Operating Instructions

MAGNATECH

4 Head Linear Welding Machine

Located in ICB

OPERATING INSTRUCTIONS

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OPERATING INSTRUCTIONS

1.0 SET-UP CONTROLS

1.1 REMOTE PENDANT

Two remote pendants are supplied with the system. Each pendant has a selector switch to choose lead torch or lag torch functions. Jog switches for AGC position and wire are selected by the selector switch. The travel jog switch is independent of the selector and moves both welding modules. Travel jog forward is at set welding speed. Travel jog reverse is at maximum speed and the switch will rest in the reverse position. Even though load protection devices are in place to protect the drive motor and welding heads, the system must never be left unattended in the reverse jog mode.

1.2 MAIN CONTROL

In addition to the main power switch in the power distribution section of the control cabinet, the small power switch on the face of the motor speed control unit must be in the "ON" position. Also on the motor speed control unit, the red 'ENTER' switch must be pressed following each system power up or speed change.

1.2.1 AUTO GAP SET

The auto gap set switch located in the main control causes all four torches to move torward the work until contact is made, then back off to a preset height ready for welding. As each torch completes this gap set cycle, the red LED on the front panel of the appropriate control unit becomes lit.

1.3 INDIVIDUAL CONTROL UNIT

In addition to the main power switch, all individual control units must be turned on. This is true even if that unit is not be used during a weld test. In that case the Test Switch(es) for the disabled unit(s) should be depressed and lit and the individual function switches (wire and AGC in the main control should be turned off.

2.0 WELDING FUNCTIONS

2.1 ARC GAP CONTROL FUNCTION

The arc gap control function is designed to maintain a constant arc length while varying the welding current. If the workpiece and rail alignment accuracy is sufficiently close, the arc gap control function can be left inoperative.

The main control unit has a master Arc Gap Control (AGC) Switch and individual Arc Gap Control (AGC) Switches for each torch. For a torch to have active AGC, both switches must be "ON". In addition, an AGC Step Switch is provided to disable the AGC function during background or the low current period of pulsed current operation.

Separate arc length reference controls for each torch are also located on the main control front panel.

Sensitivity controls located on each of the individual control units adjust the AGC response. For normal operaton, the controls are in their center position

2.2 WIRE FUNCTION

Operation of the wire function is similar to operation of the AGC function. Both a main control switch and individual control switches must be depressed for a given wire drive to function. Similarly a Wire Step Switch is provided to halt wire feed during background welding current, if desired.

2.3 TRAVEL FUNCTION

Travel is accomplished by a large DC motor propelling both welding heads. For proper operation, the Travel Switch at the top of the main control unit must be lit. In addition the power switch on the motor control unit (DLC 100) must be on. Finally, to cause the dialed in speed (0.00 to 99.99 inches per minute) to control, the" ENTER" switch must be depressed every time the main power has been turned off or a change of setting is desired.

2.4 PULSE FUNCTION

This function causes each of the individual control units to pulse. Each unit however, controls its own pulse parameters independently. Background welding current, high pulse time and low pulse time are adjusted on the front panel of each control unit.

2.5 PURGE FUNCTION

The Purge Switch located in the main control unit permits gas to flow to each of the torches. With this switch, the operator can purge air from the lines following a prolonged shutdown or the changing of a gas bottle. During welding, gas flow is controlled automatically by the logic circuitry.

2.6 PRE-PURGE FUNCTION

The Pre-Purge Control adjusts the time of gas preflow that will occur just prior to arc initiation.

2.7 PROGRAM DELAY FUNCTION

This control adjusts the time from when all four arcs are present until welding functions begin. This period permits the arc to porperly stabilize.

2.8 WELD CONTROLS

The three basic weld function switches located in the main control are described below.

2.8.1 START WELD SWITCH

The Start Weld Switch initiates the welding cycle. Following the actuation of this switch prepurge begins. This switch remains illuminated throughout the welding cycle.

2.8.2 DOWNSLOPE SWITCH

This switch initiates downslope of welding current followed immediately by arc shutdown. Both AGC and wire operation end when this switch is depressed. This function can also be addressed by a microswitch mounted on the guide rails and actuated by one of the welding modules. When the downslope function is active, this switch is illuminated and stays lit until the last welding arc is extinguished.

