

# Cutlass Fasteners, Inc.

83 Vermont Ave., Unit 6, Warwick, RI 02888

Tel: (401) 732-6333 Fax: (401) 732-6336

cutlass-studwelding.com

## Stud Welding...

- Fasteners
- Equipment
- Service

## PHM-1A GAP CD WELD GUN MANUAL

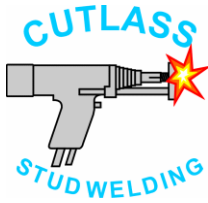
**MODEL : SIGNUS**

**PART NO. : PHM-1A**

**SERIAL NO. :**



PLEASE READ THIS OPERATION AND MAINTENANCE MANUAL  
CAREFULLY BEFORE USING YOUR NEW CUTLASS STUD WELDER.



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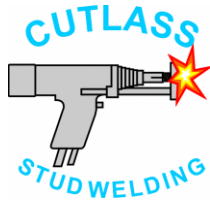
## PHM-1A GAP CD WELD GUN MANUAL

### WARRANTY

The electrical and mechanical components of the Cutlass Stud Welders are thoroughly performance inspected prior to assembly in the Welder. The assembled Welder is completely performance checked. The Welder is delivered to you in perfect electro-mechanical condition. All parts used in the assembly of the Welder are fully warranted for a period of three (3) months from the date of delivery.

Under this warranty, the manufacturer reserves the right to repair or replace, at its option, defective parts which fail during the warranty period. Notice of any claim for warranty repair or replacement must be furnished to the manufacturer, by the purchaser, within five (5) days after the defect is first discovered. The manufacturer does not assume any liability for paying shipping costs, or for any labor or material furnished where such costs are not expressly authorized in writing.

We do not warrant the Cutlass Stud Welders, parts or accessories against failures resulting from misuse, abuse, improper installation, normal wear and tear, maladjustment or use not in accordance with the operating instructions furnished by the manufacturer. Cutlass shall never be liable for any consequential damages.



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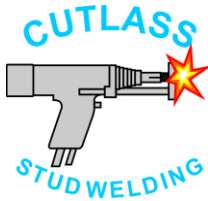
## PHM-1A GAP CD WELD GUN MANUAL

### SUGGESTED SAFETY PRECAUTIONS

In any welding operation, it is the responsibility of the welder to observe certain safety rules to insure his personal safety and to protect those working near him.

Reference is directed without endorsement or recommendation, to ANSI Z49.1, Safety in Welding and Cutting, and to AWG Publication A6, 1-66 Recommended Safe Practices for Gas-Shielded Arc Welding.

1. Always treat electricity with respect. Under open circuit conditions, the welding machine output may be dangerous.
2. Do not work on live circuits and conductors. Disconnect the main power line before checking the machine or performing any maintenance operations.
3. Ensure the welding machine cabinet is properly grounded to a good electrical ground.
4. Do not stand in water or on damp floors while welding or weld in the rain. Avoid wearing wet or sweaty clothes when welding.
5. Do not operate with worn or poorly connected cables, and do not operate weld gun with loose cable connections. Inspect all cables frequently for insulation failures, exposed wires, loose connections and repair as needed.
6. Do not overload weld cables or continue to operate with hot cables.
7. Do not weld near flammable materials or liquids, in or near atmospheres, or on ducts carrying explosive gases.
8. Do not weld on containers which have held combustible or flammable materials, or on materials which give off flammable or toxic vapors when heated, without proper cleaning, purging, or inerting.
9. Ensure adequate ventilation is provided when welding in confined spaces.
10. Never look at the electrical arc without wearing eye shields.
11. Always use proper protective clothing, gloves etc. Never weld close to a bystander who is unaware of the possible dangers of ultraviolet light and weld splatter on their eyes.
12. Installation, servicing and trouble shooting should only be done by qualified personnel, familiar with this type of equipment.



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The **SIGNUS** CD stud welding system consists of the power unit (LBS-075), ground cables, welding gun (PHM -1A), a suitable chuck (collet) and welding stud.

