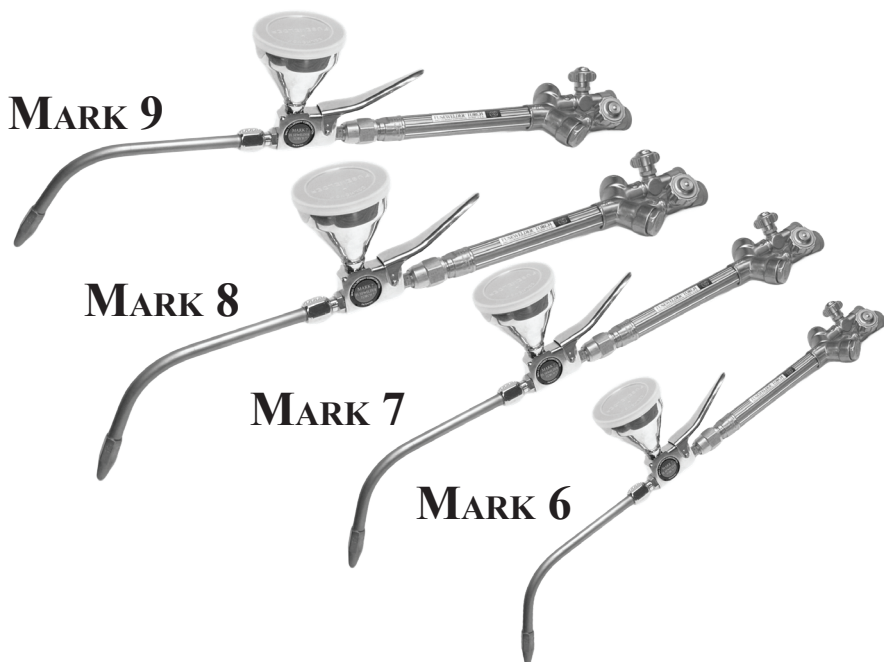


Fusewelder™ Torch

Operating Manual



Flame-spray torches for applying powdered
hard-surfacing alloys and brazing filler metals



WALLCOLMONOY

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Wall Colmonoy trademarks and tradenames: Colmonoy[®], ColTung[™], Fusewelder[™], Fuseweld[™], Stop-Off[™], Microbraz[®], SoloCoat[™], Spraywelder[™], and Wallex[™]

Safety Precautions

Protect yourself and others: Before using any welding or welding-related product, read, understand and follow the manufacturer's instructions, the Material Safety Data Sheets (MSDS) and your employer's safety practices. Wear correct eye, ear and body protection. See American National Standard Z49.1, "*Safety in Welding and Cutting*" available from the American Welding Society, 550 N.W. Lejeune Rd., Miami, FL 33135; and OSHA Safety and Health Standards, 29 CFR 1910, available from the U.S. Government Printing Office, P.O. Box 371954, Pittsburgh, PA 15250-7954.

Fumes and Gases can be dangerous to your health. Heat rays (infrared radiation from flame or hot metal) can injure eyes. Keep your head out of the fumes. Use enough ventilation, exhaust at the work, or both, to keep fumes and gases from your breathing zone and the general area.

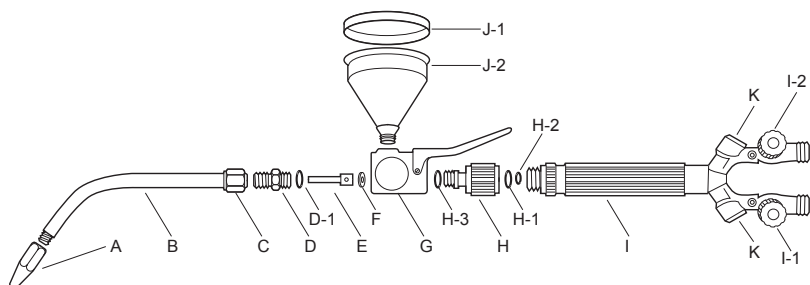
Bottled Gases: Gases under pressure are highly combustible and must be handled with care to prevent fire or explosion. Pressure-reducing regulator valves must be used. Store oxygen and acetylene cylinders separate from one another. Always refer to these gases by their true names: "oxygen" and "acetylene" (never "air" or "gas"). Never interchange regulators, hoses or other pieces of apparatus between these two gases. Never transfer gases from one cylinder to another, or allow any mixture of gases in a cylinder.

