

Cutlass Fasteners, Inc.

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

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

cutlass-studwelding.com

Stud Welding...

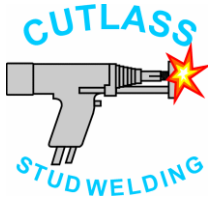
- Fasteners
- Equipment
- Service

SIGNUS GAP MANUAL

MODEL : SIGNUS GAP CD MANUAL
PART NO. : LBS-075G-T / LBS-075G-B
SERIAL NO. :



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



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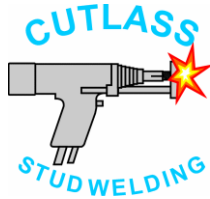
SIGNUS GAP MANUAL

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 twelve (12) 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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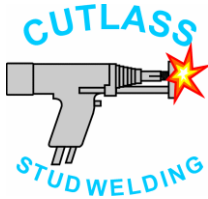
SUGGESTED SAFETY PRECAUTIONS



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. **Danger!** Wearers of cardiac pacemakers must keep clear of welding & stud welding systems.
2. Always treat electricity with respect. Under open circuit conditions, the welding machine output may be dangerous.
3. Do not work on live circuits and conductors. Disconnect the main power line before checking the machine or performing any maintenance operations.
4. Ensure the welding machine cabinet is properly grounded to a good electrical ground.
5. Do not stand in water or on damp floors while welding or weld in the rain. Avoid wearing wet or sweaty clothes when welding.
6. 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.
7. Do not overload weld cables or continue to operate with hot cables.
8. Do not weld near flammable materials or liquids, in or near atmospheres, or on ducts carrying explosive gases.
9. 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.
10. Ensure adequate ventilation is provided when welding in confined spaces.
11. Never look at the electrical arc without wearing eye shields.
12. 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.
13. 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-066), 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.

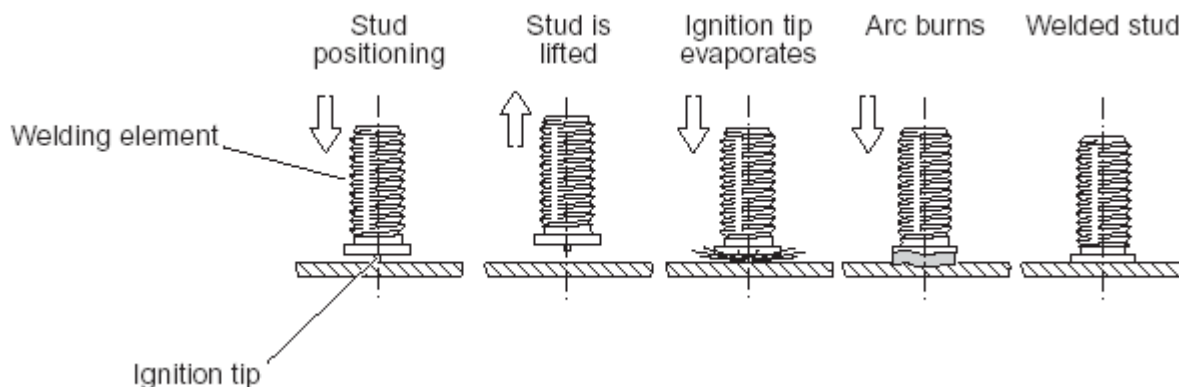
THE GAP CAPACITOR DISCHARGE STUD WELDING PROCESS

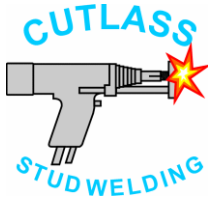
A stud is first pushed into the weld chuck or collet. The gun is then placed in a vertical position on the workpiece. When the trigger button is pressed the gun automatically lifts the stud off the surface. When the maximum set lift is achieved the lifting solenoid is turned off and the welding current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



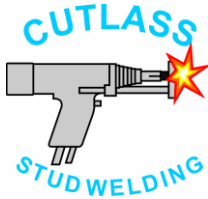
Attach twin ground cable here

Attach gun control cable here

Attach gun weld cable here

1. Attach the twin ground cable to the workpiece with the "C" clamp. Connect the other end of the cable to the left socket on the **SIGNUS** front panel.
2. Connect the Control Plug (7 pin connector) on the Gun cable, to the 7 Pin Socket on the front panel of the **SIGNUS**.
3. Connect the Weld Cable Plug on the Gun cable to the right socket on the front of the **SIGNUS**.
4. Connect the power lead to a 120 volt supply.