The **PHM-1A** is a GAP welding gun for welding studs with ignition tips. Due to the very short welding time (compared to contact CD welding) the PHM-1A is ideal for welding to very thin work pieces and allows welding to Aluminum without inert gas.

With the recommended settings shown on pages 9 and 10, other materials can also be welded.

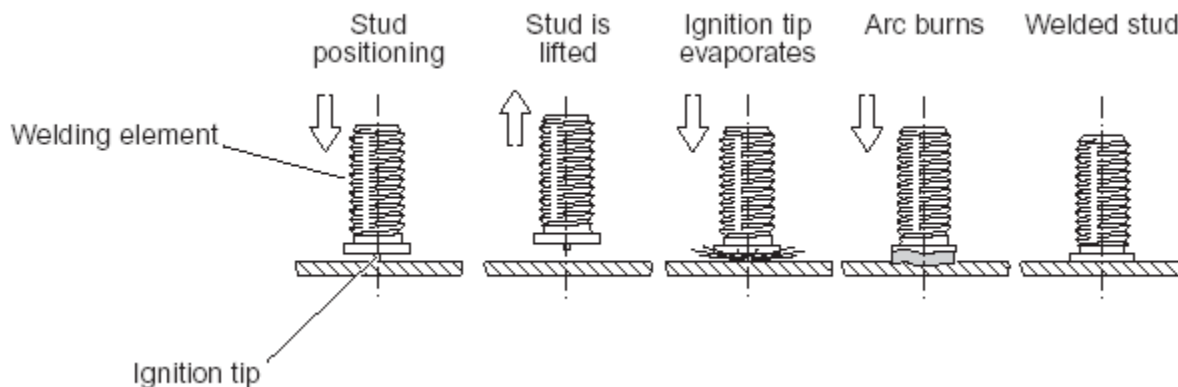
### THE GAP CAPACITOR DISCHARGE STUD WELDING PROCESS

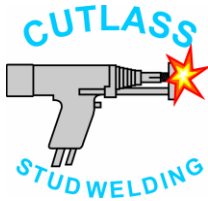
A stud is first pushed into the weld chuck or collet. The gun is then placed in a vertical position on the workpiece. When the trigger button is pressed the gun automatically lifts the stud off the surface. When the maximum set lift is achieved the lifting solenoid is turned off and the welding current is switched on. The spring in the gun forces the stud towards the workpiece.

When the ignition tip hits the workpiece surface, a very high current is discharged. This vaporizes the ignition tip and an arc is generated which melts the face of the stud and an approximately equal area of the workpiece. The stud then dips into the molten weld pool, the arc is extinguished and the weld pool solidifies. The welding process lasts about 1-3 milliseconds.

The weld gun is pulled off the weld stud. The **SIGNUS** recharges and a new stud can be fitted in the weld chuck and the weld sequence repeated.

The higher the lift setting, the shorter the weld time (see the chart on page 9 for suggested settings). It is recommended that the workpiece is 0.020" (0.5mm) minimum thickness.





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## PHM-1A GAP CD WELD GUN MANUAL

### CD STUD/BASE METAL COMBINATION WELDING CAPABILITIES

BASE MATERIAL	STUD MATERIAL			
	MILD STEEL 1008-1010	STAINLESS 302, 304, 305	ALUMINUM 1100, 5356, 6061	BRASS 70/30, 65/35
MILD STEEL 1006-1030	Excellent	Excellent	-----	Excellent
MEDIUM CARBON STEEL 1030-1050	Good*	Good*	-----	Good*
GALVANIZED DUCT	Excellent	Excellent	-----	Excellent
STRUCTURAL STEEL A-36, A-108	Excellent	Excellent	-----	Excellent
STAINLESS STEEL 405, 410, 430, AND 300 SERIES EXCEPT 303	Excellent	Excellent	-----	Excellent
LEAD FREE BRASS, ELECTROLYTIC COPPER, LEAD FREE ROLLED COPPER	Excellent	Excellent	-----	Excellent
MOST ALUMINUM ALLOYS OF THE 1100, 3000, 5000, AND 6000 SERIES	-----	-----	Excellent	-----
DIE-CAST ZINC ALLOYS	Good*	Good*	Excellent	Good*

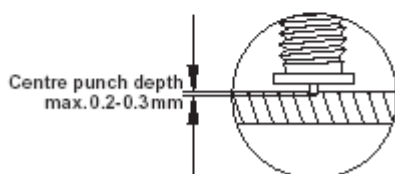
\* Generally full strength results, depending upon the combination of stud size and base metal.