Oxygen: Never permit oil or grease to contact oxygen equipment. Never use oxygen near flammable materials.

Acetylene: Never use acetylene at pressures in excess of 15 psi. Keep cylinders upright and away from flame, sparks and heat. Do not open the valve more than one full turn, and keep the valve key on the valve stem for fast shut-off in an emergency. Should a leak occur, take cylinder into open air, away from fire.

Handling the Fusewelder Torch: Do not operate the Fusewelder Torch without powdered alloy in the hopper. ***Do not block the tip in any way.*** To prevent burns, exercise caution when handling torch and work piece. Wear protective gloves and clothing.

Parts List



Standard Tip Numbers

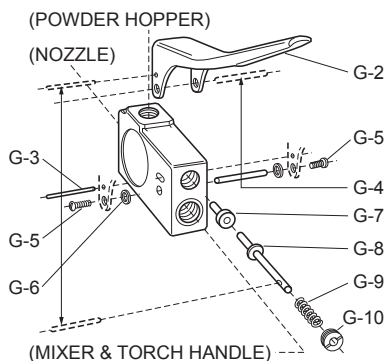
A	MARK 6	MARK 7	MARK 8	MARK 9
Tip No.	Tip No.	Tip No.	Tip No.	Tip No.
24 213200-39	44 213200-41	64 213200-38	84 213200-44	
34 213200-40	54 213200-42	74 213200-43	94 213200-45	
	40MF* 213200-46		80MF* 213200-48	
	50MF* 213200-47			

*Multi-flame tips for wider spray patterns

Standard Part Numbers

		MARK 6	MARK 7	MARK 8	MARK 9
B	Nozzle & Nozzle Nut	213200-52	213200-52	213200-53	213200-53
C	Nozzle Nut	213200-54	213200-54	213200-54	213200-54
D	Nozzle Adapter (D-1) O-Ring	213200-55 213200-65	213200-55 213200-65	213200-55 213200-65	213200-55 213200-65
E	Jet	213200-73	213200-74	213200-76	213200-75
F	Seal Ring**	213200-59	213200-59	213200-59	213200-59
G	Main Body Assembly**	213200-15	213200-16	213200-29	213200-17
H	Mixer & Nut (H-1) O-Ring (H-2) O-Ring (H-3) O-Ring	213200-66 213200-61 213200-60 213200-61	213200-66 213200-61 213200-60 213200-61	213200-67 213200-63 213200-62 213200-61	213200-67 213200-63 213200-62 213200-61
I	Torch Handle Assembly (I-1) Acetylene Valve (I-2) Oxygen Valve	213200-70 213201-17 213201-16	213200-70 213201-17 213201-16	213200-71 213201-15 213201-14	213200-71 213201-15 213201-14
J	Hopper Assembly (J-1) Hopper Cover (J-2) Hopper	213200-85 213200-84 213200-82	213200-85 213200-84 213200-82	213200-86 213200-84 213200-83	213200-86 213200-84 213200-83
K	Flashback Arrester Kit	213200-72	213200-72	213200-72	213200-72

Parts are interchangeable between models only if they have identical part numbers



All torch handle assemblies have built-in reverse flow check valves to protect against accidental ignition in oxygen and fuel-gas supply hoses.