NOTE: UNIT IS SHIPPED FROM THE FACTORY TAPPED FOR 120 VOLT OPERATION. FOR 220/240 VOLT OPERATION THE TRANSFORMER MUST BE RE-TAPPED. CALL CUTLASS FOR THE CORRECT PROCEDURE.



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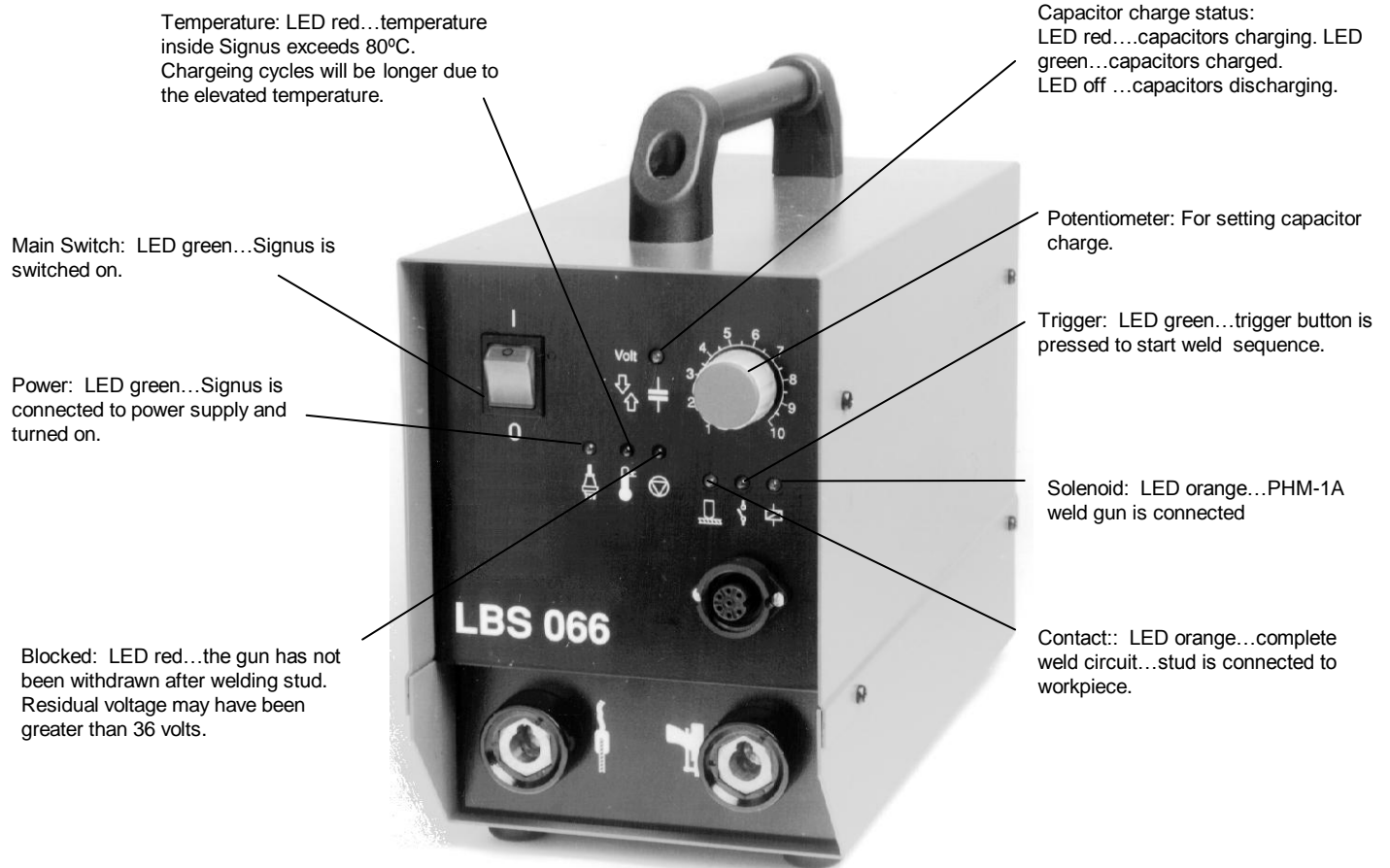
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SIGNUS GAP MANUAL

INDICATORS AND SYMBOLS



Temperature: LED red...temperature inside Signus exceeds 80°C. Charging cycles will be longer due to the elevated temperature.

Capacitor charge status:
LED red...capacitors charging. LED green...capacitors charged. LED off ...capacitors discharging.

Main Switch: LED green...Signus is switched on.

Potentiometer: For setting capacitor charge.

Power: LED green...Signus is connected to power supply and turned on.

