RIVAL

TIG 185 DC

Operating Manual

EN

Welcome to a better way of welding.

Congratulations on purchasing the Ryval TIG 185 DC welding machine. The products in Ryval's manual metal arc range perform with reliability and have the backing of one of the world's leading suppliers of welding products.

This operating manual provides the basic knowledge required for MMA and DC TIG welding, as well as highlighting important areas of how to operate the TIG 185 DC welding machine.

For more information or support please contact your local Ryval supplier.

EN

Contents.

1. Recommended safety precautions.

1.1 Health hazard information

The actual process of welding is one that can cause a variety of hazards. All appropriate safety equipment should be worn at all times, i.e. headwear, respiratory, hand and body protection. Electrical equipment should be used in accordance with the manufacturer's recommendations.

Eyes
The process produces ultraviolet rays that can injure and cause permanent damage. Fumes can cause irritation.

Skin
Arc rays are dangerous to uncovered skin.

Inhalation
Welding fumes and gases are dangerous to the health of the operator and to those in close proximity. The aggravation of pre-existing respiratory or allergic conditions may occur in some workers. Excessive exposure may cause conditions such as nausea, dizziness, dryness and irritation of eyes, nose and throat.

1.2 Personal protection

Respiratory
Confined space welding should be carried out with the aid of a fume respirator or air supplied respirator.
- You must always have enough ventilation in confined spaces. Be alert to this at all times.
- Keep your head out of the fumes rising from the arc.
- Fumes from the welding of some metals could have an adverse effect on your health. Don't breathe them in. If you are welding on material such as stainless steel, nickel, nickel alloys or galvanised steel, further precautions are necessary.
- Wear a respirator when natural or forced ventilation is not good enough.

Eye protection
A welding helmet with the appropriate welding filter lens for the operation must be worn at all times in the work environment. The welding arc and the reflecting arc flash gives out ultraviolet and infrared rays. Protective welding screen and goggles should be provided for others working in the same area.

Clothing
Suitable clothing must be worn to prevent excessive exposure to UV radiation and sparks. An adjustable helmet, flameproof loose fitting cotton clothing buttoned to the neck, protective leather gloves, spats, apron and steel capped safety boots are highly recommended.

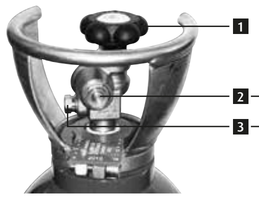
Recommended filter shades for arc welding

Less than 150 amps	Shade 10*
150 to 250 amps	Shade 11*
250 to 300 amps	Shade 12
300 to 350 amps	Shade 13
Over 350 amps	Shade 14

* Use one shade darker for aluminium

1.3 Cylinder safety

1 Cylinder valve hand-wheel, 2 Back-plug, 3 Bursting disc



Backview of typical cylinder valve

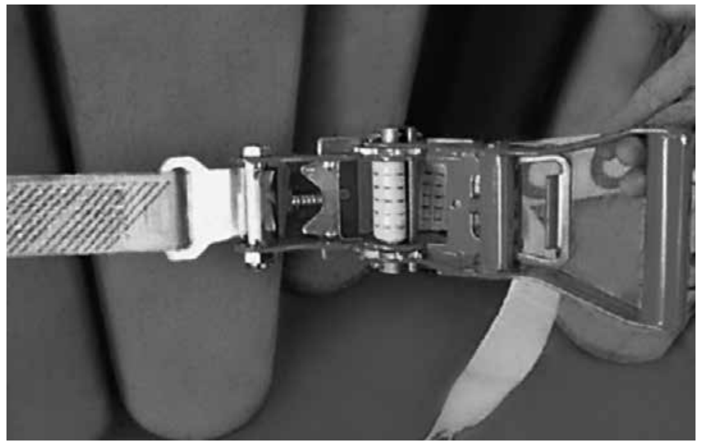

Operator wearing personal protective equipment (PPE) in safe position

Ten points about cylinder safety
1. Read labels and Material Safety Data Sheet (MSDS) before use.
2. Store upright and use in well ventilated, secure areas away from pedestrian or vehicle thoroughfare.
3. Guard cylinders against being knocked violently or being allowed to fall.
4. Wear safety shoes, glasses and gloves when handling and connecting cylinders.
5. Always move cylinders securely with an appropriate trolley. Take care not to turn the valve on when moving a cylinder.
6. Keep in a cool, well-ventilated area, away from heat sources, sources of ignition and combustible materials, especially flammable gases.

7. Keep full and empty cylinders separate.
8. Keep ammonia-based leak detection solutions, oil and grease away from cylinders and valves.
9. Never use force when opening or closing valves.
10. Don't repaint or disguise markings and damage. If damaged, return cylinders to Ryval immediately.

Cylinder valve safety
When working with cylinders or operating cylinder valves, ensure that you wear appropriate protective clothing – gloves, boots and safety glasses. When moving cylinders, ensure that the valve is not accidentally opened in transit.

Before operating a cylinder valve:
- Ensure that the system you are connecting the cylinder into is suitable for the gas and pressure involved.
- Ensure that any accessories (such as hoses attached to the cylinder valve, or the system being connected to) are securely connected. A hose, for example, can potentially flail around dangerously if it is accidentally pressurised when not restrained at both ends.
- Stand to the side of the cylinder so that neither you nor anyone else is in line with the back of the cylinder valve. This is in case a back-plug is loose or a bursting disc vents. The correct stance is shown in the diagram.



