SHIELDING GASES

1. Problems faced, due to improper shielding gas or gas mixtures; used during the process of MIG Welding.

   - High Spatter
   - Poor weld appearance
   - Excessive Fumes
   - Low Productivity
   - Rework due to quality rejection

2. Characteristics of various gases used for MIG welding

   - Argon : Produces a quite, smooth arc with excellent metal transfer and minimal spatter.
   - Carbon Di Oxide : Promotes a bowl-like penetration shape for a strong, tough weld. Penetration increases with Carbon di Oxide content.
   - Oxygen : Focuses the arc and gives a final spray. Also increases weld proof fluidity to give faster welding and improved welding with the parent plate, so that the weld blends smoothly into it.

3. Cost components involved in the process of MIG welding.

   - The labour component approx. 60%
   - The wire or consumable usage approx. 32%
   - The shielding gas approx. 1.5%
   - Power consumption approx. 6.5%

4. Conclusion :

   From above table it reveals that reducing the cost of the weld or improving the weld productivity is greatly enhanced by the use of the right shielding gas for the job. The right shielding gas will help to reduce the labour component by –

   - Increasing welding speed.
   - Reducing clean-up time (less spatter).
   - Improving the quality of weld (reduced weld rejection).
   - Reducing inefficient deposition of wire (excessive spatter and convex bead shape).
   - Greater operator satisfaction (is of welding).

SELECTION FOR SHIELDING GAS FOR MIG/TIG WELDING

Gas or Gas Mixture	Application
Oxygen	Welding and cutting
Nitrogen	Freezing, purging, certain steels, plasma cutting.
Helium	TIG welding of non-ferrous metals and alloys. General TIG application.
Argon	Non- toxic, smooth arcs, easy start, little spatter. Used in MIG and TIG welding and in gas mixtures.
Hydrogen	MAG welding of Stainless Steel. Very inflammable
Carbon Di Oxide	Sometimes used on its own for welding. Also mixed with other gases.
Propane	For cutting and heating when used with oxygen
Acetylene	Welding and cutting.
Air(blended)	Cutting
Ar 93% + CO_2 5% + O_2 2%	Thin low carbon steel. Low spatter, pulse arc.
Ar 78% + CO_2 20% + O_2 2%	Thick low carbon steel. Reduced spatter. Not suitable for pulse.
Ar 85% + CO_2 13.5% + O_2 1.5%	Most sections. Low carbon steel. Smooth arc. Minimum spatter. Suitable pulse arcs and has robotic uses.
Ar 92% + CO_2 8%	CO_2 component controls penetration and bead shape for welding strength. Improves wetting and viscosity.
Ar 80% + CO_2 15% + O_2 5%	Oxygen content stabilizes the arc, improves wetting and gives good fusion.
Ar 97-98% + O_2 1-3%	Used for the MIG and MMA welding for stainless steel. Reasonable spatter.
Ar 95-99% + H_2 1-5%	For TIG welding of stainless steels.

TROUBLE SHOOTING GUIDE

Trouble Shooting

Where to begin?

Listen to the customer

Restate the problem to the customer to determine if you have correctly heard what they are saying.

If problem can be solved with literature (Ordering Problem) or other simple means. FIX IT!

If solution to problem will require the help of others from inside or outside our organization – GET THE FACTS.

Weld Parameter

Amps/Volts, Wire Type and Size

Gas mix being used, Flow rate.

Process being used.

DOES IT MAKE SENSE SO FAR?

Study the problem

Has the problem been present for a long time, or is the problem “New”?

If the problem is new, what has changed?

If you are on site can you witness the problem?

Where to end

If you have fixed the problem inform office of “Fix”

Follow up to see if problem has “Stayed Fixed”

If you have not fixed the problem inform office that the problem is out of your hands

Offer solutions

What would YOU do to solve the problem?

Porosity:

Porosity is caused by four main possibilities:

- Base metal Contamination
- Filler metal Contamination
- Atmosphere in the element including gas turbulence.
- Welding Parameters.

Binzel has found that most porosity problems are directly related to a gas problem, followed by problems with base metal contamination.