Trigger: LED green...trigger button is pressed to start weld sequence.

Blocked: LED red...the gun has not been withdrawn after welding stud. Residual voltage may have been greater than 36 volts.

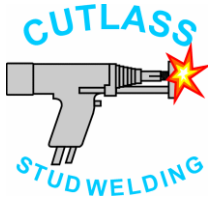
Solenoid: LED orange...PHM-1A weld gun is connected

Contact: LED orange...complete weld circuit...stud is connected to workpiece.

START CHECK

The Main Switch and the following LED's must light up when **SIGNUS** is turned on...

- a) Power LED
- b) Capacitor charge LED...lights up red briefly and green when **SIGNUS** is ready.
- c) Solenoid light (when PHM-1A weld gun is connected).
- d) Contact light...when stud in gun is touched to workpiece (grounds must be connected).
- e) Hold the gun in the air and pull trigger...trigger LED should illuminate.



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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*

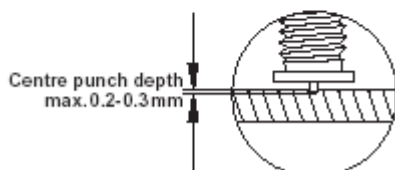
* Generally full strength results, depending upon the combination of stud size and base metal.

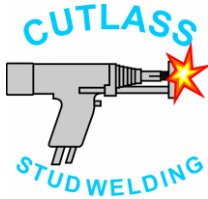


Welding studs with ignition tip can be positioned exactly on center punch marks or scribed lines. Since the welding process is started by the ignition tip, marking must be performed carefully.

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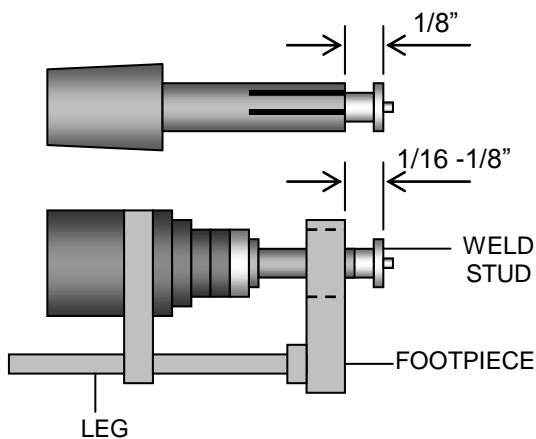
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The electrical and mechanical parameters of the weld are set using the voltage control knob on the front of the welder and by adjusting the lift distance of the welding gun.

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

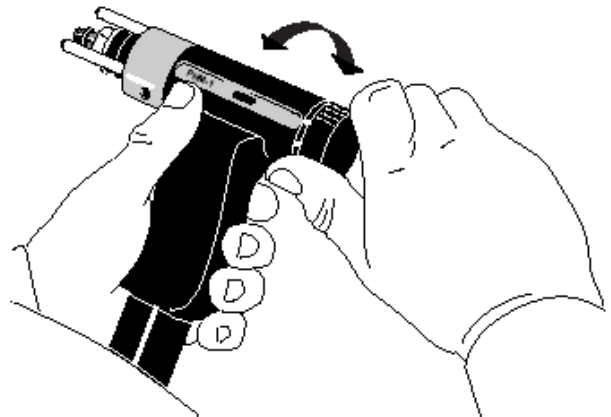
The welding time depends on the stud speed . It is adjusted indirectly via the lift mechanism in the gun. The greater the lift is, the higher the speed of the welding stud as it returns to the workpiece, and hence the shorter the welding time.

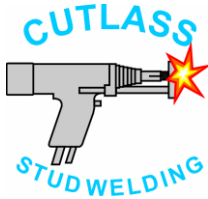
The lift is set with the rear cap on the back of the weld gun:

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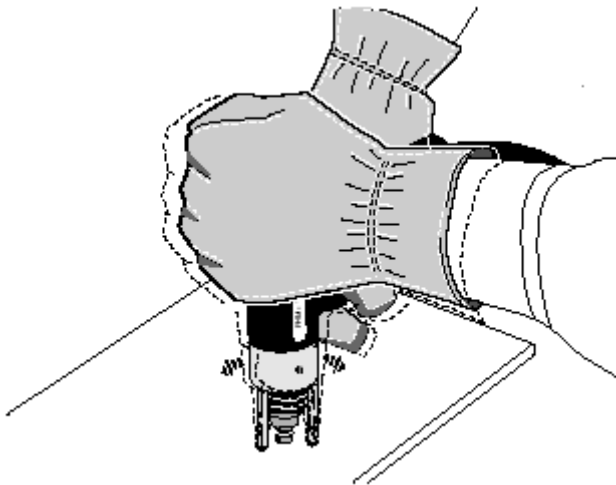
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Turn the rear cap clockwise to approximately maximum lift. Place the gun in the welding position on a flat surface as shown.

