

How to set up & start using a MIG welder

How to choose a MIG set, tune it in and weld perfect seams

YOU WILL NEED...

EQUIPMENT MIG welding set, gas and regulator, mask, gauntlets, degreaser, angle grinder.

TIME (HRS) **5**
MONEY (£) FROM **500**

DIFFICULTY RATING



practical CLASSICS



THIN METAL

Making strong and good-looking welds on car bodywork means using just enough heat to fuse the metal together without blowing holes or causing too much distortion.

THICK METAL

Welding chunkier steel requires the input of lots of heat to ensure full fusion. A happy weld sounds like frying bacon.

TRIAL AND ERROR

Don't worry if things look ugly to begin with – it all comes with practice.

Welding is a near-essential skill if you're an old car enthusiast. Whether you're undertaking a full restoration or helping a daily driver through an MOT, the ability to carry out your own welded repairs will potentially save you a massive amount of money. It's a skill that comes in handy in a wide range of other workshop situations, too.

This particular feature was part of a series about welding in Practical Classics.

We started with MIG welding, which is the most common, versatile and accessible process for home restoration. Other processes are useful in certain situations, too. You can find more information in previous issues of Practical Classics. In this introductory instalment, we cover the basics of setting up your MIG welder and running a simple weld on mild steel. Different joint types and advanced techniques are covered elsewhere.

Choosing a welder

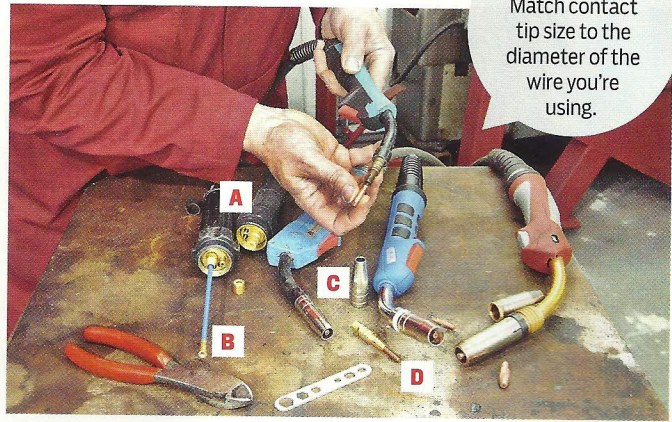
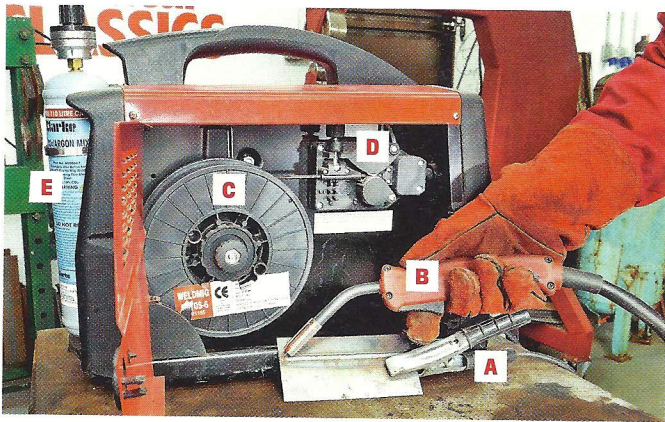
Buy a decent MIG welding set – avoid cheap sets that have constantly live torches or that don't have cooling fans. Make sure its minimum current is 30 amps or less.

Stay away from budget 'gasless' sets, too – the ugly results will risk putting you off welding forever. Gas is conveniently available in various forms. Generally speaking, the larger the cylinder, the more cost-effective it is.



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PREPARE YOUR WELDER



TECH TIP

Match contact tip size to the diameter of the wire you're using.

1 The welding set

The earth clamp [A] is connected to the work piece. When the torch trigger [B] is pulled, welding wire [C] is fed by motorised rollers [D] to the torch, where it's made live. A shielding gas [E] flows over the work piece. When the wire contacts the metal, it causes a short circuit. This melts the wire and the metal.

2 The torch

Some sets have torches permanently attached, others have a Euro connection [A], which allows torches of different current capacities to be used. Wire is fed through a liner [B]. You can remove the gas shroud [C] and contact tip [D]. The tip can be recessed for thin metals or flush for thicker material.