Problem	Probable Causes	Solution
Base metal	Impurities on base metal	Remove Contamination.
		Use of specific wire / gas mix for specific types of impurities.
Filler Metal	Impurities on filler metal (wire)	Replace wire.
		Install wire-cleaning system.
		Prevent industrial dust/dirt/grit from contaminating the wire during storage or use.
		Remove wire from wire drive unit and store in sealed plastic bag when not in use for long periods.
		Use aluminum wire quickly to prevent build up of aluminum oxide on surface.
Gas Atmosphere in weld	Drafts, wind, fans, etc.	Protect weld area from drafts.
		Use tapered or bottle neck gas nozzles when drafts cannot be avoided.
	Too high gas flow causing turbulence and /or sucking air at connectional points: creating venturi effect at the end of gas nozzle.	Reduce gas flow. Fix all hose connection points.
	Too low gas flow causing insufficient gas coverage.	Increase gas flow.
	Damaged or kinked gas lines.	Repair.
Gas Mixing Apparatus.	Too high oxygen content.	Fix mixer.
	Leaks in gas distribution system.	Fix leaks.

	Other impurities in gas moisture, etc.	Overhaul system fit filters and / or dryers.
	Non-consistent delivery of flow (cfh) at torch connection.	Regulated pressure into flow meter for consistent delivery of cfh.
Gas turbulence.	Excessive spatter build up in gas nozzle / contact tip.	Clean nozzle and tip.
	Nozzle damage causing uneven gas coverage	Change nozzle.
	Torch gas ports clogged or deformed.	Clean or replace.
	Super heated nozzle causing shielding gas to expand rapidly creating return effect at end of nozzle leading to contamination of gas by atmosphere.	Check duty cycle rating of torch. Check for correct water pressure and flow if water-cooled torch is used. Use suitable rated cooler: change to water-cooled gas nozzle.
	Missing gas diffuser nozzle insulator.	Replace.
	Too high gas flow causing venturi effect.	Reduce gas flow.
Porosity	Too long wires stick out gas nozzle too far from weld puddle.	Use longer nozzle.
	Bad torch position – too sharp torch incline causing venturi effect at the end of nozzle leading to atmospheric contamination.	Correct torch angle.
	Excessive wide weld pool for nozzle I.D	Use wider gas nozzle.
	Arc voltage too high.	Reduce voltage.
	Too high travel speed.	Reduce speed.
Erratic wire feed	Slipping feed rolls.	Check that the feed roll size is correct for the wire size being used. Increase the drive roll pressure until the wire feed is even. Do not apply excessive pressure as this can damage the wire surface and may cause copper coating to loosen from steel wires or metal shavings to be formed from soft wires like aluminum which will be drawn into the wire feed conduit and will rapidly clog the liner. When welding with flux-cored

		wires, excessive drive roll pressure may open the wire seam and allow flux or metal powers to escape.
Erratic wire feed	Clogged or worn liner.	Dust, particles of copper, drawing lubricants, metal or flux and other forms of contamination rapidly clog the liner so that the feed is impeded. A liner which has been in use for an extended period of time becomes worn and saturated with dust and must be replaced.
		When changing wire, remove the contact tip from the front end of the gun and blow out the liner with clean, dry compressed air from the back of the gun. Note: Wear safety goggles when using compressed air to clean liner. Insure proper safety procedures are followed to avoid possible serious eye injury.
	Liner too long or too short.	Check the length of the liner and either trim if too long or replace the liner if too short. Proper feed of the welding wire is dependent upon the correct length of the liner. Consult the operating instructions for the gun or contact your local Authorized Binzel Distributor for further information.
	Spatter on wire.	An unprotected coil of wire quickly collects dust and other airborne contamination. If grinding is being performed in the vicinity, particles can become attached to the wire, severely interfering with the wire feed. Replace with clean wire and keep it protected with a cover.
	Coil break incorrectly adjusted.	Set the break so that the coil immediately stops rotating as soon as welding is interrupted. If the brake is applied too hard it will cause the feed rolls to slip, resulting in uneven wire feed. If it is too loose, overrun of the wire will occur, causing tangles of the wire irregular tension in the feed mechanism and irregular arc characteristics.