When operating the cylinder valve:
- Open it by hand by turning the valve hand-wheel anti-clockwise. Use only reasonable force.
- Ensure that no gas is leaking from the cylinder valve connection or the system to which the cylinder is connected. Do not use ammonia based leak detection fluid as this can damage the valve. Approved leak detection fluid can be obtained from your Ryval supplier.
- When finished with the cylinder, close the cylinder valve by hand by turning the valve hand-wheel in a clockwise direction. Use only reasonable force.

Remember NEVER tamper with the valve. If you suspect the valve is damaged, DO NOT use it. Report the issue to Ryval and arrange for the cylinder to be returned to Ryval.

1.4 Electrical shock

- Never touch 'live' electrical parts
- Always repair or replace worn or damaged parts
- Disconnect the power source before performing any maintenance or service
- Earth all work materials
- Never work in moist or damp areas.

Avoid electric shock by:
- Wearing dry insulated boots
- Wearing dry leather gloves
- Never changing electrodes with bare hands or wet gloves
- Never cooling electrode holders in water
- Working on a dry insulated floor where possible
- Never hold the electrode and holder under your arm.

1.5 User responsibility

- Read the Operating Manual prior to installation of this machine.
- Unauthorised repairs to this equipment may endanger the technician and operator and will void your warranty. Only qualified personnel approved by Ryval should perform repairs.
- Always disconnect mains power before investigating equipment malfunctions.
- Parts that are broken, damaged, missing or worn should be replaced immediately.
- Equipment should be cleaned periodically.

PLEASE NOTE that under no circumstances should any equipment or parts be altered or changed in any way from the standard specification without written permission given by Ryval. To do so, will void the Equipment Warranty.

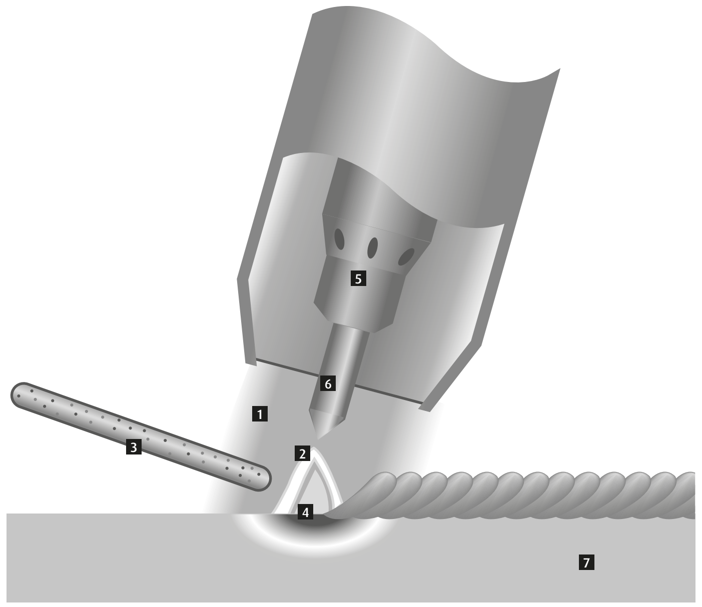
2. Gas Tungsten Arc Welding (GTAW/TIG).

2.1 Introduction

The Tungsten Inert Gas, or TIG process, uses the heat generated by an electric arc struck between a non-consumable tungsten electrode and the workpiece to fuse metal in the joint area and produce a molten weld pool. The arc area is shrouded in an inert or reducing gas shield to protect the weld pool and the non-consumable electrode. The process may be operated autogenously, that is, without filler, or filler may be added by feeding a consumable wire or rod into the established weld pool.

2.2 Process

1 Shielding gas, 2 Arc, 3 TIG filler rod, 4 Weld pool, 5 Collet, 6 Tungsten Electrode, 7 Workpiece



Schematic of the TIG welding process

Direct or alternating current power sources with constant current output characteristics are normally employed to supply the welding current. For DC operation the tungsten may be connected to either output terminal, but is most often connected to the negative pole. The output characteristics of the power source can have an effect on the quality of the welds produced.

Shielding gas is directed into the arc area by the welding torch and a gas lens within the torch distributes the shielding gas evenly over the weld area. In the torch the welding current is transferred to the tungsten electrode from the copper conductor. The arc is then initiated by one of several methods between the tungsten and the workpiece.

During TIG welding, the arc can be initiated by several means:

Scratch start
With this method, the tungsten electrode is physically scratched on the surface of the workpiece and the arc is initiated at the full amperage set by the operator. The incidence of the tungsten melting at the high initiation amperage is high and tungsten inclusions in the weld metal are quite common.

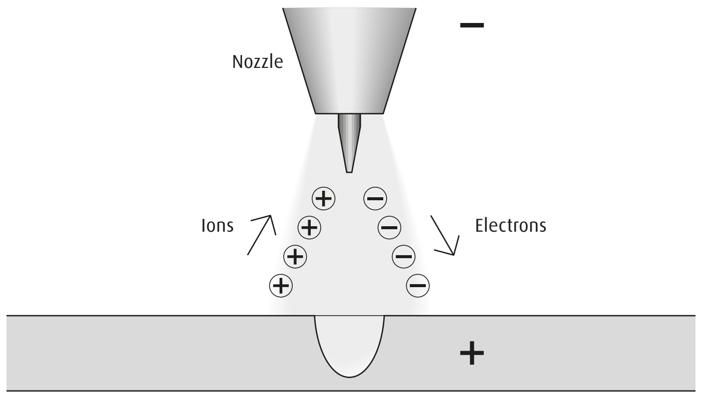
High frequency start
During High Frequency start, the arc will 'jump' towards the workpiece if a critical distance is reached. With this method, there is no incidence of tungsten inclusions happening. High Frequency is only available on certain types of machines and it can affect nearby electronic equipment.