3 Protective equipment

MIG produces UV radiation and hot spatter. Get a welding mask that attaches to your head, as you'll need both your hands. An auto version is best. Wear overalls, a skull cap and gauntlets, plus a leather jacket, earplugs and safety spectacles.



TECH TIP

Large spools are more cost-effective than small ones.

4 Welding wire

Wire is sold in 0.7, 5 and 15kg reels. It comes in 0.6, 0.8, 1.0mm and larger diameters. If you're only going to be welding bodywork, go for 0.6mm wire. Otherwise, 0.8mm is most versatile. Buy good quality copper-coated steel wire. Never use rusty wire.



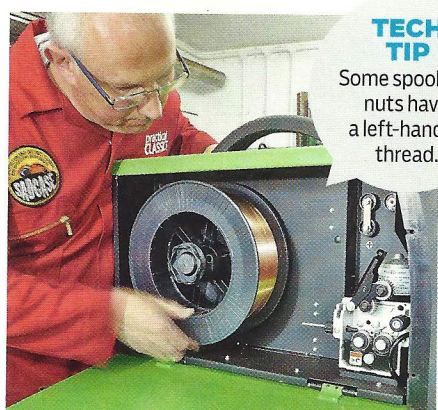
5 Shielding gas

A mix of argon and CO2 is best for mild steel. A 95/5% Ar/CO2 mix is a good all-rounder. Pure CO2 creates a hotter weld, so isn't ideal for thin metal. Disposable cylinders are convenient, but expensive. Larger cylinders can be connected with an adaptor.



6 Set gas flow

Slowly open the main valve. The gauges read cylinder pressure and flow rate. Release the wire tension and pull the trigger. Screw in the regulator until the flow gauge reads 10-15 litres per minute... lower for small shrouds; higher if there's a breeze.



TECH TIP

Some spool hub nuts have a left-handed thread.

7 Mount the spool

Fit the spool so it unwinds into the wire-feed rollers as directly as possible. Set the hub nut tension so the spool just stops dead after being spun. Detension or unlatch the rollers. One will be grooved. Ensure its markings show the correct wire diameter.



8 Set feed tension

Snip off the wire's end. Feed it through the rollers, then relatch them. Pull the trigger until wire emerges from the torch, then fit the contact tip and shroud. Set the tension so the wire just slips in the rollers when held against your gloved hand.



Theo says

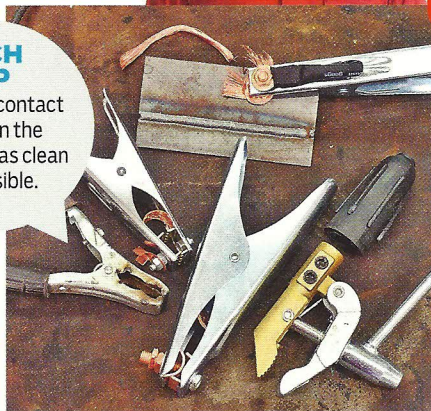
'There are lots of nasties in welding fumes. Try to work in a well-ventilated environment. Ideally, place an extraction unit above the workpiece.'

GET YOUR SETTINGS RIGHT



TECH TIP

Make the contact patch on the workpiece as clean as possible.



1 Prepare test pieces

Make life easy for yourself by starting out on 3-5mm mild steel cut into hand-sized rectangles. Avoid rusty scrap or really thin metal, or you'll give up before you start. Clean off any mill scale with a flap disc in an angle grinder and degrease it thoroughly.

2 Earth clamp

A good earth is essential for a good weld. If you have a cheap welder with a jump lead-style clamp, it's worth investing in a more robust type. Place the clamp as near to the weld as possible. Copper strands will increase the contact area.

3 Voltage and wire speed

All sets are different, but at the heart there will be two main controls: voltage and wire speed. A good weld relies on their correct relationship. Some set have knobs; others buttons. The controls are rarely marked in actual volts or metres/min.



TECH TIP

Synergic sets may need further tweaking, so don't rely on their accuracy.



TECH TIP

Free smartphone apps exist for calculating basic settings.