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

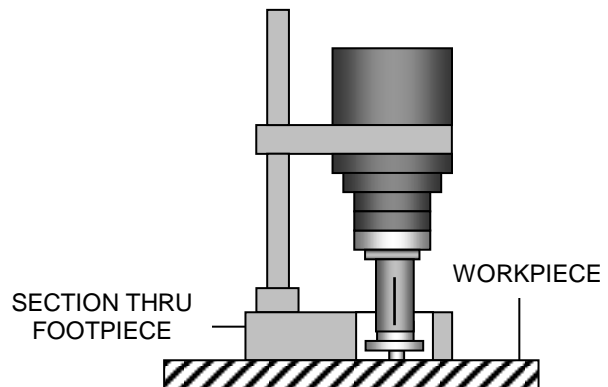
Find your material combination and the diameter of the welding stud in the following chart. Then set the lift by turning the rear cap clockwise by the specified value.

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.

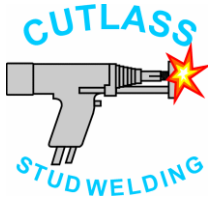
Hold gun steady and pull trigger when stud is in required position. After weld cycle withdraw gun from stud. Pull gun straight back so weld chuck is not damaged.

Inspect weld and adjust settings as required.



RECOMMENDED LIFT FOR PHM-1A (in millimeters)

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.

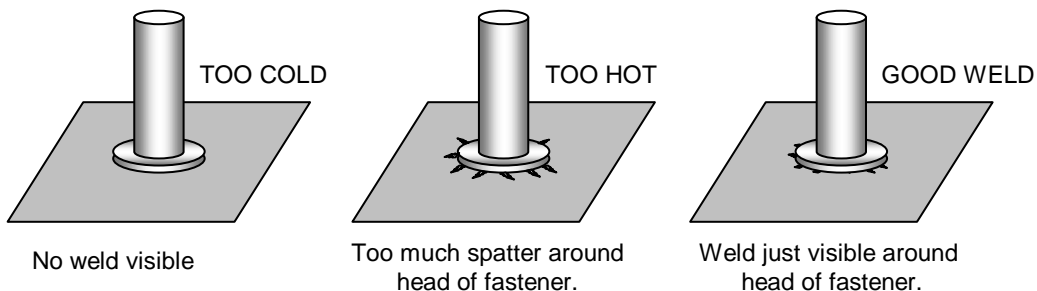
The settings shown below are to be used as a guide only, and we recommend test welding on scrap material to ascertain optimum weld parameters for a specific application.

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	-

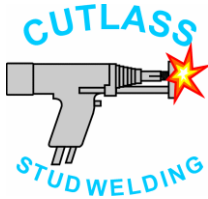
**The settings shown above are for standard Flanged welding studs. For Mini-Flanged or Non-Flanged Studs, lower settings will be required.

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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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.

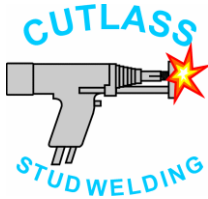
NOTE: The weld cables and ground cables should be laid out in a straight line or large loops. Poor weld quality may result if welding cables are closely coiled.

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 the 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 **SIGNUS** share a common power supply with MIG or TIG equipment. Similarly the main ground connection from the **SIGNUS** 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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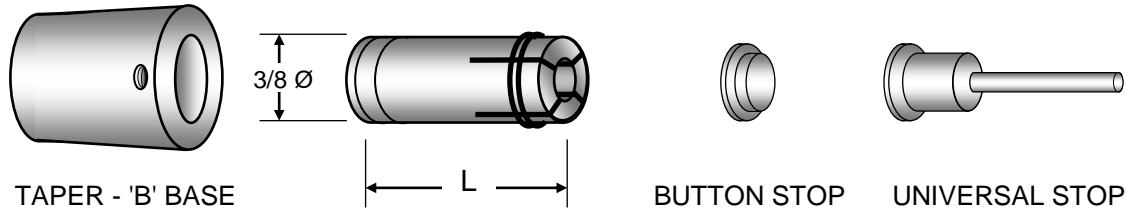
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INCH SIZES