Lift Arc™
During this method of arc initiation, the tungsten is actually touching the workpiece. This occurs at very low amperage that is only sufficient to pre-heat, not melt the tungsten. As the tungsten is moved off the plate, the arc is established. With this method, there is little chance of tungsten inclusion occurring.

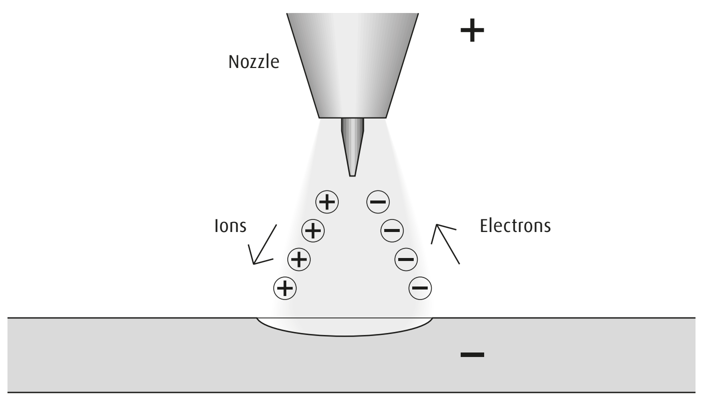
2.3 Process variables

DCEN
When direct-current electrode-negative (straight polarity) is used:
→ Electrons strike the part being welded at a high speed
→ Intense heat on the base metal is produced
→ The base metal melts very quickly
→ Ions from the inert gas are directed towards the negative electrode at a relatively slow rate
→ Direct current with straight polarity does not require post-weld cleaning to remove metal oxides

DCEN – Narrow bead, deep penetration



DCEP – Wide bead, shallow penetration



Use of DCEN
For a given diameter of tungsten electrode, higher amperage can be used with straight polarity. Straight polarity is used mainly for welding:
→ Carbon steels
→ Stainless steels
→ Copper alloys

The increased amperage provides:
→ Deeper penetration
→ Increased welding speed
→ A narrower, deeper, weld bead

DCEP
The DCEP (reverse polarity) is different from the DCEN in the following ways:
→ High heat is produced on the electrode rather than on the base metal
→ The heat melts the tungsten electrode tip
→ The base metal remains relatively cool compared to straight polarity
→ Relatively shallow penetration is obtained
→ An electrode whose diameter is too large will reduce visibility and increase arc instability

Use of DCEP
→ Intense heat means a larger diameter of electrode must be used with DCEP
→ Maximum welding amperage should be relatively low (approximately six times lower than with DCEN)

2.4 Shielding gas selection

Brass	With argon, the arc is stable and there is little smoke.
Cobalt-based alloys	Argon provides a stable, easy-to-control arc.
Copper nickel (Monel)	Argon gives a stable, easy-to-control arc. Also used for welding copper nickel to steel.
Deoxidised copper	Helium is preferred as it helps greatly in counteracting thermal conductivity of copper. A mixture of 75% helium and 25% argon (Alushield Heavy) produces a stable arc, less heat than an arc produced with helium alone.
Nickel alloys (Inconel)	Argon produces a very stable arc. Helium is recommended for automatic welding at high speeds
Mild steel	For manual welding, argon is recommended. Successful welding depends on the skill of the welder. Helium is preferred for: → high speed automatic welding → where deeper penetration than with argon is required → small HAZ
Magnesium alloys	Argon recommended with continuous high frequency AC. Produces good arc stability and good cleaning action
0.5% Molybdenum	Pure argon or helium is recommended. For good welding ductility, welding must be carried out in a draught-free area.
Silicon bronze	Argon decreases internal tension in base metal and in the weld since there is less penetration with this gas compared to helium.
Stainless steel	Argon is the most commonly used gas for stainless steel. Helium can be used if better penetration is required.
Titanium alloys	Argon produces a stable arc. Helium is recommended for high speed welding.

2.5 Consumable selection

Filling rod

Filler rod diameter (mm)	Thickness of metal (mm)
2	0.5–2
3	2–5
4	5–8
4 or 5	8–12
5 or 6	12 or more

2.6 Non-consumable tungstens – tungsten electrode selector chart

Copper alloys, Cu-NI alloys and nickel alloys

Thickness range	Desired results	Welding current	Electrode type	Shielding gas	Tungsten performance characteristics
All	General purpose	DCSP	2% Thoriated (EW-Th2)	75% Argon/ 25% Helium	Best stability at medium currents. Good arc starts. Medium tendency to spit. Medium erosion rate.
			2% Ceriated (EW-Ce2)	75% Argon/ 25% Helium	Low erosion rate. Wide current range. AC or DC. No spitting. Consistent arc starts. Good stability.
Only thin sections	Control penetration	ACHF	Zirconiated (EW-Zr)	Argon	Use on lower currents only. Spitting on starts. Rapid erosion rates at higher currents.
Only thick sections	Increase penetration or travel speed	DCSP	2% Ceriated (EW-Ce2)	75% Argon/ 25% Helium	Low erosion rate. Wide current range. AC or DC. No spitting. Consistent arc starts. Good stability.