2.8.3 EMERGENCY STOP SWITCH

The Emergency Stop Switch causes all welding functions to halt immediately except for post-flow of gas. The emergency stop function can also be addressed by a second switch located slightly behind the downslope switch on the rail or by switches signalling drive disengagement.

2.9 CURRENT CONTROL FUNCTION

To accomodate the varying heat sink of the expendable run-on tab and early section of work piece, a four level current programmer has been provided. Separate control pots are provided for each torch. The first current level marked "Initial", has authority until all four arcs have been established. The second and third current control levels are controlled by timers addressed by the two digit controls at the left of each row. Times are in seconds. After the second time period has expired, the final controls have authority for the remainder of the weld. A red LED to the left of each row indicates which row is in command

3.0 WELDING SEQUENCE

Figure 1 shows a typical welding sequence. Points of interest indicated are described below.

3.1 START WELD

When the Start Weld Switch is depressed, shielding gas begins flowing.

3.2 ARC INITIATION

Following pre-purge, the welding arcs are initiated. Each individual arc starts at its mimimum setting then up-slopes to the "INITIAL" current setting of the current control. Failure of any torch to achieve an arc within approximately three seconds will end the weld cycle here.

3.3 ARCS PRESENT

Once all four arcs are present, the welding current jumps to the second welding level. The duration of this welding current level is determined by the two digit control at the left of this row. Also starting at this time is the program delay.

3.4 PROGRAM DELAY ENDS

When the program delay time has ended,wire, AGC and travel all begin operating.

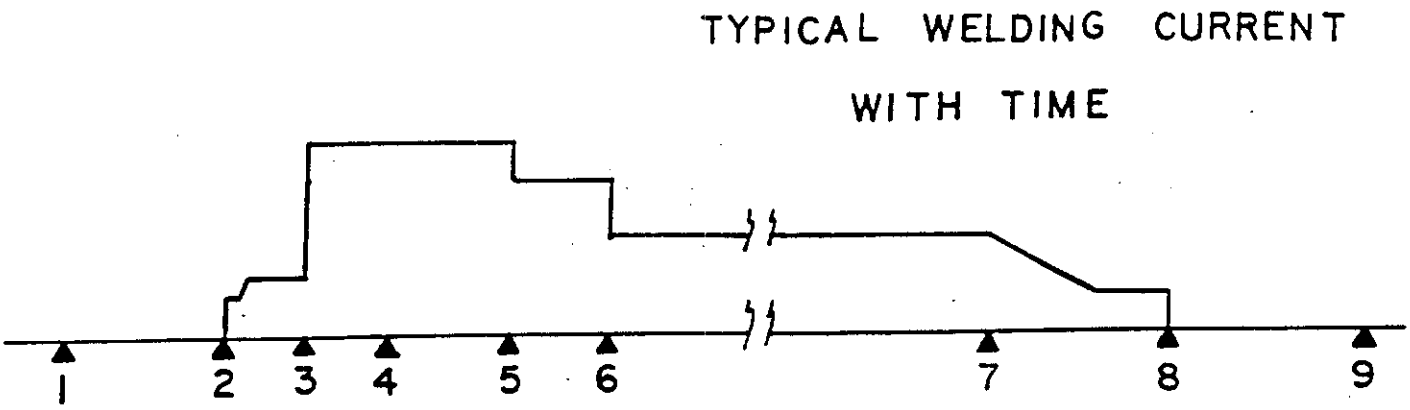


FIGURE 1

3.5 FIRST CURRENT CONTROL TIME PERIOD ENDS

Following the first timer period, the current level switches from row 2.to row 3. This level is also timer controlled.

3.6 FINAL CURRENT

Following the second time controlled interval, the current control shifts to the "Final" current setting for the remainder of the weld.

3.7 DOWNSLOPE

Once the weld is complete, the downslope function is activated. When activated, the switch is lit. Wire feed and AGC cease operation at this time. Welding current begins to taper.

3.8 SHUTDOWN

Following weld taper to minimum, the arcs shut down and travel halts.

3.9 POSTPURGE

Shielding gas continues to flow for approximately 15 seconds, then it also ceases.

4.0 CAUTIONS AND COMMENTS

4.1 TOUCH START VS HIGH FREQUENCY ARC STARTING

Usually high frequency arc starting is used for TIG welding. In this mode of operation the Touch Start/High Frequency switch in each individual control must be set in the High Frequency position. In addition, the switch on the welding power source should be set in the "Auto" or "Start" position. Continuous high frequency must never be used with this system.

