and crater voltage control knob on the front panel of the machine.

The actual current and voltage values are displayed on the front panel of the machine. When the torch trigger is released, welding ends. 2 seconds after welding ends, the gas supply will be cut off.

Gas selection

Metal inert gas welding (MIG): Uses Argon (Ar), Helium (He) or Ar-He mixtures as the shield gas, and it mainly used for welding aluminium and its alloys.

Metal active gas welding (MAG): Uses Argon (Ar) mixed with a certain amount of CO² / O² as the shield gas, and it usually used in short circuit transfer and spray transfer. It can be applicable to flat position welding, vertical position welding, overhead position welding and all-position welding, and it mainly used for welding carbon steel, high strength low alloy steel and stainless steel. Welding robots mostly use the MAG process.

CO₂ (carbon dioxide) gas shielded arc welding (CO₂ welding): It uses CO₂ as the shield gas, and is usually used in globular transfer and short circuit transfer to implement welding. It can be used to weld in different positions. As compared with other welding methods, CO₂ welding has many advantages, though it produces more spatters, CO₂ welding is widely used for general metal structure welding.

1) Welding current setting

Welding wire ϕ (mm)	Applicable current (A)	Optimal current (A)
0.8	50~120	70~100
1.0	70~180	80~120
1.2	80~350	100~200

Set the welding current after the above preparation. Short circuiting transfer is mainly fit for electrode wires of diameter 0.6~1.2mm. As a guide for short circuit welding set the welding current according to the table below.

2) Welding speed selecting

The welding quality and productivity should be taken into consideration for the selecting of welding speed. In the case that the welding speed increases, it weakens the protection

effect and quickens the cooling. As a consequence, it is not good for weld bead shaping. In the event that the speed is too slow, the workpiece will be burned through, and a good weld bead will be unavailable. In practical operation, the welding speed should not exceed 50cm/min.

3) Wire Stick-out

The increase of the stick-out can improve the productivity, but too long stick-out may lead to excessive spatter, wire breaking and unstable welding. Generally, the stick-out should be 10 times as the welding wire diameter.

4) Shield gas flow selection

The protection effect is the primary consideration. Besides, the protection effect of inner-angle welding is better than

Welding mode	Welding with thin wire	Welding with thick wire	Welding with thick wire under high current
Gas flow (L/min)	5~15	15~20	20~25

that of external-angel welding, so the gas flow in inner-angle welding should be lower. Less or no shield gas is needed in FCAW. Refer to the table below for the recommended gas flow rates.

TIG Welding

Using valve type torch with no trigger

Scratch Arc ignition mode:

When TIG welding in scratch arc mode connect the valve type torch as shown in the installation section.

Select the MMA position.

Open the regulator valve on the gas cylinder and open the torch valve to set the gas flow.

The operator should bring the tungsten electrode into contact with the workpiece.The arc will strike at the current selected.

The arc is extinguished by drawing the torch away from the work piece.

Turn of the torch gas valve

For welder training please visit our Academy website at

www.wilkinson-welding-academy.com

6

Maintenance and troubleshooting

The following operation requires sufficient professional knowledge on electric aspects and comprehensive safety knowledge. Make sure the input cable of the machine is disconnected from the electricity supply and wait for 5 minutes before removing the machine covers.

In order to guarantee that the arc welding machine works efficiently and in safety, it must be maintained regularly. Operators should understand the maintenance methods and means of arc welding machine operation. This guide should enable customers to carry on simple examination and safeguarding by oneself, try to reduce the fault rate and repair times of the arc welding machine, so as to lengthen service life of arc welding machine

Period	Maintenance item
Daily examination	Carry out a full visual inspection. Check for any damage to the machine, leads, cables and connections. Replace where necessary. Switch on the machine and check for any warning Led's and general operation
Monthly examination	Using the dry compressed air to clean the inside of arc welding machine. Especially check for build up of dust / debris on intake grills, main voltage transformer, inductance, IGBT module, the fast recover diode and PCB, etc. Take care when blowing electronic components and do not dislodge any wiring connections Check the security of output connections and plugs. Replace if signs of overheating.
Yearly examination	Carry out an annual service. Check earth continuity and insulation resistance of the machine at the relevant points. PLEASE NOTE THIS WORK SHOULD BE CARRIED OUT BY A TRAINED COMPETENT PERSON.

Troubleshooting

Before arc welding machines are dispatched from the factory, they have already been checked thoroughly. The machine should not be tampered with or altered.