** Main Body Assembly (All Models)		
G-2	Control Lever	213200-93
G-3	Spiral Pin	213200-92
G-4	Threaded Pin	213200-94
G-5	Screw, 2-56 x 1/4 in. (2 required)	213200-96
G-6	Nylon Washer (2 required)	213200-95
G-7	Plunger Seal	213200-88
G-8	Plunger	213200-87
G-9	Spring	213200-90
G-10	Retainer Nut	213200-89
F	Seal Ring	213200-59

For maintenance tools and replacement parts, see section 9-4

Instructions

1. Installation

- 1-1. Check Fusewelder Torch to see that all threaded fittings are snug, to eliminate gas leakage. Use a leak check fluid to assure seals*.
- 1-2. Connect 15-ft. 1/4 in. (4.65 m) ID gas hoses as follows:
 - a. Connect one end of hose set to the Fusewelder Torch: Green hose (right-hand nut) to oxygen valve on torch handle. Red hose (left-hand nut) to acetylene valve on torch handle.
 - b. Connect other end of hose set to the gas regulators: Green hose (right-hand nut) to oxygen regulator outlet fitting. Red hose (left-hand nut) to acetylene regulator outlet fitting.
- 1-3. Adjust regulators to correct settings as indicated in chart (below) for torch model and tip being used.

2. Inspection

- a. Check that regulators are in good operating condition.
- b. Tighten fittings and check for leaks.
- c. Follow "Safety Precautions," page 1*.

3. Regulator Settings

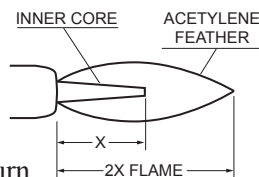
- a. Gauge pressure is only indicated pressure, so be sure gauges are correctly calibrated.
- b. Final adjustment should be made with torch operating.

Torch Model	Tip No.	Powder Flow/Hr (approx.)		Gas Pressure, PSI	
		lbs.	kgs.	Acet.	Oxy.
MARK 6	24	1.3	0.59	6	10
	34	2.8	1.27	8	12
MARK 7	44 & 40 MF	3.7	1.68	10	14
	54 & 50 MF	6.2	2.81	12	16
MARK 8	64	7.0	3.18	14	20
	74	9.0	4.08	14	20
MARK 9	84 & 80 MF	9.9	4.49	14	22
	94	14.2	6.44	15	24

4. Lighting Flame

The Fusewelder Torch should be at room temperature before using. A cold torch, when ignited, will produce condensation, which seriously impairs powder flow.

- a. Open acetylene valve on torch handle 1/4 turn.
- b. Ignite acetylene gas at tip.
- c. Slightly open oxygen valve on torch handle.
- d. Open acetylene valve at least 1-1/2 turns.
- e. Open oxygen valve until a 2X feather flame is obtained. (With powder flowing, the flame should change to a neutral (1X) flame. If it does not change, adjust the oxygen valve until it does.)



der flow. It may also be used to vary the rate of powder flow; however, this will require some practice.

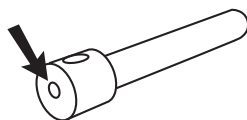
5. Extinguishing Flame

- Quickly shut-off the acetylene valve on the torch handle.
- Close the oxygen valve on the torch handle.
- Following this procedure, the flame is completely extinguished without soot formation.

6. Special Precautions

- 6-1. If a deposit forms on the tip while spraying, it can be dislodged by removing it with a piece of copper wire.
- 6-2. If deposits form regularly, shut-off the gases and polish tip face with a soft cloth. Flame hole should be cleaned with a tip cleaner. This should be straight in and straight out, never bevel.
- 6-3. If the torch accidentally backfires, the jet should be removed from the Fusewelder body and carbon deposits removed from all exposed surfaces with a soft cloth. Dislodge carbon particles in the orifice by cleaning it with a tip cleaner or soft wire. Use a wire no larger in diameter than indicated for the model involved.
- 6-4. If Fusewelder Torch is not in operation, and acetylene and oxygen valves are opened, do not place hand or any object over tip, as this will drive gases through the body and hopper and will be dangerous when unit is ignited.
- 6-5. Assembly hints: Care should be taken to avoid overtightening the nozzle nut or nozzle adapter, which will result in damage to the threads and/or improper seating of mating surfaces. Also avoid overtightening the retainer nut, which will seriously impair powder flow. Adjust nut as necessary for proper shut-off and flow.