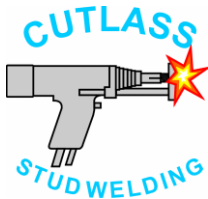
STUD SIZE	"L" LENGTH	PART NUMBER
2-56UNC	1.3/8"	669-232
12GA., 4-40UNC	1.3/8"	669-219
1/8	1.3/8"	669-230
10GA., 6-32 UNC	1.3/8"	669-220
8-32 UNC	1.3/8"	669-222
3/16, 10-24UNC, 10-32UNF	1.3/8"	669-216
0.217	1.3/8"	669-217
1/4	1.3/8"	669-218
5/16	1.3/8"	669-228
3/8	1.3/8"	669-229

METRIC SIZES

STUD SIZE	"L" LENGTH	PART NUMBER
3MM	1.3/8"	669-243
4MM	1.3/8"	669-231
5MM	1.3/8"	669-244
6MM	1.3/8"	669-235
8MM	1.3/8"	669-228
10MM	1.3/8"	669-247

ACCESSORIES

ITEM	PART NUMBER
B COLLET TAPER BASE	669-223
BUTTON STOP	669-225A
UNIVERSAL STOP	669-225



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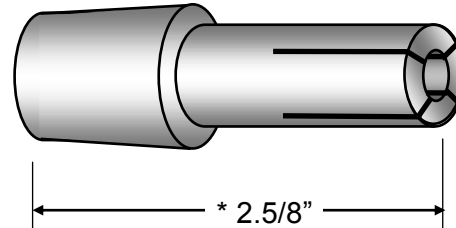
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STANDARD ACCESSORIES

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



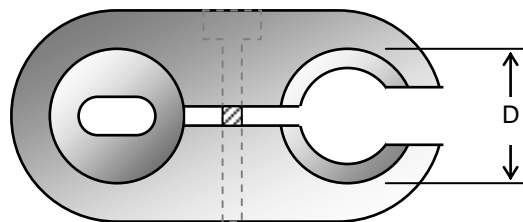
STANDARD ADJUSTABLE WELD CHUCKS

METRIC

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

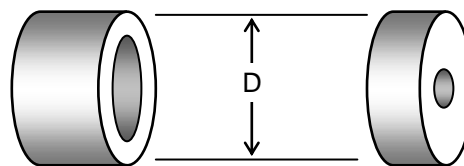
- LONGER LENGTHS AVAILABLE ON REQUEST

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

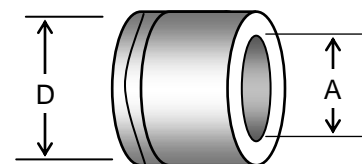


JIG LOCATING BUSH

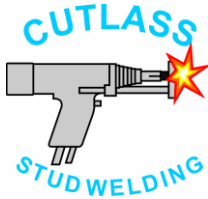
NAIL GUIDE



CHUCK DRIFT



SPARK SHIELD



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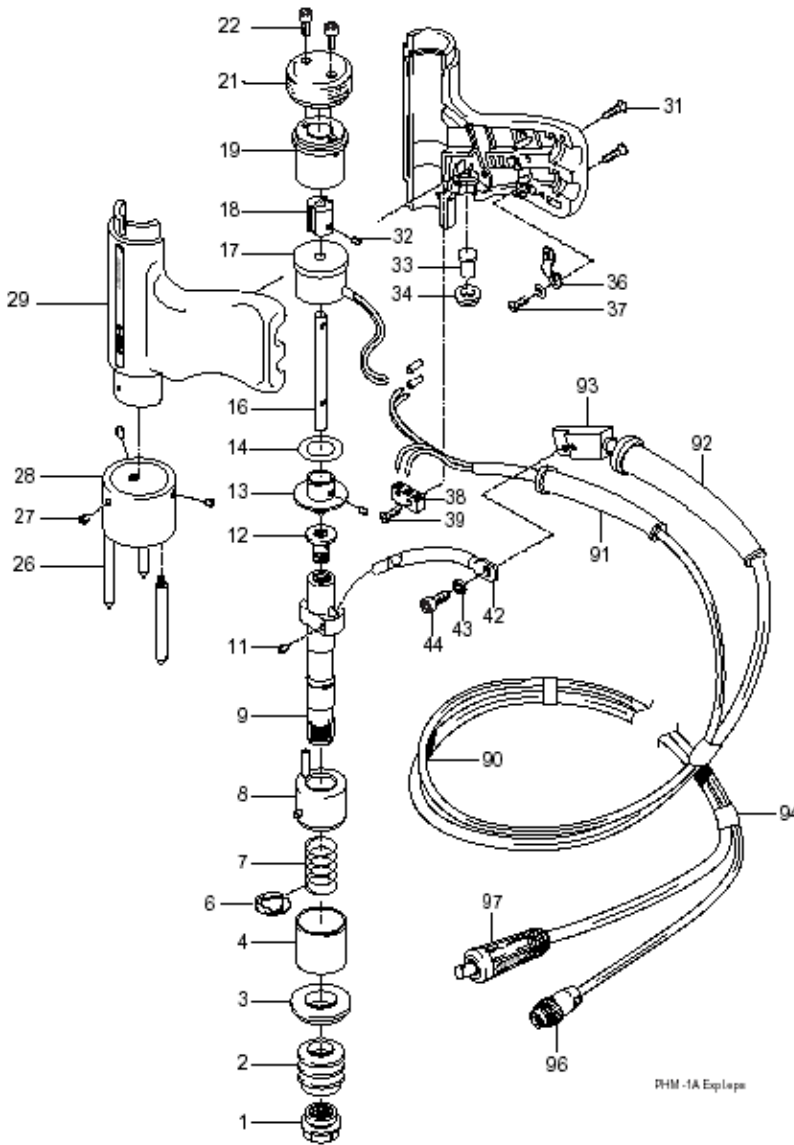
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Stud Welding...