Maintenance must be carried out carefully. If any wire becomes loose or is misplaced, it maybe potential danger to user!

Only professional maintenance personnel should repair the machine!

Ensure the power is disconnected before working on the machine. Always wait 5 minutes after power switch off before opening the case.

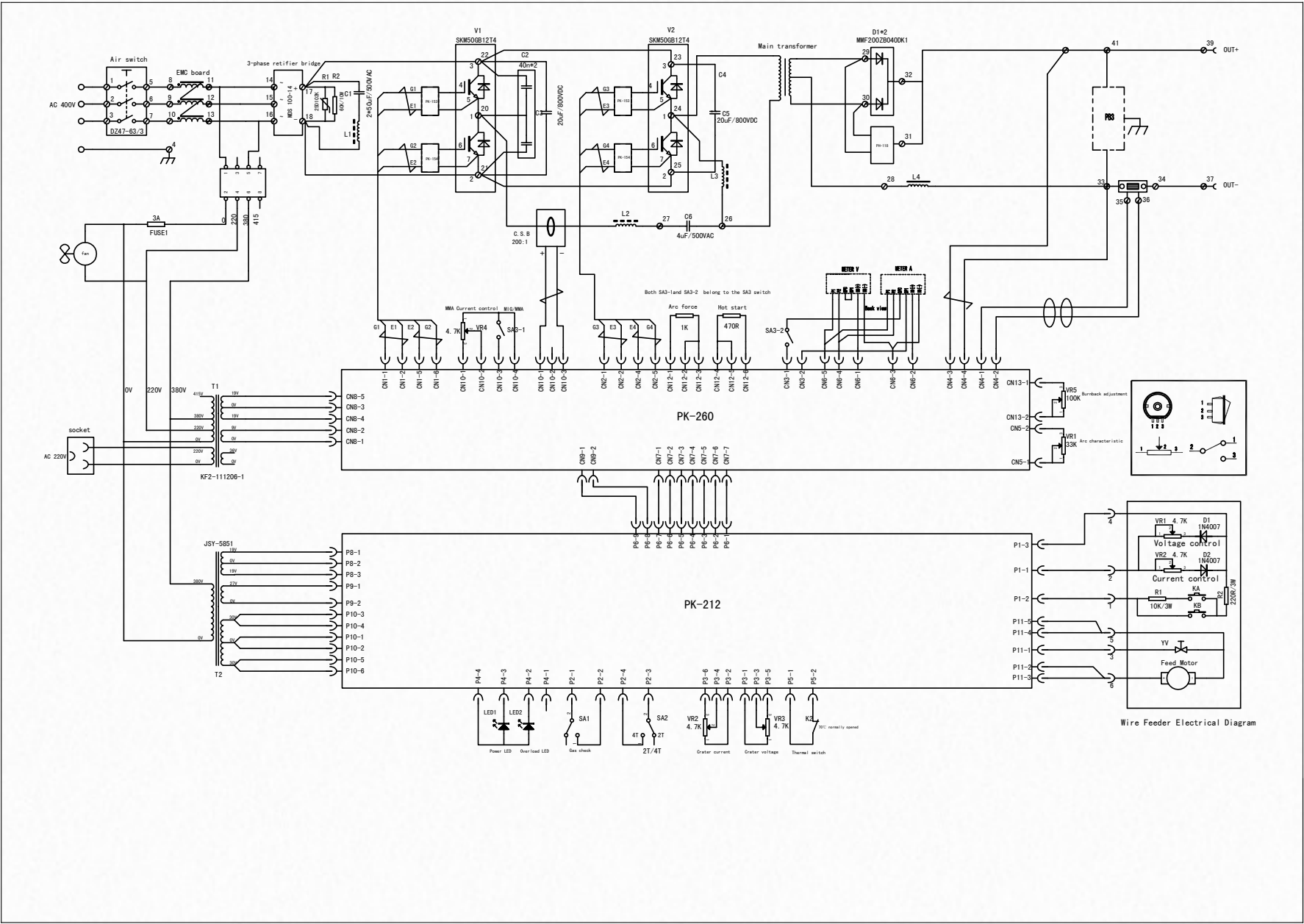
Protection LED warnings

Power LED	After connecting the machine to the mains power supply and starting the machine, the power LED will be on. If the machine works normally with the power LED off, the power LED is damaged. Replace it if necessary.
Overload LED	If the overload LED is on during welding, it indicates that the main circuit is overheated and the machine will stop welding.time that welding.It is unnecessary to shut down the machine, but just wait for the overload LED to go out, and then welding can be continued.