Flame Hole Sizes				
Torch Model	Tip No.	Drill Size	Size in.	Size mm
MARK 6	24	#56	.0465	1.18
MARK 6	34	#55	.052	1.32
MARK 7	44	#52	.0635	1.61
MARK 7	54	#48	.076	1.93
MARK 7	40MF	#66	.033	0.84
MARK 7	50MF	#60	.040	1.02
MARK 8	64	#46	.081	2.06
MARK 8	74	#43	.089	2.26
MARK 9	84	#36	.1065	2.71
MARK 9	94	#31	.120	3.05
MARK 9	80MF	#51	.067	1.70



Torch Model	Wire Diameter	
	in.	mm
MARK 6	.031	0.79
MARK 7	.038	0.97
MARK 8	.047	1.19
MARK 9	.062	1.57

7. The Fuseweld Process

- 7-1. **Surface Preparation.** To permit the bonding of any overlay, the surface of the base metal must be clean and free of oxides, oil and dirt. Roughening the surface is not necessary.
- 7-2. **Preheating.** All work must be preheated before attempting to spray and fuse an overlay. Bring work up to 400-500°F (205-260°C). On small pieces, the Fusewelder Torch is adequate for preheating; however, parts of sizeable mass require a larger heat source.
- 7-3. **Spraying and Fusing.** With powder in the hopper and the Fusewelder Torch ignited, spraying is accomplished by depressing the powder control lever. Powder enters the gas stream, passes through the flame, and then the heated particles are deposited on the work surface. The deposited alloy is fused to the base metal by using the torch flame (with no powder flow). You will find it faster and more efficient to spray and fuse alternately, doing one small area at a time.

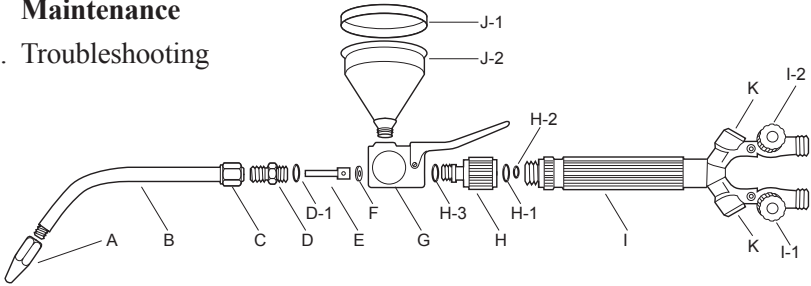
8. Interchangeable Fusewelder Parts

- a. Owners of either a MARK 6 or MARK 7 unit who wish to gain a greater range of flame sizes do not have to buy another complete Fusewelder Torch. The torch handle, mixer, adapter, nozzle and powder hopper are identical on both units. However, the bodies, jets and tips are different between units and may be purchased separately. Use the part numbers given on page 2.
- b. Do not interchange parts between the MARK 6 or 7 torches and the larger MARK 8 or 9 torches.



9. Maintenance

9-1. Troubleshooting

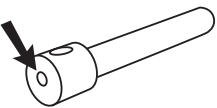


Trouble	Probable Cause	Remedy
Unit will not light	No gas flow	Check regulator settings
	Tip worn oversize	Replace with new or correct tip
	Wrong tip size	Replace with new or correct tip
Flame difficult to adjust	Seal ring missing	Install seal ring
	Wrong regulator settings	Adjust regulator settings
Cool flame	Wrong regulator settings	Adjust regulator settings
	Carbon deposits in jet- Carbon in mixer	Clean orifices with tip cleaner
	Wrong jet	Replace with correct jet
Low powder output	Tip worn oversize- Jet worn oversize	Replace with new part of correct size
	Two seal rings installed	Remove one seal ring
	Wrong regulator settings	Adjust regulator settings
No powder output	Powder hopper empty	Add powder
	Foreign material blockage	Clean hopper, body, jet and tip orifices
	Plunger not retracting	Check lever, spring and plunger assembly Loosen retainer nut
	Jet and/or tip worn oversize	Replace jet and/or tip
	Two seal rings installed	Remove one seal ring
	Moisture in unit	Clean and dry unit
Powder will not shut-off	Worn plunger seal	Replace plunger seal
	Foreign material between seat and seal	Remove obstruction
	Retainer nut loose	Screw in retainer nut slightly
	Bent spiral pin	Replace spiral pin
Unit backfires	Jet orifices blocked or plugged	Remove any obstructions- Clean jet (see section 6-3)
	Mixer O-Rings worn/missing	Replace O-Rings
Scattered or overly wide spray	Tip worn oversize	Replace tip
	Obstruction in tip	Clean tip
Popping, ignition difficulties	Tip worn oversize	Replace tip
	Tip loose on nozzle	Tighten tip
	Missing seal ring	Install seal ring
	Wrong regulator settings	Adjust regulator settings
	Bad oxy, or acet. valves	Replace valves
Acetylene in hopper	Obstruction in jet	Clean jet