If arc starting is poor due to long cables or stray high frequency losses, touch start may be used. The switches in the controls must be placed in the Touch Start position and the high frequency switches on the power sources must be turned to "OFF".

Under no circumstances can the power sources be used with high frequency when the individual controllers are set for touch start operation. Critical protection circuitry is by-passed to permit touch start operation. Without this circuitry, damage may result to the welding head

4.2 POWER SWITCHES

During normal operation, the complete control system will be turned on and off with the power switch located in the power distribution section. Other power switches in the control cabinet may be left "ON". Switches that must be ON in the console:

Main power section power switch
Power switches in each control module
Motor speed control on the face of the main control.

4.3 TRAVEL CONTROL - ENTER FUNCTION

The motor speed control (DLC 100) located in the front panel of the main control is designed to permit the operator to dial in a new desired speed, with it taking effect only after pressing the "Enter" switch. The switch must also be depressed whenever the system has turned off and repowered

4.4 TRAVEL REVERSE

Travel reverse by-passes the DLC 100 motor speed control permitting high speed jog reverse without resetting the control input. While a maintained revese position is provided on the jog switch, continuous operator vigilance is required for safe operation

FILLER WIRE REQUIREMENTS FOR THE AUTOMATIC LINEAR WELDING SYSTEM

It is possible to feed filler wire of either .035 or .045 diameter in the four wire feed modules incorporated in the welding system. Magnatech strongly recommends however that wire of .035 diameter be used. The wire feed conduits have several sharp bends dictated by the confined access area of the press/fixturing mechanism. The increased stiffness of the .045 stainless wire may result in feeding problems. Both sets of filler wire nozzles supplied (one set mounted on the welding modules and the second spare set) are designed for .035 wire.

The four wire spool mounts provided on the two welding modules are designed to accept a standard 4" diameter spool. This size spool is commonly available from a wide variety of filler wire manufacturers. The spools are normally supplied with 2/lbs. of filler wire. Magnatech has calculated that approximately 3.5/lbs. of wire will be required to adequately fill the proposed joint geometry. One manufacturer can supply the standard 4" diameter spool wound with 3.7/lbs. of filler wire on special order. This supplier is Sandvik Welding and Wire Products, P.O. Box 1220, Route 81, Waverly, Exit 59, Scranton, Pennsylvania 18501, phone (717) 587-5191. 308 and 308L alloys can be supplied from this manufacturer. This is accomplished by using a spool with a smaller hub diameter than the standard 2/lb. spool.

W A R N I N G !

USE ONLY DISTILLED (OR DE-IONIZED) WATER) IN WATER COOLER

THIS AVOIDS ELECTRICAL CONDUCTIVITY PROBLEMS BETWEEN THE COOLING CIRCUIT AND GROUND WHICH CAN, DEGRADE ARC-STARTING CHARACTERISTICS

WHERE FREEZING MIGHT BE A PROBLEM, MAGNATECH RECOMMENDS THE USE OF PURE ALCOHOL (METHANOL) MIXED IN A RATIO OF 3 PARTS DISTILLED WATER, 1 PART ALCOHOL FOR PROTECTION TO -10 DEGREES F.

THIS MAY ALSO PROVIDE SOME PROTECTION AS FUNGICIDE AGAINST ALGAE GROWTH

BRADLEY PARK • EAST GRANBY, CONNECTICUT 06026 • PHONE (203) 653-2573
TELEX NO. 99284

CHEMFLO
EQUIPMENT CO.
234 S.W. 12th Avenue
Deerfield Beach, FL 33442
Telex: 807081
Phone: (305) 428-8259

INSTALLATION AND MAINTENANCE

MODEL 125-BP SERIES

SPECIFICATIONS

FLOW SETTINGS

MODEL	AIR	WATER
	Adjustable Ranges	
125 BP	100 to 20,000 cc/min. at STP	3 to 500 cc/min.
125 BPHF	200 to 60,000 cc/min. at 60 PSI	5 to 950 cc/min.

MATERIALS

MATERIALS	MAXIMUM WORKING PRESSURE	WETTED PARTS
T TEFLON	100 PSI	TEFLON
B BRASS	1500 PSI	BRASS, TEFLON VITON, EPOXY
S 316ss	3000 PSI	316ss VITON, EPOXY

Max. Recommended Working Temperature 220° F.