- Fasteners
- Equipment
- Service

SIGNUS GAP MANUAL

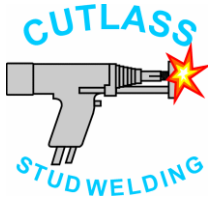
PHM-1A GUN PARTS



#	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	80-40-1017	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



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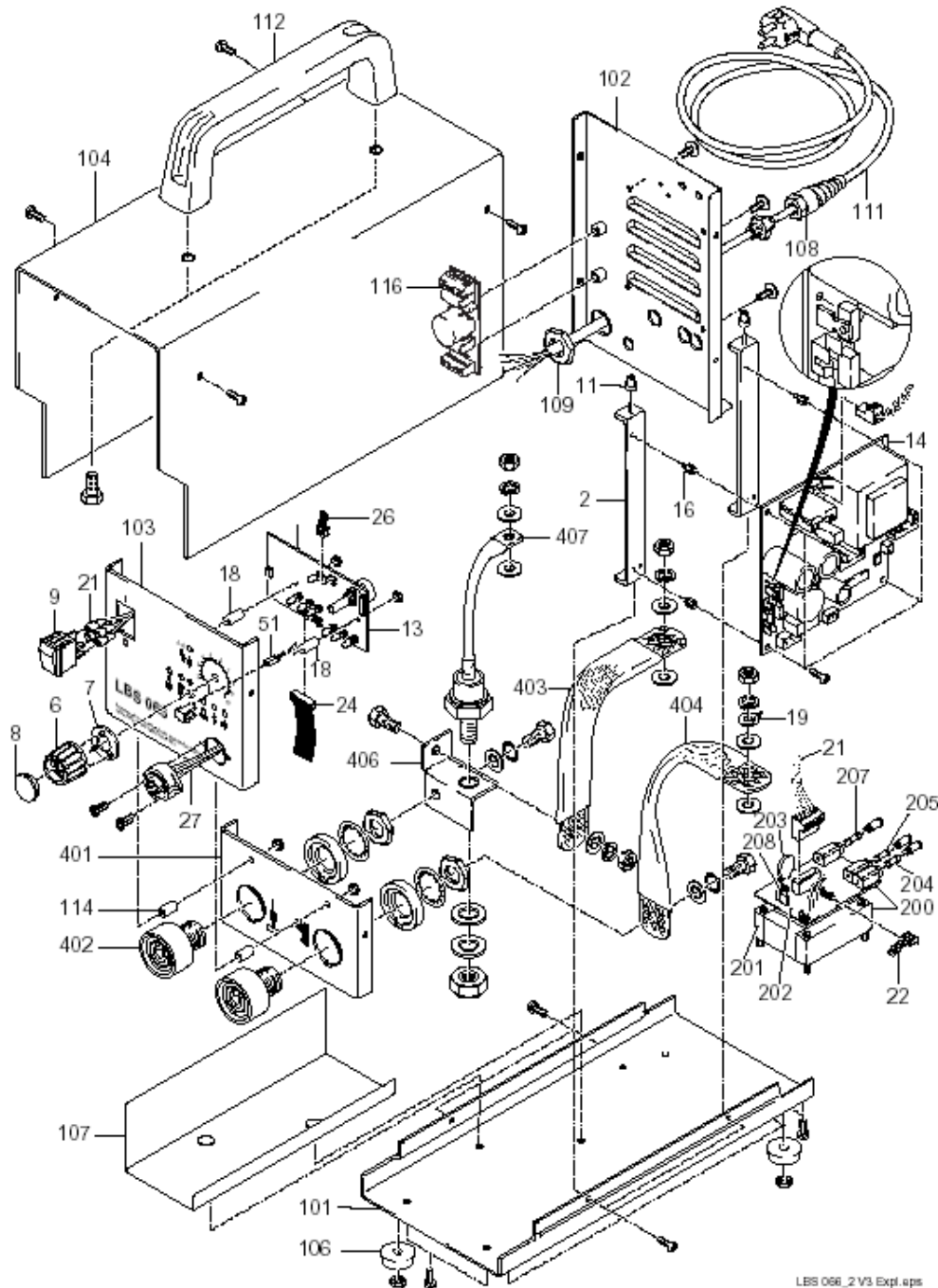
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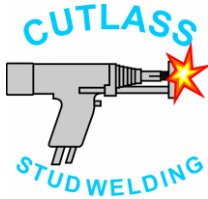
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SIGNUS GAP MANUAL