Problem	Probable Causes	Solution
Unstable Arc	Incorrect setting of voltage and / or current	Set the wire feed in relation to the arc voltage in such a way that the arc burns evenly and stable. In spray arc welding, set the wire feed so that short-circuiting ceases and so that the filler metal is transferred in a spray across the arc.
	Defects in wire feed.	Find the cause of the interference and correct the condition. (See action “Erratic wire feed”.)
	Worn contact tips.	When the opening of the contact tip has become too badly worn the wire will no longer will be in continuous electrical contact, which will result in an unstable arc and an increase in spatter.
	Impurities on the base metal.	Paint, mill scale, rust, silicon scale or flux deposits from the previous weld runs from an insulating layer causing an unstable arc. Clean the surface to be welded.
	Poor contact between ground cable and work piece.	Securely attach the ground cable as close to the point of welding as possible on the work piece. Clean the surfaces to ensure good contact.
	Loose power connection.	Check to ensure welding power connection on the power is tight, the connection on the wire feeder is tight, the connection on the adaptor block is tight, and the connection of the gun to the adaptor block is tight.
	Stick out too long.	Adjust the contact tip to work distance to a minimum of 3/8” for short arc welding with small diameter wires.
Porosity	Drafts, wind, fans, exhaust ducts, etc.	Protect the work piece from drafts with curtains or screens. Drafts can easily draw away the shielding gas from the weld pool leaving it without sufficient gas protection.
	Impurities on the base metal.	Remove all contamination from the surfaces to be welded. Paint, mill scale, rust, grease and other contamination can cause porosity in the weld.
	Unsuitable joint fit-up.	Minimize gaps or provide backing.

Porosity	Spatter in nozzle and on contact tip.	Clean the nozzle and the contact tip regularly. Spatter on these parts causes turbulence on the gas flow, causing air to be become mixed into the shielding gas resulting in porosity. Do not hit the nozzle to remove spatter, use a suitable scraper.
	Too high or too low gas flow rate.	Consult your welding engineer for proper flow rate. Check accuracy of regulator using Binzel Gas checker (P/N 191.0013), which is available from your authorized Alexander Binzel Distributor.
		Too low a gas flow rate gives insufficient protection to the weld pool. Too high a gas flow rate causes turbulence in the gas shield, which in turn can suck in air resulting in porosity.
	Nozzle damaged.	Replace nozzle. A nozzle with uneven edges gives rise to turbulence in the gas flow. Do not hit nozzle to remove spatter, use a suitable scraper
	Too long a stick-out.	Generally, set the stick-out at about 15 times the diameter of the wire being used. If a longer or shorter stick-out than normal is required, consult your Authorized Alexander Binzel Distributor about the availability of special nozzles. Many types are available.
	Misdirected welding gun.	Direct the gun at the weld puddle when critical areas like external corners, edges and joints with wide gaps are encountered. A too sharply inclined welding gun can cause porosity due to misdirection of the shielding gas from the nozzle or air entrapment.
	Excessively wide weld pool in spray arc welding or too high welding speed.	The width of the weld pool should not exceed 1.3 times the diameter of the nozzle. A wider weld pool will be in-sufficiently protected by the shielding gas when the air gets mixed into the outer layer of the gas stream. If necessary, a shielding gas post-flow should be applied. Consult your Authorized Alexander Binzel Distributor about the availability of special nozzles that may help you weld wide joints.

Problem	Probable Causes	Solution
Porosity	Damaged, kinked or leaking gas hose.	Inspect and repair or replace as necessary. Consult your Authorized Alexander Binzel Distributor for genuine Alexander replacement parts.
	Damaged or missing nozzle insulator or gas diffuser.	Inspect and replace as necessary. Consult your Authorized Alexander Binzel Distributor for genuine Alexander replacement parts.
Spatter	Too fast or too slow wire feed in relation to the arc voltage.	Set the wire feed rate and voltage in accordance with good welding practices as recommended by a qualified welding engineer.
	Too long arc.	Adjust the wire feed and voltage so that the arc is in accordance with good welding practice for the joint to be welded. The distance from the welding gun to the work-piece should be about ½" to 1". If the arc is too long there will be spatter, usually in the direction of the weld.
	Damaged contact tip.	If the contact tip becomes worn the filler will not be in constant contact with the arc will become unstable. A contact tip contaminated with spatter will cause uneven wire feed resulting in further spatter.
	Inclination of the welding gun too great.	The angle of the gas nozzle relative to the work-piece should be between 45 to 90 degrees. If the angle is too small, the wire runs parallel to the weld pool, resulting spatter in the direction of welding.
	Faulty power source.	Have the power source checked for faulty conditions such as broken wires or faulty contact.