INSTALLATION

Install as shown in vertical position with inlet on bottom. Avoid dirt, teflon tape shred, or other foreign material entering unit. Do not use pipe dope. We recommend the use of a 100 micron filter.

FOR SIGNAL ADJUSTING PROCEDURE

A. For increasing flow actuation point:
1.) Turn adjustment counter clockwise to full open.
2.) Establish flow in system at nominal rate desired.
3.) Turn adjustment clockwise until switch activates.

B. For decreasing flow actuation point.
1.) Follow steps above.
2.) Turn adjustment back counter clockwise until switch de-activates.

The standard unit is provided with a SPST, N.O. (Open at rest) dry reed switch. Increasing flow to set point will close the switch, decreasing flow to set point will open the switch. N.C. models are closed at rest. Increasing flow to set point will open the switch, decreasing flow to set point will close the switch. SPDT models have both N.O. and N.C. capabilities.

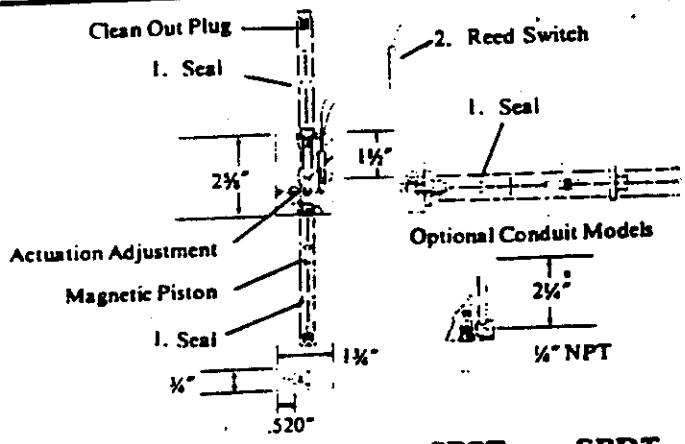
Large metallic bodies and magnetic fields may affect the principle of operation of these units. If disturbance is suspected, adjustment of the reed switch may be necessary, or magnetic shielding in severe cases.

PARTS LIST

1.) Seal kit (viton) brass and S.S. models — P/N: A-631
Seal kit (TFE) teflon models — P/N: A-632

2.) Reed switch capsule.
Standard unit — P/N: A-149 SPST 1AMP
N.C. Unit — P/N: A-149 N.C. SPST 1AMP
SPDT Unit — P/N: A-149 SPDT .3AMP

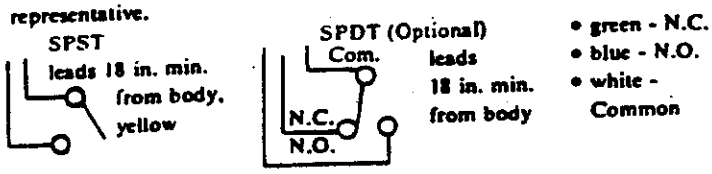
Other parts are available upon request. Factory will repair and recondition units for a nominal fee.



SWITCH DATA

	SPST	SPDT
Maximum voltage (VDC)	200	200
Contact Rating (W)		
DC	50	3
AC	70	—
Maximum Switching Current (A)		
DC	1.0	0.3
AC	0.7	—

Above values for resistive loads only. For inductive loads, surge current and rush current — contact protection required, consult your local representative.



22 E 19, TFE INSULATION — 24 E 19, TFE INSULATION

MAINTENANCE

Cleaning the flow switch is easily accomplished without removal from the line. By unscrewing the clean-out plug, the piston may be removed and the flow passage flushed or cleaned. Care should be taken to thoroughly clean the piston before replacing. A magnet may be used to conveniently lift out the piston. For teflon models care should be taken not to over tighten the clean out plug. A torque of 20 in/oz is recommended.

For reed switch replacement:
1.) Loosen allen set screws (6-32) on face of body.
2.) Remove and replace reed switch if needed.
3.) A. Normally Open
Move switch downward until switch closes then move upward until switch opens. Very gently retighten allen screws.
B. Normally Closed
Move switch downward until it closes and reopens, then move switch upward until it closes. Very gently retighten allen set screws.
4.) If possible cycle unit on and off to test. If unit is not installed turning upsidedown will simulate flow.