4 Synergic adjustment

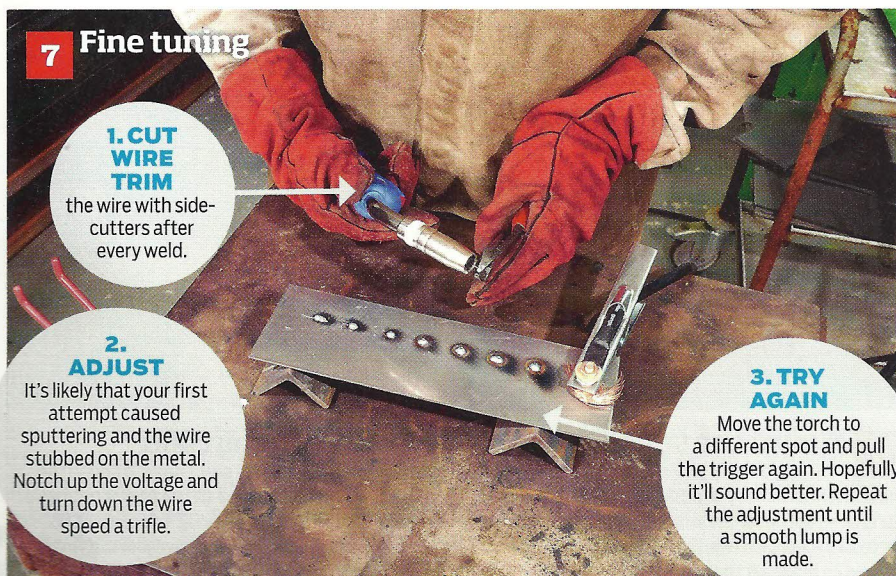
Many modern sets have synergic controls. Some can work out the voltage and wire speed if you tell them the material thickness, wire diameter and gas type. Others maintain a predetermined relationship between voltage and wire speed.

5 Find a basic setting

Begin tuning-in your set with the voltage too low and the wire speed too high. It'll look and sound nasty, but it's a start. As you get used to your set, you'll get better at predicting settings. Some sets come with handy charts to calculate basic settings.

6 Trial weld

Turn on the set, gas and shield. Hold the torch in one hand with your forefinger on the trigger. Steady the torch with your other hand. Hold the torch's contact tip 9-12mm from the surface at the angle shown. Pull the trigger for a few seconds.



7 Fine tuning

1. CUT WIRE TRIM

the wire with side-cutters after every weld.

2. ADJUST

It's likely that your first attempt caused sputtering and the wire stubbed on the metal. Notch up the voltage and turn down the wire speed a trifle.

3. TRY AGAIN

Move the torch to a different spot and pull the trigger again. Hopefully it'll sound better. Repeat the adjustment until a smooth lump is made.

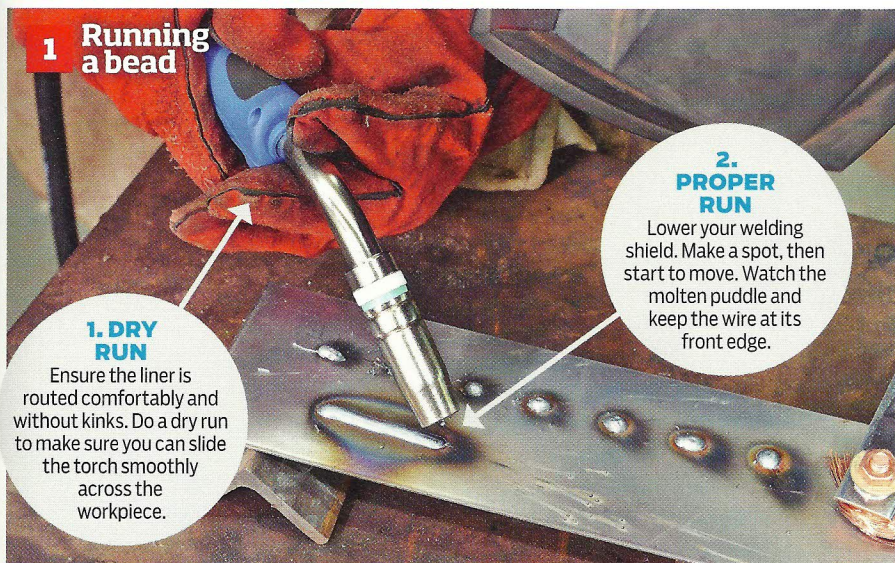


8 Moving the torch

Torch movement is a key factor in producing a strong and good-looking weld. Move it as smoothly as possible. Maintain an even speed, angle and distance from the metal. Pushing rather than pulling the torch allows you to see where you're going.