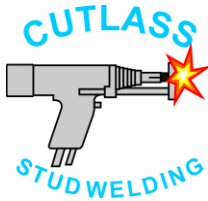


Welding studs with ignition tip can be positioned exactly on center punch marks or scribed lines. Since the welding process is started by the ignition tip, marking must be performed carefully.

The weld cannot ignite on a center punch mark which is too deep. Should the weld start the weld strength may still be questionable.

Therefore make sure the depth of the center punch mark does not exceed 0.012" (0.3mm).





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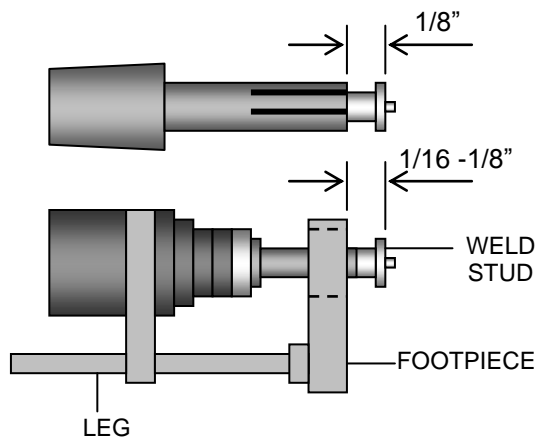
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## PHM-1A GAP CD WELD GUN MANUAL

The electrical and mechanical parameters of the weld are set using the voltage control knob on the front of the welder and by adjusting the lift distance of the welding gun.

### WELD GUN SETUP



The weld chuck should be adjusted as shown. For longer studs, as much of the stud should be held as possible. This may require complete removal of the adjusting screw.

Seat weld chuck firmly in the front of weld gun and attach leg and footpiece assembly. Set leg depth so approximately 1/8" of stud/chuck protrudes beyond the footpiece.

### ADJUSTING THE PHM-1A WELD GUN

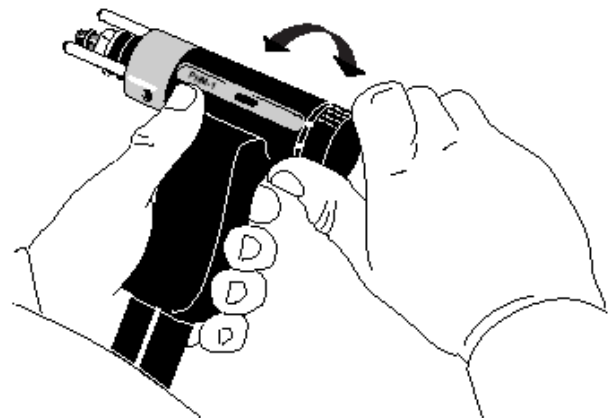
The welding time depends on the stud speed. It is adjusted indirectly via the lift mechanism in the gun. The greater the lift is, the higher the speed of the welding stud as it returns to the workpiece, and hence the shorter the welding time.

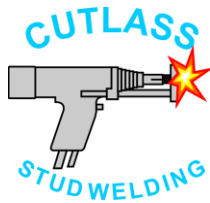
The lift is set with the rear cap on the back of the weld gun:

Turning the rear cap clockwise will increase the lift, thereby reducing the weld time.

Turning the rear cap counterclockwise will reduce the lift, thereby increasing the weld time.

To prevent damage to the adjusting mechanism, never use force to turn the rear cap at the limits of the adjustment.