Mild steels, carbon steels, alloy steels, stainless steels and titanium alloys

Thickness range	Desired results	Welding current	Electrode type	Shielding gas	Tungsten performance characteristics
All	General purpose	DCSP	2% Thoriated (EW-Th2)	75% Argon/ 25% Helium	Best stability at medium currents. Good arc starts. Medium tendency to spit. Medium erosion rate.
			2% Ceriated (EW-Ce2)	75% Argon/ 25% Helium	Low erosion rate. Wide current range. AC or DC. No spitting. Consistent arc starts. Good stability.
			2% Lanthanated (EWG-La2)	75% Argon/ 25% Helium	Lowest erosion rate. Widest current range on DC. No spitting. Best DC arc starts and stability.
Only thin sections	Control penetration	ACHF	Zirconiated (EW-Zr)	Argon	Use on lower current only. Spitting on starts. Rapid erosion rates at higher currents.
Only thick sections	Increase penetration or travel speed	DCSP	2% Ceriated (EW-Ce2)	75% Argon/ 25% Helium	Low erosion rate. Wide current range. No spitting. Consistent arc starts. Good stability.
			2% Lanthanated (EWG-La2)	Helium	Lowest erosion rate. Highest current range. No spitting. Best DC arc starts and stability.

3. Manual Metal Arc Welding (MMAW).

3.1 Introduction

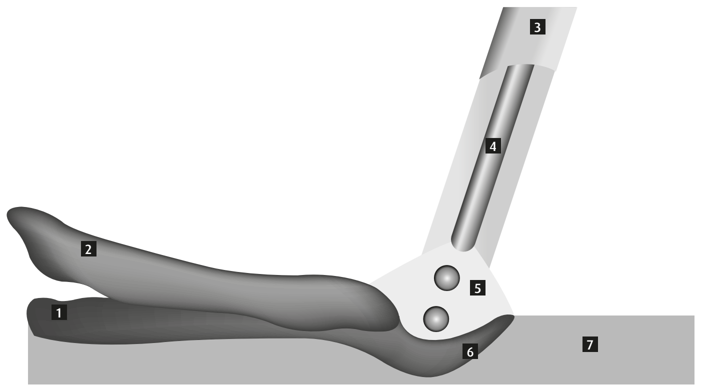
The main purpose of this manual is to help the welder with limited experience to obtain a better understanding of the process, and to acquire a reasonable degree of proficiency in the least possible time. Even welders with experience may benefit from the information in this manual.

3.2 Process

Manual Metal Arc welding is the process of joining metals where an electric arc is struck between the metal to be welded (parent metal) and a flux-coated filler wire (the electrode). The heat of the arc melts the parent metal and the electrode which mix together to form, on cooling, a continuous solid mass.

Before arc welding can be carried out, a suitable power source is required. Two types of power sources may be used for arc welding, direct current (DC) or alternating current (AC).

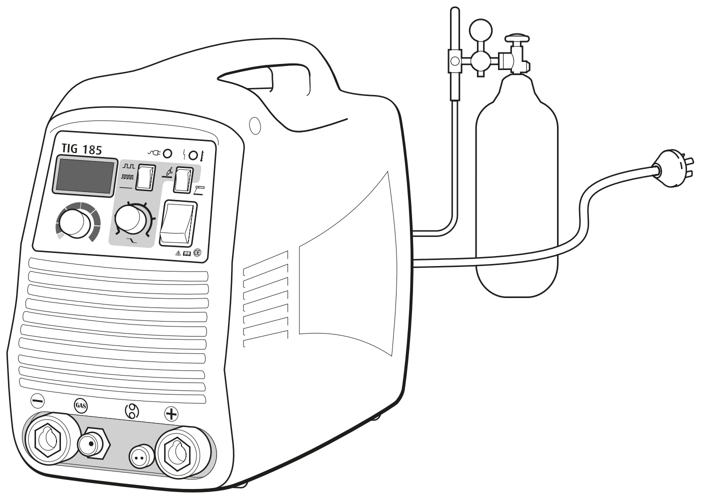
1 Weld metal, 2 Slag, 3 Flux covering, 4 Core wire, 5 Arc, 6 Weld pool, 7 Workpiece



The essential difference between these two power sources is that, in the case of DC, the current remains constant in magnitude and flows in the same direction. Similarly, the voltage in the circuit remains constant in magnitude and polarity (i.e. positive or negative).

In the case of AC however, the current flows first in one direction and then the other. Similarly, the voltage in the circuit changes from positive to negative with changes in direction of current flow. This complete reversal is called a 'half cycle' and repeats as long as the current flows. The rate of change of direction of current flow is known as the 'frequency' of the supply and is measured by the number of cycles completed per second.

3.3 Welding machine



Basic welding machine and cables

The choice of welding machine is based mostly on the following factors:

→ primary voltage, e.g. 240 volt or 380 volt
→ output amperage required, e.g. 140 amps
→ output required, e.g. AC or DC +/-
→ duty cycle required, e.g. 35% @ 140 amps
→ method of cooling, e.g. air-cooled or oil-cooled method of output amperage control, e.g. tapped secondary lugs
→ infinitely variable control

Having decided on a welding machine, appropriate accessories are required. These are items such as welding cables, clamps, electrode holder, chipping hammer, helmet, shaded and clear lenses, skull cap, gloves and other personal protective equipment.