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RUN A PERFECT BEAD



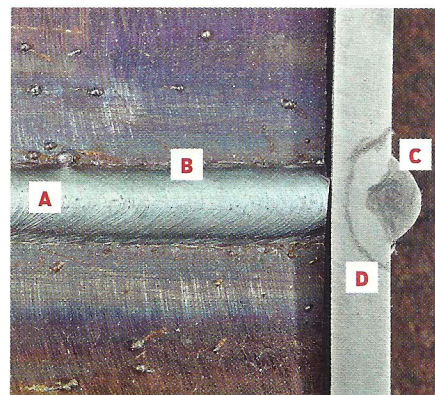
1 Running a bead

1. DRY RUN

Ensure the liner is routed comfortably and without kinks. Do a dry run to make sure you can slide the torch smoothly across the workpiece.

2. PROPER RUN

Lower your welding shield. Make a spot, then start to move. Watch the molten puddle and keep the wire at its front edge.



2 Bead anatomy

This bead face is fairly smooth, though some spatter is evident [A]. The bead height isn't excessive and it's well-fused at the edges [B]. The penetration is OK [C]. The heat-affected zone [D] is too faint to see (we've pencilled it in, here).

WHAT GOES WRONG



1 Voltage

Voltage alters the profile. The bottom bead was welded at recommended settings, the middle 4V higher and the top 4V lower. The low-voltage bead is stringy and has hardly penetrated. The over-voltage bead is wide with no extra penetration.

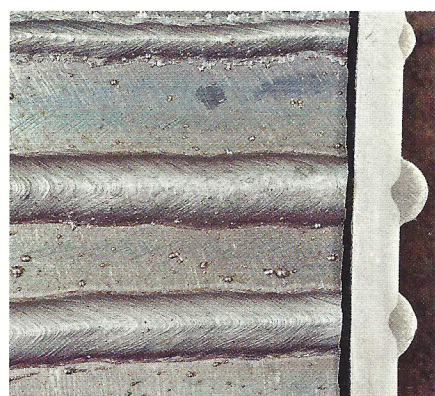
TECH TIP

Too high a wire speed doesn't make a stronger weld – it just wastes wire.



2 Wire speed

The top bead is too slow, the middle is too fast; and the bottom is as recommended. It's difficult not to compensate by moving the torch at a different speed, so the results are subtle. There's a clear variation in bead height, however.



3 Travel speed

If you move too fast (top), the weld pool won't have time to melt the base metal. If you move too slowly (middle), the pool will melt in too much, becoming wide and burning through thin metal. The bottom bead was at the correct speed.



TECH TIP

Being able to see the weld pool is essential for good welding.

4 Torch distance

Holding the torch too far away (top) will result in a poorly-controlled weld with a lack of gas coverage causing porosity. Holding it too close (middle) will obscure the sight of the puddle, making it hard to control. The bottom is weld is correct.

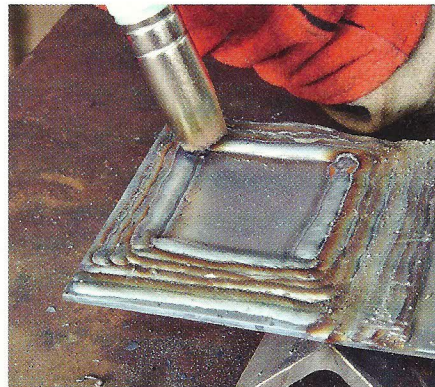
TECH TIP

Low inductance may favour thinner steel; high inductance use of pure CO₂.



5 Inductance

Some welders have variable inductance (the rate at which volts and amps alternate). High 90% inductance (middle) produces a 'wetter' flatter bead; vice versa for low 10% inductance (top). Most welders are set as standard to 35% (bottom).



6 Homework

Weld successive beads on a steel plate. Alternate between push and pull, and left and right hands (this ambidextrousness will be handy for real-world work). Clean out the torch nozzle regularly to prevent a build-up of spatter. ■