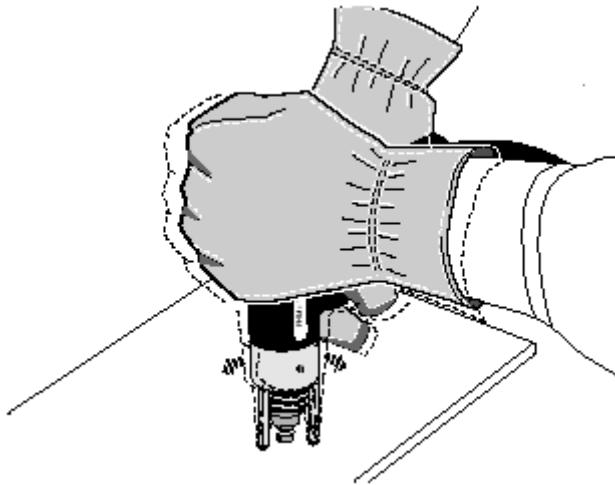
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Turn the rear cap clockwise to approximately maximum lift. Place the gun in the welding position on a flat surface as shown.

Turn the rear cap counterclockwise until the stud and footpiece lie flat on the surface. This setting is called "zero lift".

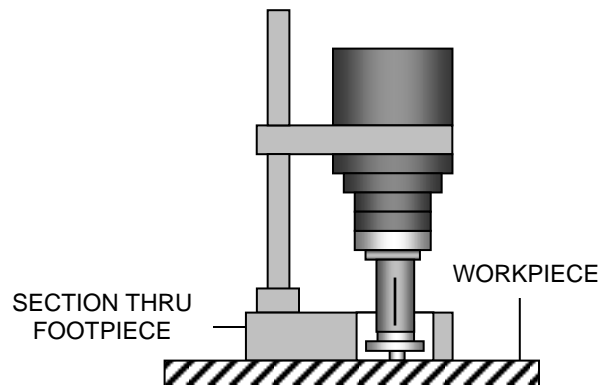
Find your material combination and the diameter of the welding stud in the following chart. Then set the lift by turning the rear cap clockwise by the specified value.

NOTE: One revolution of the rear cap corresponds to 1.0mm (0.040") lift

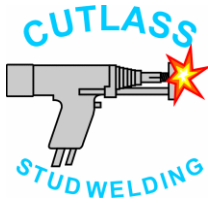
Place the weld gun perpendicular to the workpiece as shown. Apply pressure to the gun so the footpiece lies firmly on the workpiece.

Hold gun steady and pull trigger when stud is in required position. After weld cycle withdraw gun from stud. Pull gun straight back so weld chuck is not damaged.

Inspect weld and adjust settings as required.



WORKPIECE MATERIAL	STUD MATERIAL AND DIAMETER														
	MILD STEEL					STAINLESS STEEL					ALUMINUM ALLOY				
	#6	#8	#10	1/4	5/16	#6	#8	#10	1/4	5/16	#6	#8	#10	1/4	5/16
STEEL	1.5-2	1.5-2	1.5-2	1.5-2	1.5-2	1.5-2	1.5-2	1.5-2	1.5-2	1.5-2	-	-	-	-	-
STEEL GALVANIZED	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	-	-	-	-	-
STAINLESS STEEL	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	-	-	-	-	-
ALUMINUM ALLOY	-	-	-	-	-	-	-	-	-	-	3-3.5	3-3.5	3-3.5	3-3.5	-



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### RECOMMENDED CHARGE VOLTAGE

The welding current strength is regulated via the charge voltage of the capacitors in the **Signus** power unit. To set the charge voltage, turn the knob on the front panel to the recommended setting from the following table.

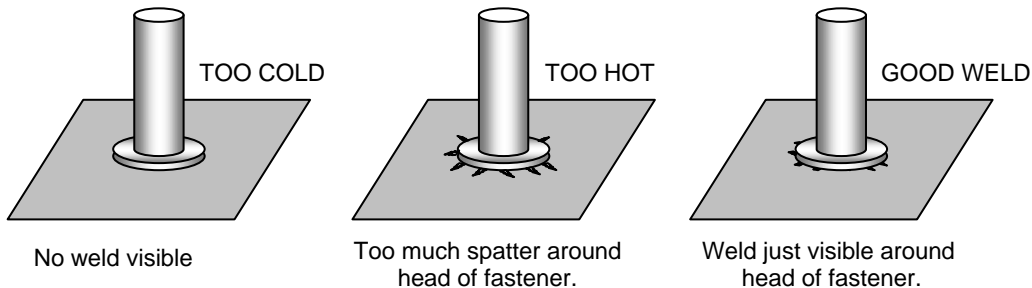
**The settings shown below are to be used as a guide only, and we recommend test welding on scrap material to ascertain optimum weld parameters for a specific application.**