OPERATION

With no flow present, the magnetic piston rests on the bottom of the bore. When flow is established, the piston is forced upward by the by-pass flow and actuates the reed switch. The by-pass flow is controlled by manual external-adjustment of the adjustable orifice. When flow decreases, the piston moves downward and the reed switch is deactivated.

REV.	DESCRIPTION	DRAWN / APPD.	DATE / DATE

1.0)SCOPE

THIS DOCUMENT COVERS GAS-TUNGSTEN ARC WELDING OF AUSTENITIC STAINLESS STEEL ON THE SSC 50MM SINGLE PHASE SKIN TO SKIN ALIGNMENT KEY WELD MADE USING THE FERMILAB LONG MODEL YOKE AND SKINNING PRESS AND LINEAR WELDER

2.0)WELDING MATERIALS

THE FOLLOWING MATERIALS ARE USED ON THIS WELD

2.1)SKIN MAT'L: .195" THICK 304LN STAINLESS STEEL
2.2)KEY MAT'L: .375 NOM.THK. 304 STAINLESS STEEL
2.3)WELDING WIRE: 308L ANNEALED STAINLESS 0.035" DIA.
2.4)SHIELDING GAS SUPPLY: LIQUID ARGON IN 242 SCF CYL(SEE FERMI STK #1980-1160)

3.0)WELDING PROCESS CONTROL PARAMETERS

3.1)INTENTION OF PROCESS PARAMETERS
THE INTENTION OF PROCESS PARAMETERS ARE TO GIVE THE GENERAL GUIDELINES OR RANGES OF VARIABLES WHICH HAVE BEEN EXPERIENCED DURING PREVIOUS PRODUCTION
3.2)GAS-TUNGSTEN ARC WELDING WILL BE USED
3.3)VOLTAGE:18-24 VOLTS
3.4)AMPERAGE:STRAIGHT D.C. CURRENT 125-150 AMPS
3.5)PULSED OPERATION: 30%-60% BACKGROUND(HIGH PULSE .20 SEC/LOW PULSE .10 SEC)
PEAK D.C. SQUARE WAVE 165 AMPS HIGH / 65 AMPS LOW
3.6)SHIELDING GAS FLOW RATE 25-35 CFM
3.7)WIRE FEED SPEED 210 TO 800 I.P.M.
3.8)CARRIAGE LINEAR TRAVEL SPEED: 4 - 6 I.P.M.
3.9)AUTO GAP CONTROL SETTING: 50% (STRAIGHT CURRENT) 25% PULSED MODE OPERATION

4.0)PRE-WELDING REQUIREMENTS AND PROCEURES

4.1)CONFIRM SKIN CLEANING AND KEY CLEANING:AS PER FERMI SPEC. 0102-ES-292380, INSTRUCT TECHNICIANS IF UNSATISFACTORY
4.2)CONFIRM RAIL CLEANING AND LUB:CLEAN RAILS WITH ALCOHOL AND LUBRICATED WITH A LIGHT GENERAL PURPOSE LUBRICATING OIL
4.3)TORCH CARRIAGE CLEANING AND MAINTENANCE:CLEAN TORCH CARRIAGE OF DUST AND DIRT WITH ALCOHOL OR SIM. SOLVENT
4.4)CONFIRM CHAIN TENSION OK. INSTRUCT TECHNICIANS IF UNSATIS.

5.0)WELDING PROCESS SET-UP PROCEDURE

5.1)THE INTENTION OF WELDING PROCESS SET-UP PROCEDURE IS TO GIVE THE GENERAL METHODOLOGY FOR THE SET-UP OF THE FERMI-MAGNATECH LINEAR WELDER; NO RANK IS INFERRED BY THE PLACEMENT OF DIFFERING TASKS IN THE FOLLOWING LISTS
5.2)CHECKLIST SET-UP TASKS:COMPLETE CHECKLIST LOCATED IN RUN SHEET BINDER LOCATED IN CONTROL CONSOLE DRAWER
5.3)FILL OUT PROCESS PARAMETER SHEET AFTER THE EACH PASS COMPLETED. LEAVE BOOK IN OPERATORS CONSOLE DRAWER.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.