SIGNUS CONTROLLER PARTS



LBS 066_2 V3 Expl. eps



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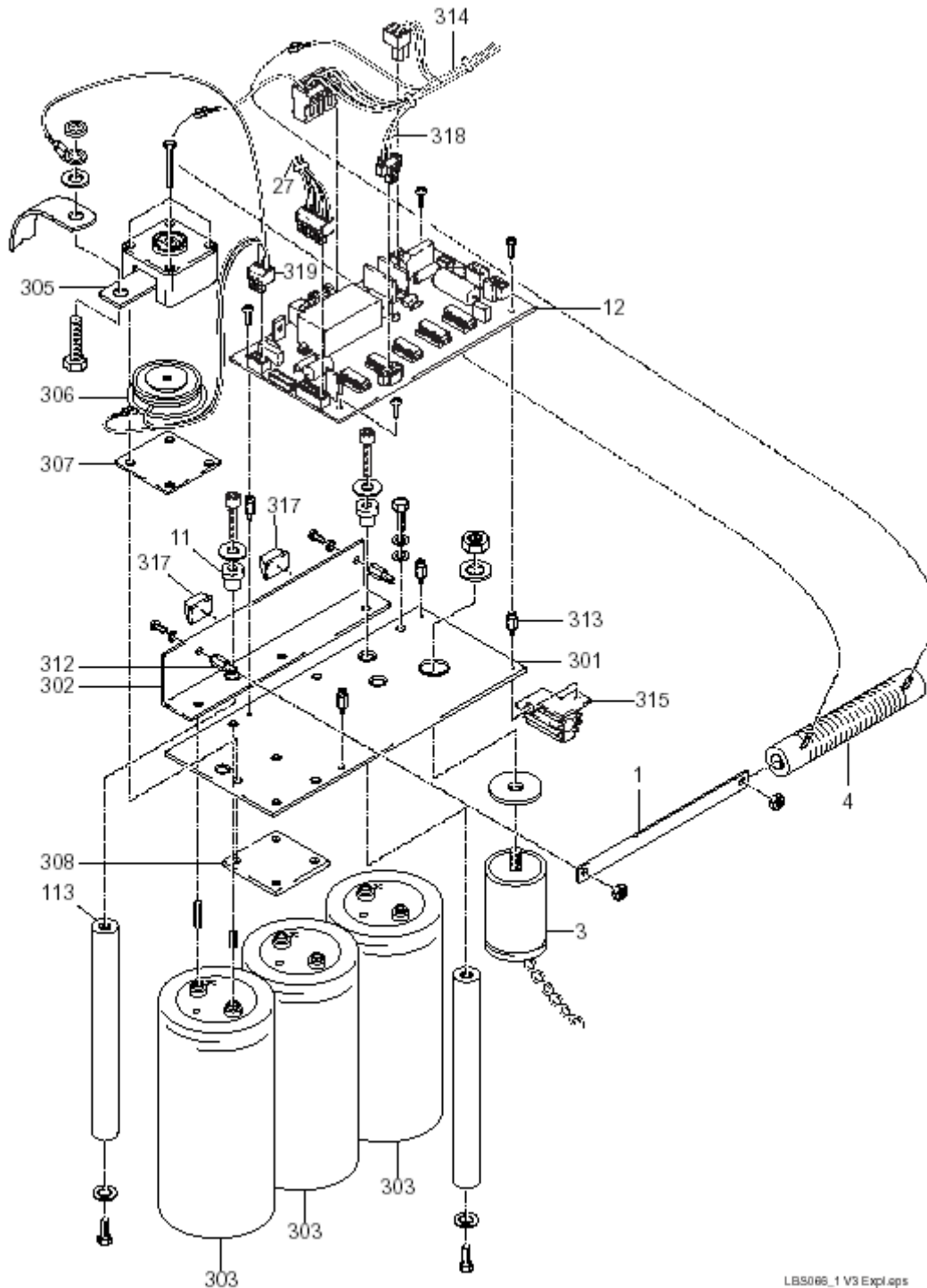
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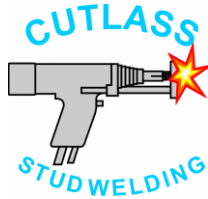
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- Fasteners
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SIGNUS GAP MANUAL