3.4 Welding technique

Successful welding depends on the following factors:
- → selection of the correct electrode
- → selection of the correct size of the electrode for the job
- → correct welding current
- → correct arc length
- → correct angle of electrode to work
- → correct travel speed
- → correct preparation of work to be welded

3.5 Electrode selection

As a general rule the selection of an electrode is straight forward, in that it is only a matter of selecting an electrode of similar composition to the parent metal. It will be found, however, that for some metals there is a choice of several electrodes, each of which has particular properties to suit specific classes of work. Often, one electrode in the group will be more suitable for general applications due to its all round qualities.

Electrode size
The size of the electrode is generally dependent on the thickness of the section being welded, and the larger the section the larger the electrode required. In the case of light sheet the electrode size used is generally slightly larger than the work being welded. This means that if 1.5 mm sheet is being welded, 2.0 mm diameter electrode is the recommended size. The following table gives the recommended maximum size of electrodes that may be used for various thicknesses of section.

Recommended electrode sizes

Average thickness of plate or section	Maximum recommended electrode diameter
≤ 1.5 mm	2.0 mm
1.5–2.0 mm	2.5 mm
2.0–5.0 mm	3.15 mm
5.0–8.0 mm	4.0 mm
≥ 8.0 mm	5.0 mm

For further help on choosing the right electrode for your work please contact your local Ryval supplier.

Welding current
Correct current selection for a particular job is an important factor in arc welding. With the current set too low, difficulty is experienced in striking and maintaining a stable arc. The electrode tends to stick to the work, penetration is poor and beads with a distinct rounded profile will be deposited.

Excessive current is accompanied by overheating of the electrode. It will cause undercut, burning through of the material, and give excessive spatter. Normal current for a particular job may be considered as the maximum which can be used without burning through the work, overheating the electrode or producing a rough spattered surface, i.e. the current in the middle of the range specified on the electrode package is considered to be the optimum.

In the case of welding machines with separate terminals for different size electrodes, ensure that the welding lead is connected to the correct terminal for the size electrode being used. When using machines with adjustable current, set on the current range specified.

The limits of this range should not normally be exceeded.

Arc length
To start the arc, the electrode should be gently scraped on the work until the arc is established. There is a simple rule for the proper arc length; it should be the shortest arc that gives a good surface to the weld. An arc that is too long reduces penetration, produces spatter and gives a rough surface finish to the weld. An excessively short arc will cause sticking of the electrode and rough deposits that are associated with slag inclusions.

For downhand welding, it will be found that an arc length not greater than the diameter of the core wire will be most satisfactory. Overhead welding requires a very short arc, so that a minimum of metal will be lost. Certain Ryval electrodes have been specially designed for ‘touch’ welding. These electrodes may be dragged along the work and a perfectly sound weld is produced.

Electrode angle
The angle which the electrode makes with the work is important to ensure a smooth, even transfer of metal. The recommended angles for use in the various welding positions are covered later.

Correct travel speed
The electrode should be moved along in the direction of the joint being welded at a speed that will give the size of run required. At the same time the electrode is fed downwards to keep the correct arc length at all times.

Correct travel speed for normal welding applications varies between approximately 125–375 mm per minute, depending on electrode size, size of run required and the amperage used.

Excessive travel speeds lead to poor fusion, lack of penetration, etc. Whilst too slow a rate of travel will frequently lead to arc instability, slag inclusions and poor mechanical properties.

Correct work preparation
The method of preparation of components to be welded will depend on equipment available and relative costs. Methods may include sawing, punching, shearing, lathe cut-offs, flame cutting and others. In all cases edges should be prepared for the joints that suit the application. The following section describes the various joint types and areas of application.

3.6 Types of joints

This system is capable of several types of weld, from Butt through to Fillet welds.