Malfunction phenomena	Cause analysis	Solution
The fan does not work or it works abnormally.	The 3-phase power cord is not connected.	Reconnect the 3-phase power cord.
	Phase failure	Solve the phase failure problem.
	The mains voltage is too low.	Welding can be carried out after the mains voltage recovers.
There is no no-load voltage.	The mains voltage is too low.	Welding can be carried out after the mains voltage recovers.
	Phase failure	Solve the phase failure problem.
There is no no-load voltage, and the overload LED is on.	Overload protection	It can recover automatically after the welding machine is cooled.
No response when pushing the torch trigger and the protection LED is off.	The welding torch is not well connected with the wire feeder.	Reconnect it.
	The control cable of the wire feeder is not well connected with the welding power supply.	Reconnect it.
	The torch trigger fails.	Repair or replace the welding torch.
When the torch trigger is pushed, there is gas output and the wire feeder works, but there is no output current, and the protection LED is off.	The earth cable is not well connected with the workpiece.	Reconnect it.
	The wire feeder cable is not well connected.	Reconnect it.
	The wire feeder or welding torch fails.	Repair the wire feeder or welding torch.
There is output current when pushing the torch trigger to feed gas, but the wire feeder does not work.	The control cable of the wire feeder is broken.	Get it repaired or replaced.
	The wire feeder is clogged.	Unclog it.
	The wire feeder fails.	Repair it.
	The control PCB or wire-feeder power PCB inside the machine fails.	Replace it.
The welding current is unstable.	The pressure arm on the wire feeder is not properly adjusted.	Adjust it to get proper pressure.
	The drive roll does not match the wire size being used.	Make sure they match with each other.
	The contact tip of the welding torch is badly worn.	Replace it.
	The wire-feeding tube of the welding torch is badly worn.	Replace it.
	The welding wire is of poor quality.	Replace it with welding wire of good quality.
The electrode holder becomes very hot.	The rated current of the electrode holder is lower than its actual working current.	Replace it with a higher rated current.
Other malfunction		Contact the service centre

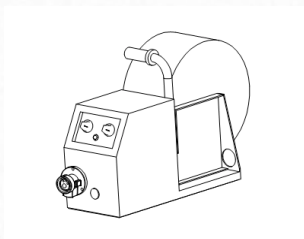
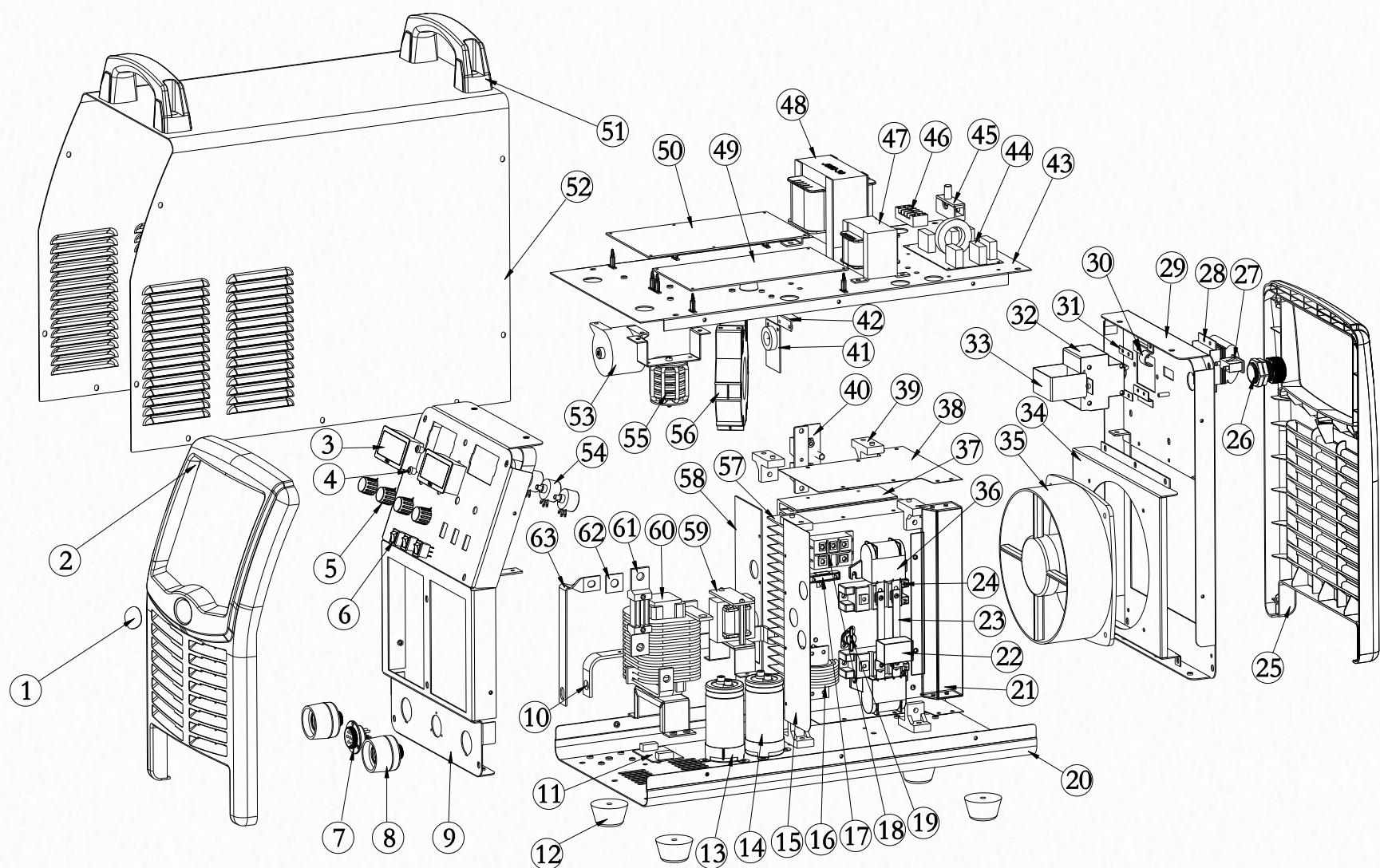
7