SIGNUS CONTROLLER PARTS (continued)





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SIGNUS GAP MANUAL

Item	Qty.	Article no.	Part / Assembly
-	1	90-30-2024	Power unit LBS 066 complete
1	1	80-40-1283	Resistor holder LBS 066
2	2	80-40-1276	Board bracket 066
3	1	89-54-1012	Resistor 3K3 2W
3	1	80-52-1013	Capacitor E 4700U/100V mit Isoscheiben I8-18
4	1	80-54-1010	Resistor 3R 70W
6	1	80-10-1115	Rotary button 28mm
7	1	80-10-1117	Arrow 28mm
8	1	80-10-1116	Cap 28mm
9	1	80-50-1027	Main switch
11	4	80-40-1280	Insulating bush LBS 066
12	1	80-60-1166	Board LBS05/STD, compatible with 80-60-1066
13	1	80-60-1055	Board LED-FP / Series 066
14	1	80-60-1063	Board, NTG-Thü-oNF
16	4	80-10-1173	Spacer bolt 6K10IAM4ST
18	2	80-10-1035	Distance bush 7x15-3
21	1	80-72-1040	Cable harness LBS 066 / mains
22	1	80-72-1073	Ribbon cable L6/220
24	1	80-72-1045	Ribbon cable L14/255
26	1	80-72-1069	Ribbon cable L4/160
27	1	80-75-1012	Control cable module BE7/S6
101	1	89-40-1400	Base plate LBS 066 RAL 9005, new version
102	1	82-40-1401	Back wall LBS 066 RAL 9005, new version
103	1	89-30-1403	Front panel LBS 066 RAL 9005 with screen print, new version
104	1	82-40-1405	Cover LBS 066 RAL 2002, new version
106	4	80-10-1020	Housing foot 25/12
107	1	80-40-1277	Cardboard insert LBS 066
108	1	80-10-1038	Screwed cable gland PG9
109	1	80-10-1024	Nut PG9
111	1	80-50-1016	Power cable
112	1	80-10-1214	Handle LE 700
113	2	80-40-1273	Spacer bolt 10-168-M5
114	2	80-40-1691	Distance bush 8x10.5-4.5
116	1	80-60-1062	Board
200	1	80-35-1061	Assembly control transformer LBS 066/S3

Item	Qty.	Article no.	Part / Assembly
201	1	80-65-1040	Transformer
202	1	80-60-1053	Board (no replacement part)
203	1	80-50-1136	Varistor S14K250
204	2	80-50-1031	Fine-wire fuse 4AF
205	1	80-50-1030	Fine-wire fuse 1AM
208	1	80-10-1165	Connecting bridge
300	1	80-35-1095	Capacitor battery 066 01
301	1	80-40-1275	Bus bar - LBS 066
302	1	80-40-1274	Bus bar + LBS 066
303	3	80-52-1012	Capacitor E22.000/200
305	1	80-10-1017	Clamping cap 46x46/L
306	1	80-51-1011	Thyristor SKT 491/04
307	1	80-40-1041	Copper clad aluminium plate
308	1	80-40-1044	Clamping plate 50x50
312	2	80-10-1047	Spacer bolt 6K15IAM4ST
313	4	80-10-1177	Spacer bolt 6K18IAM4ST
314	1	80-75-1023	Cable set LBS 066/KB 01
315	1	80-54-1221	Resistor 220R20W
317	1	80-10-1037	Housing foot 20x20
318	1	80-75-1024	Cable set LBS 066/LE 01
319	1	80-50-1118	Socket cable 3/3.81
401	1	89-30-1404	Socket plate 160x93mm, 9011, with screen print P/M
402	2	80-50-1022	Panel socket BE50
403	1	80-40-1285	Copper fabric tape 230mm
404	1	80-40-1394	Copper fabric tape 195mm
406	1	80-40-1272	Diode bracket LBS 066
407	1	80-51-1012	Diode SKR240/04