9-2. **Tip wear.** When tip holes are the correct size, the profile of the inner cone of the flame is pointed (see diagram, section 4).
An excessively worn tip will produce an inner cone with a bulbous profile. Other symptoms of tip wear are indicated in section 9-1.

9-3. **Jet wear.** As powder flow wears the jet opening, there will be a temporary increase in the powder output from normal to maximum, followed by a decrease in output until there is no flow, and powder "bubbles" in the hopper. Openings can be gauged with standard drills, using data from the table below.

Torch Model	Opening Size					
	Normal			Maximum		
	Drill	Inch	mm	Drill	Inch	mm
MARK 6 or 7	#50	.070	1.78	#49	.073	1.85
MARK 8 or 9	#43	.089	2.26	#42	.0935	2.37



9-4. Special Tools and Equipment

Maintenance Tool & Parts Kit includes: tool box, needle-nose pliers, two screwdrivers, spanner wrench, pin punch and parts kit.
For MARK 6 or 7, order No. 213201-43.
For MARK 8 or 9, order No. 213201-42.

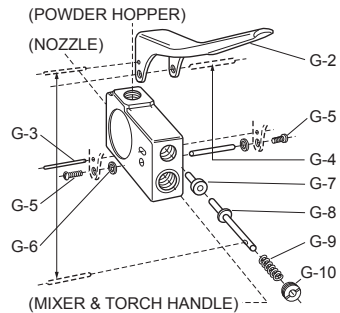
Parts Kit includes: Tube of dry white lube (for plunger seal) Plunger Plunger Seals (4) Retainer Nut Plunger Spring Spiral Pins (6) Threaded Pins (2) Nylon Washers (4) Screws (4) Seal Rings (6) O-Rings (20) For MARK 6 or 7, order No. 213201-44. For MARK 8 or 9, order No. 213201-45.	O-Ring Kit includes O-Rings for: MARK 6 or 7 No. 213200-60 (12) No. 213200-61 (24) No. 213200-65 (2) Order kit No. 213200-21. MARK 8 or 9 No. 213200-61 (12) No. 213200-62 (12) No. 213200-63 (12) No. 213200-65 (2) Order kit No. 213200-22.
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Oxygen valve assembly order No. 213201-14-00
Acetylene valve assembly order No. 213201-15-10
Flashback arrester kit order No. 213200-72-00

9-5. **Preventive Maintenance.** Clean face and orifice of tip before each use.
See section 6 for the correct size of tip cleaner for each tip.

9-6. Maintenance and Repair, Disassembly (see diagram, page 7)