PARTS LIST

UNLESS OTHERWISE SPECIFIED:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. TOLERANCES: ± 1 mm.
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982.
4. INCH DIMENSIONS ARE FOR REFERENCE ONLY.
5. BREAK ALL SHARP EDGES.
6. DO NOT SCALE DRAWING.
7. MAX. ALL MACH. SURFACES √
8. DIMENSION IDENTIFICATION: MILLIMETER/INCH, MILLIMETER/INCH

ORIGINATOR	ERIC HAGGARD	8-19-91
DRAWN	ERIC HAGGARD	8-19-91
CHECKED	W. Hamstein	9/16/91
APPROVED	[illegible]	9/12/91
USED ON	0102-ME-292451	
MATERIAL		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY
SSC

SSC 50MM LONG COLD MASS
YOKE AND SKINNING
WELD OPERATION SPECIFICATION

SCALE	FILMED	DRAWING NUMBER	REV.
AS NOTED		0102-ES-2[illegible]98	

CREATED WITH I-DEAS 4.1

REV.	DESCRIPTION	BY	DATE

6.0)SET-UP CHECK-LIST FOR LINEAR WELDER OPERATION

6.1)VISUAL CHECK FOR LEAKING COOLANT
6.2)CLEAN AND LUBRICATE LINEAR BEARINGS AND RAILS
6.3)INSPECT RAILS FOR OBSTRUCTIONS
6.4)INSPECT ELECTRODES FOR NEW GROUND TIP
6.5)EXPOSED TUNGSTEN SET AT .500" FROM END OF GAS CUP
6.6)CARRIAGE GUIDES WHEELS IN SLOT,CARRIAGE ADJUSTED FORWARD TO 10 LBS FORCE
6.7)TORCH TRAVEL CONFIRMED AT +0.0625/-0.0625 FROM MEDIAN
6.8)WELDING WIRE LET-OFF SET AT NOMINAL LINE TENSION
6.9.WIRE CAPSTAN COVER OPENED AND CHIPS OR DUST REMOVED
6.10)WIRE FEED TIP AND CABLE ADJUSTED TO CORRECT ANGLE AND NOT TOUCHING OR HOLDING TORCHES, TIPS, CAMERAS, OR LIGHTS
6.11)WIRE FEE TIP TRAVEL HORIZONTAL ADJUSTMENT CONFIRMED BY MOVING TIP TO EXTREME RANGES
6.12)WIRE FEED TIP TRAVEL VERTICAL ADJUSTMENT CONFIRMED BY MOVING FEED TIP TO EXTREME RANGES
6.13)WIRE FEED TESTED BY RUNNING OUT APPROX. 12" OF WIRE
6.14)AGC TRAVEL FUNCTION OBSERVED OPERATING
6.15)CAMERA IMAGE CLEAR & CENTERED (MOVE ONLY ALUMINUM MOUNTING BLOCK)
6.16)OPERATION OF QUAD IMAGE CONFIRMED
6.17)VCR TAPE REWOUND AND READY TO RECORD
6.18)TEST GAP SET: TORCH PLACEMENT CONFIRMED IN CENTER
6.19)FINAL ADJUSTMENT OF FEED TIPS AND TORCH
6.20)START VCR TAPE RECORDING
6.21)PURGE BUTTON DEPRESSED
6.22)LINEAR SPEED CONTROL SET BUTTON DEPRESSED
6.23)START WELD BUTTON DEPRESSED

7.0)WELDER OPERATIONS: ARC ESTABLISHED

7.1)THE INTENT OF WELDER OPERATIONS SPECIFICATION IS TO DESCRIBE THE SPECIFIC ACTIONS CURRENTLY TAKEN BY WELDER-OPERATORS. OPERATORS MAKE ADJUSTMENTS ACCORDING TO STANDARD WELDING PRACTISE. NO RANK OR PREFERRED METHODOLOGY IS TO BE INFERRED BY THE POSITION OF TASKS IN THE FOLLOWING LISTS.
7.2)OPERATOR ADJUSTMENTS: THE FOLLOWING PARAMETERS ARE TO BE ADJUSTED BY THE OPERATORS TO ENSURE WELD QUALITY.
7.2.1)ARC GAP SETTING: TO ENSURE FILLER METAL PUDDLE WIDTH & CLEARANCE ON WELD WIRE ENTRY AT START WIRE FEED
7.2.2)CURRENT SETTING: TO ENSURE PROPER HEAT RATE AND FUSION
7.2.3)WIRE FEED SPEED:TO ENSURE PROPER VOLUME OF FILLER METAL
7.2.4)WIRE FEED TIP POSITION:TO ENSURE PROPER WELD WIRE ENTRY
7.2.5)GAS FLOW RATE: TO PREVENT CONTAMINATION
7.2.6)TORCH VERTICAL POSITION: TO ENSURE PROPER FLOW OF WELD
7.2.7)PULSED MODE OPERATION: TO ENSURE PROPER WIDTH OF PUDDLE AND PROPER HEAT RATE ON PASSES SPECIFIED AS OPTIONAL

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.