4. Package contents.

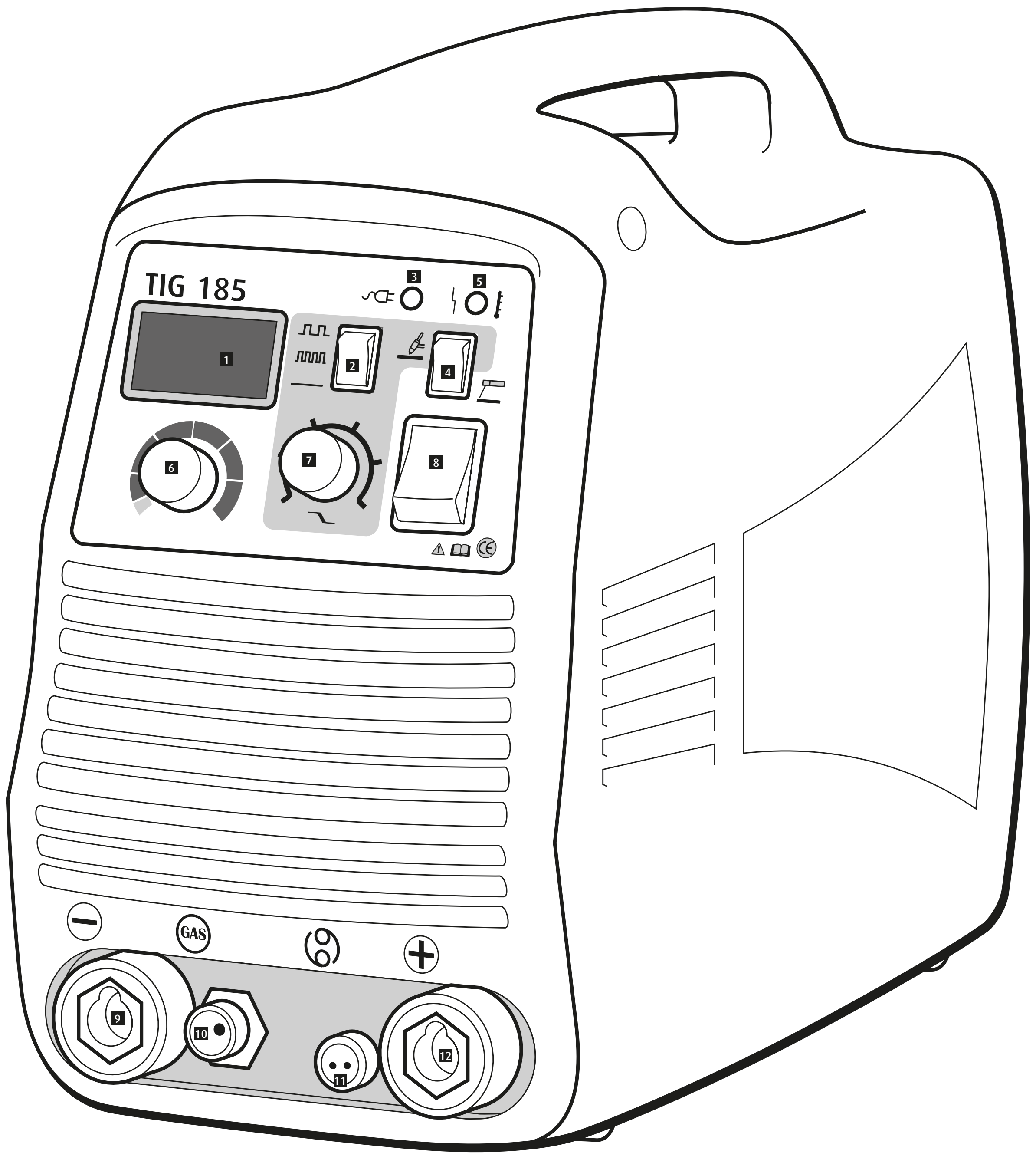
Package contents

→ TIG 185 DC welding machine
→ Power cable and plug
→ MMA electrode holder 300A
→ Earth clamp and return lead
→ TIG torch and gas outlet connections
→ Operating manual.

5. Control panel.

Front panel layout

1 Current meter, 2 Pulse frequency switch, 3 Power indicator light, 4 MMA/TIG switch, 5 Over-heating indicator, 6 Current selection knob, 7 Downslope adjustment, 8 On/off switch, 9 Negative dinse connector, 10 Gas output, 11 Contactor control, 12 Positive dinse connector



6. TIG 185 DC operation.

6.1 Power

The machine is designed to operate on a 240V ± 15% input single phase AC outlet. Ensure that there is adequate ventilation around the machine when it is connected to the mains power supply.

6.2 Shielding gas

When working the machine in the TIG mode of welding the process requires a shielding gas. The shielding gas can be supplied via a pressure regulator to the machine from either a fixed installation or single cylinder of gas.

If a cylinder of gas is used, please ensure that the cylinder is securely fastened before starting any welding operation.

Refer to the application section for the selection of the correct shielding gas.

6.3 TIG torch connection

The TIG 185 DC machine is rated at 200A at 60% duty cycle.

- → The torch is fitted to the machine by means of the Safe Lock dinse back end. For DC (–) TIG operation, [9] fit the torch back end to the negative dinse connection. Similarly for DC (+), [12] fit the torch back end to the positive dinse connection.
- → The gas hose is fitted to the gas fitting (GAS) located on the front bottom panel of the machine. [10]
- → The contactor lead is fitted to the contactor control fitting marked. [11]

6.4 MMA operation

The TIG 185 DC can be used as a MMA welding machine by fitting an electrode holder and work return lead to the respective dinse connectors [9] + [12] (dependant on the type of electrodes being used. Please consult the packaging supplied by the manufacturer for correct polarities).

When using your TIG 185 DC machine in the MMA mode, ensure that the TIG/MMA selector switch is in the MMA position. [4]

6.5 TIG welding operation

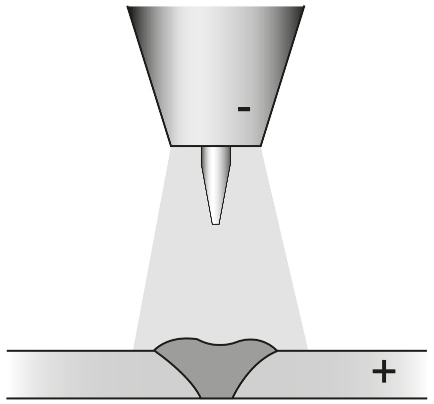
The TIG 185 DC is fitted with a High Frequency (HF) start mode. The arc will be initiated by keeping a distance of 2–4 mm between the workpiece and the tungsten. The HF will be initiated by depressing the contactor switch. Once the arc is initiated, the HF will automatically turn off.