WORKPIECE MATERIAL	STUD MATERIAL AND DIAMETER														
	MILD STEEL					STAINLESS STEEL					ALUMINUM ALLOY				
	#6	#8	#10	1/4	5/16	#6	#8	#10	1/4	5/16	#6	#8	#10	1/4	5/16
STEEL	2	3	4	6	8	2	3	4	6	8	-	-	-	-	-
STEEL GALVANIZED	3	4	5	7	9-10	3	4	5	7	9-10	-	-	-	-	-
STAINLESS STEEL	1	2	3	4	7	1	2	3	5	7	-	-	-	-	-
ALUMINUM ALLOY	-	-	-	-	-	-	-	-	-	-	2	3	4	5	-

\*\*The settings shown above are for standard Flanged welding studs. For Mini-Flanged or Non-Flanged Studs, lower settings will be required.

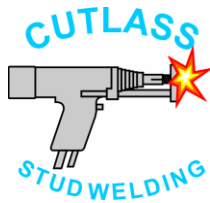
### TEST WELDING

Before making your first weld, check the ground clamp. It is essential that no power be lost through a poor connection. The surface under the ground should be free from oil, scale, grease and rust. The test should be on a piece of scrap material similar to the material to be used during actual production.



**NOTE:** IF WELD APPEARS COLD, DO NOT PLACE GUN ON WELDED STUD AND TRIGGER AGAIN. DAMAGE TO WELD CHUCK OR CONTROLLER WILL OCCUR.





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## **PHM-1A GAP CD WELD GUN MANUAL**

### **CAUSES OF POOR OR ERRATIC WELDS**

1. Loose weld chuck – does not grip stud tightly.
2. Faulty or loose ground connections.
3. Dirty base material (oil, grease, rust etc).
4. Voltage too high or too low.
5. Broken or loose cables.
6. Gun binding – dirt in weld gun preventing free movement.
7. Leg and/or footpiece incorrectly set.
8. Use of center punch.
9. Weld cables coiled.

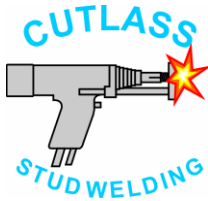
NOTE: The weld cables and ground cables should be laid out in a straight line or large loops. Poor weld quality may result if welding cables are closely coiled.

### **WELDER MAINTENANCE**

Your Cutlass welder is designed for long service with minimum care. Ordinary common sense maintenance will keep it operating efficiently. Following are some tips on preventative maintenance:

1. Treat the welding and control cables with respect. Avoid sharp bends and kinks which may break the cables. Do not use the cables as a "tow-line" to move controller. Avoid damaging or straining the cables where they enter the gun or connectors.
2. Ensure unit vents are not obstructed, and that the unit is not covered while in use. Avoid overheating.
3. Keep the welding gun free of dust and dirt. Periodically clean weld splatter from front of gun.
4. The welder should not be placed in close proximity to any MIG or TIG welders, nor should the CD power source share a common power supply with MIG or TIG equipment. Similarly the main ground connection from the CD welder to the workpiece should not be linked in any way to MIG or TIG grounds.