- a. Turn off gases at regulators. Draw the gases from torch by opening valves on torch handle assembly (I). Remove Fusewelder Torch from hoses with 11/16-in. (17.46-mm) open-end wrench. Oxygen fittings are right-hand thread, acetylene fittings are left-hand thread.
- b. Remove tip (A) with 7/16-in. (11.11-mm) open-end wrench (R.H. thread).
- c. Remove nozzle (B) and nozzle nut (C) with 5/8-in. (15.88-mm) open-end wrench (RH. thread).
- d. Remove nozzle adapter (D) with O-Ring (D-1) using 9/16-in. (14.29mm) open-end wrench (RH. thread).
- e. Remove jet (E) by pulling straight out with thumb and forefinger; do not turn. Jet has groove that slides over alignment pin.
- f. Remove seal ring (F) by using a small piece of wire.
- g. Remove hopper and cover (J), turning by hand (R.H. thread).
- h. Remove torch handle assembly (I) by placing thumb and forefinger around mixer and nut (H) and turning torch handle counter-clockwise (RH. thread).
- i. Remove mixer and nut (H) with 5/16-in. (7.94-mm) open-end wrench (R.H. thread).
- j. Drive out spiral pin (G-3) with pin punch (part number 213200-99).
- k. Remove two 2-56 x 1/4-in. screws (G-5) with screwdriver (P/N 213200-98).
- l. Remove two nylon washers (G-6), one on either side.
- m. Slide out threaded pin (G-4).
- n. Remove retainer nut (G-10) with spanner wrench (P/N 213201-00).
- o. Pull out plunger (G-8), plunger spring (G-9) and plunger seal (G-7).
- p. Fusewelder Torch is now completely disassembled. After replacing parts (see section 9-4), re-assemble in reverse order. Be sure all four O-Rings and seal ring (F) are in place.



9- 7. Repairs

- a. Check tip (A) and replace with correct size if orifice is worn.
- b. Check jet (E) and replace with correct size if worn.
- c. Check nozzle adapter O-Ring (D-1), replace if damaged.
- d. Check all three O-Rings (H-I, H-2, H-3) on mixer (H) to ensure a good seal.
- e. Replace plunger seal (G-7) if necessary.
- f. Spiral pin (G-3) should be replaced whenever unit is disassembled.

Fusewelder Powders: Designed for use

Alloy	Composition	Hardness Rockwell C	Density (gm/cc)	Fusing Temp. °C (°F)
Colmonoy 225	Boron, Silicon, Nickel	13-17	8.59	900 (1650)
226		18-21	8.58	935 (1715)
227		22-27	8.53	915 (1680)
229		25-30	8.48	920 (1690)
228		28-33	8.46	930 (1705)
Colmonoy 23A/24 21 22	Boron, Phosphorus, Silicon, Nickel	16-23 22-27 28-33	8.64 8.53 8.58	1065 (1950) 915 (1680) 930 (1705)
Colmonoy 323	Boron, Carbon, Chromium, Copper, Phosphorus, Silicon, Nickel,	20-25	7.7	865 (1590)
Colmonoy 234	Chromium, Molybdenum, Phosphorus, Nickel,	32-36	8.47	995 (1825)
Colmonoy 43	Boron, Chromium, Nickel	35-40	8.50	980 (1800)
Colmonoy 63	Boron, Chromium, Nickel	56-63	8.07	1025 (1875)
Colmonoy 705	Boron, Chromium, Tungsten Carbide, Nickel	58-63	13.36	1025 (1875)
Colmonoy 88	Tungsten Carbide, Chromium, Boron, Nickel	59-64	9.89	1100 (2020)

Wear resistance of individual alloys are classified on a comparative scale of 1 (highest) to 6 (lowest). Corrosion resistance varies with media involved.

with the Fusewelder Torch

Abrasion	Corrosion	Impact	Galling	Description
6	2	1	3	Specially formulated for glass mold protection and restoration. See page 12.
6	2	1	3	
6	2	1	3	
4	2	1	3	
5	2	1	3	
6	2	1	5	Colmonoy 23A repairs surface flaws on cast iron parts. Colmonoy 24 rebuilds edges or corners of cast iron parts. Colmonoy 21 protects and restores cast iron parts. Colmonoy 22 used to repair flaws in cast iron parts.
6	2	1	3	Excellent on cast iron.
4	2	1	3	Designed for glass container mould protection, more abrasion resistant than 228 and more ductile than 43.
4	2	2	3	Similar to Colmonoy 63, but with greater impact resistance and workability, is easily finished.
1	1	4	1	Excels in metal-to-metal wear resistance under corrosive conditions.
1	2	4	1	Contains tungsten carbides for resistance to sliding abrasion.
1	1	3	1	Contains chromium and tungsten borides and carbides for maximum resistance to abrasion, corrosion, and high temperatures.