EN

6.5.1 For direct current (DC) TIG welding

Select the correct size and type of non-consumable tungsten and shielding gas for the application.

For DC– applications (most commonly used polarity) connect the TIG torch to the negative Dinse plug connector and the work return lead to the positive dinse plug connector.



GTAW with DCEN produces deep penetration because it concentrates the heat in the joint area. No cleaning action occurs with this. The heat generated by the arc using this polarity occurs in the work thus a smaller electrode can be used as well as a smaller gas cup and gas flow. The more concentrated arc allows for faster travel speeds.

For DC+ applications connect the TIG torch to the positive dinse plug connector and the work return lead to the negative dinse plug connector. In this mode most of the heat is generated within the non-consumable tungsten and the heat input into the plate is reduced resulting in lower penetration depths. Larger tungstens are normally selected for this application.

Ensure that the MMA/TIG selector switch is in the TIG position. [4]

6.5.2 For DC pulse TIG welding

DC welding of thin material can further be enhanced by using the pulse mode. When using the pulse mode for DC applications, the current will be varied between the welding current and a pre-selected background current. Additionally, the pulse frequency can be adjusted. By adjusting the pulse frequency, the optimum heat input for a particular application can be obtained.

The TIG 185 DC has two pre-selected pulse frequencies. These can be selected by setting the pulse frequency switch [2] to low frequency (2Hz) or high frequency (200Hz). As a general rule, increasing the frequency will increase the heat input into the plate.

6.5.3 Downslope control

The downslope of the welding current can be adjusted by adjusting the Downslope Adjustment Control. [7] By increasing the downslope control time, it allows for better crater filling characteristics.

7. Technical specifications.

Specifications	MMA	TIG
Part no.	Ryval DC TIG 185	Ryval DC TIG 185
Power voltage AC	AC 240V±15%	AC 240V±15%
Frequency	50/60 Hz	50/60 Hz
No-load voltage	61 V	61 V
Rated input current	30.1 A	25,6 A
Output current	10 to 160 A	10 to 185 A
Rated output voltage	26.4 V	18 V
Duty cycle	60% at 150 A 100% at 114 A	70% at 185 A 100% at 170 A
No-load loss	40 W	40 W
Arc initiation	HF	HF
Efficiency	80%	80%
Power factor	0.73	0.73
Insulation grade	F	F
Housing protection grade	IP21	IP21
Weight	8.4 kg	8.4 kg
Dimensions L x W x H	430 x 185 x 306 mm	430 x 185 x 306 mm

EN

8. Troubleshooting guide.

Problem	Cause	Solution
Excessive electrode consumption	Inadequate gas flow	Increase gas flow
	Improper size electrode for current required	Use larger electrode
	Operating of reverse polarity	Use larger electrode or change polarity
	Electrode contamination	Remove contaminated portion, then prepare again
	Excessive heating inside torch	Replace collet. Try wedge collet or reverse collet
	Electrode oxidising during cooling	Increase downslope
	Shield gas incorrect	Change to Argon (no oxygen or CO_2)
Erratic arc	Incorrect voltage (arc too long)	Maintain short arc length
	Current too low for electrode size	Use smaller electrode or increase current
	Electrode contaminated	Remove contaminated portion, then prepare again
	Joint too narrow	Open joint groove
	Contaminated shield gas. Dark stains on the electrode or weld bead indicate contamination	The most common cause is moisture or aspirated air in gas stream. Use welding grade gas only. Find the source of the contamination and eliminate it promptly
	Base metal is oxidised, dirty or oily	Use appropriate chemical cleaners, wire brush, or abrasives prior to welding
Inclusion of tungsten or oxides in weld	Poor scratch starting technique	Many codes do not allow scratch starts. Use copper strike plate. Use high frequency arc starter
	Excessive current for tungsten size used	Reduce the current or use larger electrode
	Accidental contact of electrode with puddle	Maintain proper arc length
	Accidental contact of electrode to filler rod	Maintain a distance between electrode and filler metal
	Using excessive electrode extension	Reduce the electrode extension to recommended limits
	Inadequate shielding or excessive drafts	Increase gas flow, shield arc from wind, or use gas lens
	Wrong gas	Do not use ArO_2 or $ArCO_2$ GMAW (MIG) gases for TIG welding
	Heavy surface oxides not being removed	Use wire brush and clean the weld joint prior to welding