**FAILURE TO COMPLY COULD INVALIDATE YOUR WARRANTY**



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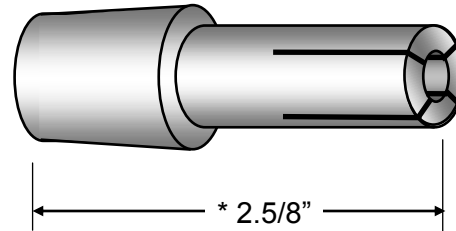
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## PHM-1A GAP CD WELD GUN MANUAL

### STANDARD ACCESSORIES

#### INCH

STUD SIZE	PART NUMBER
2-56UNC	015-509
12GA, 4-40UNC	602-467A
1/8	015-511
10GA, 6-32UNC	602-451A
8-32UNC	602-452A
#10, 3/16	605-101A
0.217	605-112
1/4	605-104A
5/16	605-105A
3/8	605-106A



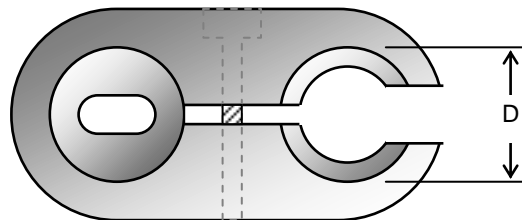
**STANDARD  
ADJUSTABLE  
WELD CHUCKS**

#### METRIC

STUD SIZE	PART NUMBER
3MM	605-111
4MM	602-423A
5MM	605-102
6MM	605-103
8MM	605-105A
10MM	605-106

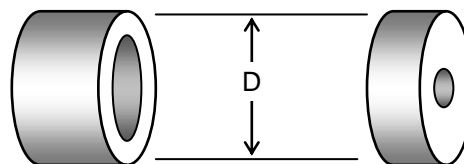
\* LONGER LENGTHS AVAILABLE ON REQUEST

**CD FOOTPIECE**



SIZE	'D' DIA.	PART NO.
SMALL	7/8"	023-252
MEDIUM	1.160"	023-252M

DESCRIPTION	PART NO.
JIG LOCATING BUSH D = 7/8"	650-691
NAIL GUIDE D = 7/8"	601-350
CHUCK DRIFT	000-374
SPARK SHIELD, SML. D = 1.16", A = 3/16"	999-013
SPARK SHIELD, LGE. D = 1.16", A = 1/2"	999-018

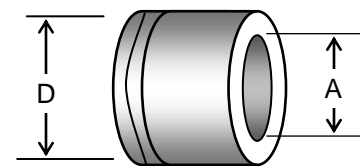


**JIG LOCATING BUSH**

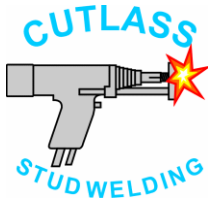
**NAIL GUIDE**



**CHUCK DRIFT**



**SPARK SHIELD**



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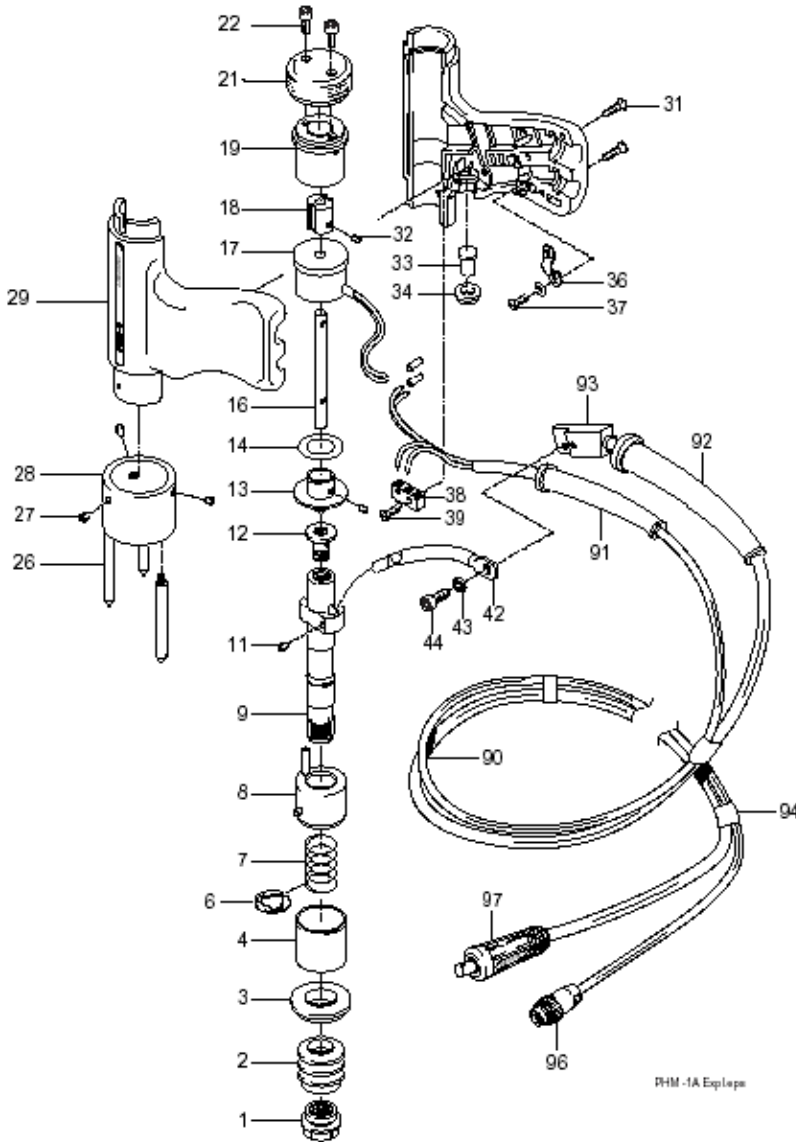
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## PHM-1A GAP CD WELD GUN MANUAL