Ask us about our cobalt-based alloys. For more information on Fusewelder Powders, request a Technical Data Sheet.

Glass Mould Alloys

Colmonoy 200-Series Alloys are specially formulated, low temperature Fusewelder Powders for protecting and restoring glass container moulds (cast iron and aluminum bronze). Colmonoy 225 and 226 are designed for glass mould repair. They provide superior hot stiff build-up, minimal overspray, and are quickly and easily filed. Colmonoy 227 and 228 protect new mould components from wear by providing superior wetting properties. Request brochure for further detail.

Spraywelder Powders

While designed for application by Wall Colmonoy's Spraywelder System (see "Optional Equipment"), Spraywelder Powders may also be applied with the Fusewelder Torch. Various nickel and cobalt base formulations are available; request WCC Tech-1K.

Brazing Filler Metals

Nicrobraz nickel-based filler metal powders may be used with the Fusewelder Torch for brazing stainless or superalloy assemblies where furnace brazing is not suited or available. Nicrobraz filler metals produce strong, heat and corrosion resistant joints.

Application Aids

Nicrobraz Flux dissolves oxides and facilitates the adhesion of hard-surfacing and brazing materials at high temperatures.

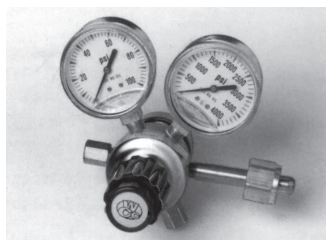
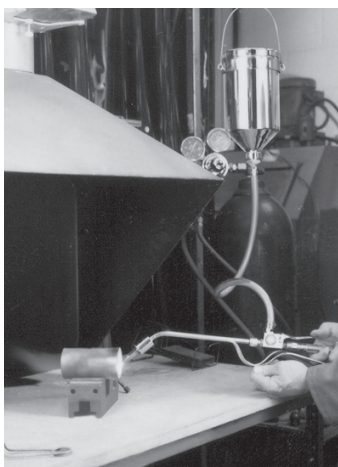
Nicrobraz Green Stop-Off prevents unintentional bonding of hard-surfacing or brazing materials on almost any base metal.



Optional Equipment

Detached Production Hopper holds 20 lbs. (9 kgs) of Fusewelder Powder permitting continuous spraying. Hopper includes cover and hose. Powder is gravity-fed to the torch. All models: part No. 213200-28.

Water/Air-Cooled Nozzle prevents undue wear when the torch is used in high production work or where a cavity entraps heat around the tip end. All models: part No. 213200-37.



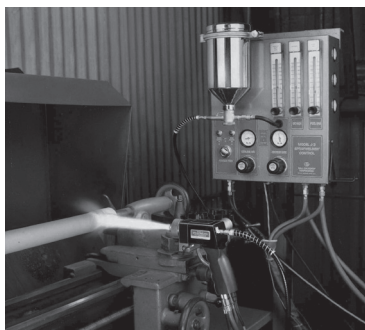
Gas Regulators, of two-stage design, display both supply and regulated pressure and provide reliable, precise gas control. Oxygen regulator, part No. 213100-66. Acetylene regulator, part No. 213100-67.

Fuel-Gas Supply Hose carries oxygen and acetylene from tanks to the torch. 15 ft. (5 m) long. Part No. 213201-27.

Nozzle Extensions spray difficult-to-reach areas. Extensions may be joined to achieve longer lengths.

Nozzle Extension	Part No.
18-in.	213200-56
10-in.	213200-57
7-in.	213200-58

Wall Colmonoy's Spraywelder System produces smooth, welded overlays of Spraywelder Powders and is ideal for overlaying large work surfaces, especially cylindrical parts. The system achieves deposit efficiencies of up to 98% and sprays up to 35 lbs/hr (16 kgs/hr). Request our general brochure for more information.



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