Problem	Probable Causes	Solution
Spatter	Incorrect start.	A lot spatter occurs if the stick out is too great and if the welding gun is held too far from the work piece when striking the arc. Try to start with as short stick out as possible and with the welding gun as close to the starting point as possible. If a large ball end is formed on the end of the welding wire remove it by cutting the wire with sharp wire cutters. It is helpful if the wire is cut to a point. Always remove the ball end before striking aluminum arc. Check welding ground connection.
	Incorrect pulse parameters.	Consult the user manual for your power supply or a qualified welding engineer.
	Uneven wire feed.	Uneven wire feed gives rise to heavy spatter. Find the cause of the disturbance and correct the condition before proceeding.
	Impurities on the base metal.	Paint, mill scale and other contamination on the base metal form an insulating layer causing an unstable arc, which results in heavy spatter. Clean the surfaces to be welded.
	Poor ground contact.	Inspect ground cable for loose connection, fraying and cuts. Correct the problem areas found and attach the ground cable directly to the work piece after having cleaned the contact surface first. POOR GROUNG CONTACT IS THE MOST COMMON CAUSE OF UNSTABLE MIDGE WELDING CONDITIONS.
	Too long stick out (short arc welding)	The stick out should be 15 times the diameter of the electrode being used. With increasing stick out the current is reduced and the arc voltage rises, giving a longer unstable arc and increased spatter.
	Incorrect polarity.	Check for correct polarity. Follow the electrode manufactures recommendations.

TROUBLE SHOOTING GUIDE – GAS / AIR COOLED GUNS

Problem	Probable Cause	Solution
Gun too hot	Poor ground.	Inspect ground cable for loose connection, fraying and cuts. Correct any problem areas found. Clean cramping area to insure good contact. Securely attach ground cable to work piece as close as possible to the point of welding. Insure good connection to welding power source.
	Loose power connection.	Check to ensure power connection on power source is tight, the connection on the wire feeder is tight, the connection on the adaptor block is tight, and the connection of the gun to the adaptor block is tight.
	Loose Bikox connection.	Remove handle assembly and adaptor support. Check to ensure Bikox connection to the swan neck is tight and the Bikox connection to the adaptor block is tight.
	Damaged Bikox assembly.	Visually inspect the Bikox assembly for cuts and tear's. Replace Bikox assembly if necessary.
	Consumable items loose or worn.	Remove nozzle from gun and inspect contact tip and contact tip holder/ gas diffuser for wear and tightness, replace or tighten if necessary.
	Capacity of gun being exceeded.	Note complete weld parameter including welding current in (AMPS), welding voltage, wire feed speed, type and size of wire, type of gas and flow rate of gas and consult your local Authorized Alexander Binzel Distributor.
	Erratic wire feed	See Erratic wire feed section in "Trouble Shooting Guide General" Published by Alexander Binzel Corporation.

TROUBLE SHOOTING GUIDE – WATER COOLED GUNS

Problem	Probable Cause	Solution
Gun too hot	Poor water flow.	Insure water flow is unrestricted and provides a minimum of 1.5 qts. Per min flow at pressure does not exceed 65psi.
	Direction of flow reversed.	Insure that water flow direction is into the gun through the blue water line and out of the gun through the red water line.
	Interrupted water flow.	Insure that a water cooler run for a minimum of 5 min after welding is completed. This ensures proper post-weld cooling can take place through the entire gun and cable assembly.
	Dirty Coolant.	Clean coolant after first disconnecting it from the line voltage and draining old coolant fluid. Consult the manufacturer of the unit for proper procedure. Refill unit with fresh clean coolant fluid.
	Poor ground.	See “Poor ground” in section marked “Gas / Air cooled Guns.”
	Loose power connection.	Check to ensure power connection on the power source is tight, the connection on the wire feeder is tight, the connection on the adaptor block is tight, and the connection of the gun to he adaptor block is tight.
	Capacity of gun is being exceeded.	See “Capacity of gun is being exceeded” in section “Gas / Air cooled Guns”.
	Water-cooling source not turned on during welding. Water leaks.	The use of water cooled MIG gun without water, even for very short periods of time, will destroy the power cable located inside the cable assembly. Longer periods of use without water will destroy the swan neck of the gun in addition to multiple components within the assembly. Consult your local Authorized Alexander Binzel Distributor for information regarding “Fast Gun” ™ repair program, or contact the Binzel Repair Department direct at 1-800-542-4867 for information regarding our exclusive 2 day program.