### PHM-1A GUN PARTS



#	PART NO.	DESCRIPTION	QTY
	90-10-2211	COMPLETE SIGNUS PHM-1A	1
1	80-40-1738	TAPER CHUCK ADAPTOR	1
2	80-40-1097	BELLOWS	1
3	80-40-1023	INSULATING BUSH	1
4	80-40-1021	GUIDE BUSH	1
6	80-40-1023	LOCK WASHER	1
7	80-15-1038	MAIN SPRING	1
8	80-40-1022	ANTI ROTATE GUIDE	1
9	80-40-1011	SPINDLE PHM-1A	1
11	80-15-1011	M3 X 12 SOC. SET SCREW	1
12	80-40-1033	LIFT ADAPTOR	1
13	80-40-1034	LIFT ASSEMBLY	1
14	80-40-1035	BRASS WASHER	1
16	80-40-1036	LIFT SHAFT	1
17	80-30-1010	LIFT SOLENOID	1
18	80-40-1037	SLIDING BLOCK	1
19	80-40-1025	LIFT ADJUSTER	1
21	80-40-1075	REAR CAP	1
22	80-15-1030	M3 X 6 SOC. HD SCREW	1
26	80-40-1012	TRIPOD LEG	3
27	80-15-1010	M5 X 4 SOC. SET SCREW	1
28	80-40-1013	TRIPOD FACEPLATE	1
29	80-40-1602	GUN BODY (TOP & BOTTOM)	1
33	80-40-1016	TRIGGER BUTTON	1
34	80-12-1017	TRIGGER GUIDE	1
36	80-10-1016	M4 LOCK WASHER	1
37	80-15-1061	M2.5 X 8 MACH. SCREW	2
38	80-50-1013	TRIGGER SWITCH	1
39	80-15-1015	M2 X 10 MACH. SCREW	2
42	80-72-1012	INTERNAL WELD CABLE	1
43	80-15-1016	M4 LOCK WASHER	1
44	80-15-1012	M4 X 8 SOC. HD SCREW	1
90	80-72-1022	WELD/CONTROL CABLE ASSY.	1
91	80-10-1011	CONTROL CABLE SLEEVE	1
92	80-10-1013	WELD CABLE SLEEVE	1
93	80-35-1134	CONTACT BLOCK SET	1
94	80-10-1012	CABLE BINDER	10
96	999-136	CONTROL PLUG C/M	1
97	650-669	DINSE WELD PLUG C/M	1
100	80-42-0011	LABEL PHM-1A	1

### ALTERNATE PARTS...

#	PART NO.	DESCRIPTION	QTY
1A	80-40-1741	B COLLET ADAPTOR	1
28A	80-40-1739	SINGLE LEG FACEPLATE (fitted as standard)	1
28B	80-40-1113	TWIN LEG FACEPLATE	1