Electrical schematic

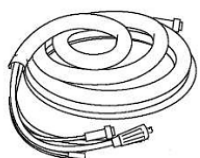


8

Parts list



10048405



The connection components include the control wire for wire feeder, welding cable for wire feeder, gas hose and bushing.

Control wire for wire feeder (5.2m) 10003902 Welding cable for wire feeder (5m) 10003912

Gas hose (6.5m) 10048476 Bushing (4.5m) 10011008

No.	Part no	Description	No.	Part no	Description
1	10019356	Trademark stickers	32	10004925	Switch
2	10039142	Moulded case front panel	33	10016137	Switch angle support
3	10006797	Digital display meter	34	10039104	Fan bracket
4	10027708/ 10043800	Indicator light	35	10043651	Fan
5	10004918	Knob	36	10005910	Filter capacitor
6	10004944	Switch	37	10016301	Heatsink
7	10004694	Seven pin socket	38	10043865	Air deflector
8	10028782	Quick socket	39	10016565	Support
9	10044489	Front panel	40	10006643	Diode module
10	10043867	Output connector	41	10040066	Current sample board
11	10043652	Absorption plate	42	10016634	Current sampling board support
12	10016490	Rubber feet	44	10026027	EMC board
13	10040011	Capacitor fixing hoop	45	10006405	Holder
14	10005752	Polypropylene capacitor	46	10004960	Wiring connector
15	10043863	Air deflector I	47	10047581	Power frequency transformer
16	10002052	Filter inductor	48	10047582	Power frequency transformer
17	10001769	Three-phase rectifier bridge mount	49	10048259	Main control board
18	10006635	Three-phase rectifier bridge	50	10039897	Wire feeding plate
19	10006443	Thermal switch	51	10027491	Handle
20	10043868	Base panel	52	10043859	Machine cover
21	10013627	Wind deflector	53	10005914	Non-inductive capacitance
22	10006000	Thin film capacitor	54	10043112	Potentiometer
23	10028065	IGBT Copper fittings	55	10002059	Saturation inductance component
24	10007254	IGBT module	56	10039921	Main transformer
25	10039141	Moulded case rear panel	57	10028069	Heat sink
26	10004895	Cable gland	58	10043864	Air deflector
27	10004744	Socket	59	10002043	Energy storage inductor component
28	10027470	Waterproof cover	60	10040050	Reactor
29	10045720	Rear panel1	61	10026535	Shunt
30	10016621	Cable clamp	62	10015778	Copper aluminum fittings
31	10027473	Tablet	63	10043866	Output connector

JM MIG Series MIG/MAG/MMA WELDING MACHINE

Order code JM-400S (MIG 400S)

© Wilkinson Star Limited

Issue 2 August 2014

Product is subject to change without notice