Problem	Cause	Solution
Porosity in weld deposit	Entrapped impurities, hydrogen, air, nitrogen, water vapour	Do not weld on wet material. Remove condensation from line with adequate gas pre-flow time
	Defective gas hose or loose connection	Check hoses and connections for leaks
	Filler material is damp (particularly aluminium)	Dry filler metal in oven prior to welding
	Filler material is oily or dusty	Replace filler metal
	Alloy impurities in the base metal such as sulfur, phosphorous, lead and zinc	Change to a different alloy composition which is weldable. These impurities can cause a tendency to crack when hot
	Excessive travel speed with rapid freezing of weld trapping gases before they escape	Lower the travel speed
	Contaminated shield gas	Replace the shielding gas
Cracking in welds	Hot cracking in heavy section or with metals which are hot shorts	Preheat. Increase weld bead cross-section size. Change weld bead contour. Use metal with fewer alloy impurities
	Crater cracks due to improperly breaking the arc or terminating the weld at the joint edge	Reverse direction and weld back into previous weld at edge. Use Amprak or foot control to manually downslope current
	Post weld cold cracking due to excessive joint restraint, rapid cooling or hydrogen embrittlement	Preheat prior to welding. Use pure or non-contaminated gas. Increase the bead size. Prevent craters or notches. Change the weld joint design
	Centreline cracks in single pass weld	Increase bead size. Decrease root opening. Use preheat. Prevent craters
	Underbead cracking from brittle microstructure	Eliminate sources of hydrogen, joint restraint and use preheat
Inadequate shielding	Gas flow blockage or leak in hoses or torch	Locate and eliminate the blockage or leak
	Excessive travel speed exposes molten weld to atmospheric contamination	Use slower travel speed or carefully increase the flow rate to a safe level below creating excessive turbulence. Use a trailing shield cup
	Wind or drafts	Set up screens around the weld area
	Excessive electrode stickout	Reduce electrode stickout. Use a larger size cup
	Excessive turbulence in gas stream	Change to gas safer parts or gas lens parts
Arc blow	Induced magnetic field from DC weld current	Rearrange the split ground connection
	Arc is unstable due to magnetic influence	Reduce weld current and use arc length as short as possible
	Cup shattering or cracking in use	Change cup size or type. Change tungsten position
Short parts life	Short collet life	Ordinary style is split and twists or jams Change to wedge style
	Short torch head life	Do not operate beyond rated capacity. Use water cooled model. Do not bend rigid torches

9. Periodic maintenance.

WARNING

Only authorised electricians should carry out repairs and internal servicing.

Modification of the primary input plug or fitment of a lower rated primary input plug will render the warranty null and void.

The working environment or amount of use the machine receives should be taken into consideration when the planning maintenance frequency of your system.

Preventative maintenance will ensure trouble-free welding and increase the life of the machine and its consumables.

9.1 Daily maintenance

Perform the following maintenance daily:

- Clean the electrode holder and TIG torch's gas nozzle. Replace damaged or worn parts.
- Check the TIG torch's electrode. Replace or sharpen, if necessary.
- Check the tightness of welding and earth cable connections.
- Check the condition of mains and welding cables and replace damaged cables.
- See that there is enough space in front of and back of the unit for ventilation.

9.2 Regular power source maintenance

- Check the electrical connections of the unit at least twice a year.
- Clean oxidised connections and tighten.
- Inner parts of the machine should be cleaned with a vacuum cleaner and soft brush.
- Do not use any pressure-washing devices.
- Do not use compressed air as pressure may pack dirt even more tightly into components.

10. Warranty information.

10.1 Terms of warranty

The TIG 185 DC machine has a limited warranty that covers manufacturing and material defects only. The warranty is affected on the day of purchase and does not cover any freight, packaging and insurance costs. Verbal promises that do not comply with the terms of warranty are not binding on the warrantor.

10.2 Limitations on warranty

The following conditions are not covered under terms of warranty: loss or damage due to or resulting from natural wear and tear, non-compliance with operating and maintenance instructions, connection to incorrect or faulty voltage supply (including voltage surges outside equipment specs), incorrect gas pressure overloading, transport or storage damage or fire or damage due to natural causes (e.g. lightning or flood). This warranty does not cover direct or indirect expenses, loss, damage or costs including, but not limited to, daily allowances or accommodation and travelling costs.

Modification of the primary input plug or fitment of a lower rated primary input plug will render the warranty null and void.

NOTE

Under the terms of warranty, welding torches and their consumables are not covered. Direct or indirect damage due to a defective product is not covered under the warranty. The warranty is void if changes are made to the product without approval of the manufacturer, or if repairs are carried out using non-approved spare parts. The warranty is void if a non-authorised agent carries out repairs.

10.3 Warranty period

The warranty is valid for 12 months from the date of purchase provided the machine is used within the published specification limits.

10.4 Warranty repairs

A Ryval approved service provider must be informed within the warranty period of any warranty defect. The customer must provide proof of purchase and serial number of the equipment when making a warranty claim. Warranty repairs may only be carried out by approved Ryval service providers. Please contact your local Ryval supplier for more information.

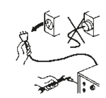
11. Recommended safety guidelines.

Some safety precautions Ryval recommends are as follows:

→ Repair or replace defective cables immediately.
→ Never watch the arc except through lenses of the correct shade.
→ In confined spaces, adequate ventilation and constant observation are essential.
→ Leads and cables should be kept clear of passageways.
→ Keep fire extinguishing equipment at a handy location in the shop.
→ Keep primary terminals and live parts effectively covered.
→ Never strike an electrode on any gas cylinder.
→ Never use oxygen for venting containers.

Diagram and safety explanation

Electrical safety alert	
Welding electrode causing electric shock	
Fumes and gases coming from welding process	
Welding arc rays	
Read instruction manual	
Become trained	

Wear dry, insulated gloves	
Insulate yourself from work and ground	
Disconnect input power before working on equipment	
Keep head out of fumes	
Use forced ventilation or local exhaust to remove fumes	
Use welding helmet with correct shade of filter	

BOC
Customer Service Centre, Priestley Road, Worsley, Manchester M28 2UT
custserv@boc.com

ISS/506695/UKS/1213