PARTS LIST

UNLESS OTHERWISE SPECIFIED:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. TOLERANCES: ± 1 mm.
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982.
4. INCH DIMENSIONS ARE FOR REFERENCE ONLY.
5. BREAK ALL SHARP EDGES.
6. DO NOT SCALE DRAWING.
7. MAX. ALL MACH. SURFACES
8. DIMENSION IDENTIFICATION: MILLIMETER/INCH

ORIGINATOR	ERIC HAGGARD	8-19-91
DRAWN	ERIC HAGGARD	8-19-91
CHECKED		
APPROVED		
USED ON	0102-ME-292451	
MATERIAL		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY
SSC

SSC 50MM LONG COLD MASS YOKE AND SKINNING WELD OPERATION SPECIFICATION

SCALE	FILMED	DRAWING NUMBER	REV.
AS NOTED		0102-ES-292398	

CREATED WITH I-DEAS 4.1 | USER NAME:JOHNE

REV.	DESCRIPTION	DRAWN / APPD.	DATE / DATE

8.0)WELD CLEANING BETWEEN PASSES

8.1)BRUSH WELDS AFTER EACH PASS USING AN AUSTENITIC STAINLESS STEEL BRUSH. DO NOT POLISH OR REMOVE SURFACE METAL. REMOVE ONLY OXIDIZED LAYER FROM PREVIOUS PASS

9.0)WELD REPAIR METHODS

9.1)KEYHOLING IN FIRST PASS MAY BE CORRECTED BY AN INTERMITTENT FILL OR FUSION PASS BETWEEN FIRST & SECOND FILL PASSES. THIS METHOD MAY ONLY BE EMPLOYED AS AN EMERGENCY PROCEDURE, AS THE SEVERITY OF PROBLEM WARRANTS.

9.2)A CONTINUOUS VOLUME OF WELD MATERIAL MUST TRAVERSE THE TOTAL CUT-TO-LENGTH DISTANCE REQUIRED BY SPECIFICATIONS DESCRIBED BY #0102-ME-292451 IF THE WELD DOES NOT MEET THIS REQUIREMENT, THE WELDER OPERATORS MUST MAKE HAND WELDS TO FILL IN THE MISSING VOLUME, AFTER REMOVAL FROM THE PRESS

9.3)GENERAL REPAIR MAY BE DONE AFTER SINGLE PHASE HAS BEEN REMOVED FROM THE YOKE AND SKINNING PRESS. THESE MAY INCLUDE THE FOLLOWING PROCEDURES.

9.3.1)WELD SMOOTHING FUSION PASSES TO REMOVE IRREGULAR SURFACE CONTOURS

9.3.2)HAND FED WIRE FILL PASS TO FILL SMALL VOLUME DEFICIENCIES

9.3.3)VOLUME REMOVAL BY GRINDING (EXTREME EMERGENCY PROCEDURE)

10.0)ALIGNMENT KEY FUSION:HAND FILL PASS IS DONE AFTER REMOVAL OF THE SINGLE PHASE FROM THE PRESS. WELDER-OPERATORS HAND FEED SMALL AMOUNT OF WIRE TO ALIGNMENT KEY BUTT JOINT USING 100-150 AMPS DCSP AND USING 20-35 CFH ARGON SHIELDING GAS AS REQUIRED. OPERATORS MUST USE STANDARD WELDING PROCEDURES

11.0)WELDER QUALIFICATION TESTS: ASME BOILER AND PRESSURE VESSEL CODE; SEC. 9; REQUIRES THAT WELD SAMPLES BE SUBMITTED TO A QUALIFIED TESTING LABORATORY AND UNDERGO A NUMBER OF MECHANICAL TESTS TO DETERMINE THE WELDED JOINT SOUNDNESS. ANY WELDER WHO HAS PERFORMED WELDING AN SSC 50MM SKIN-KEY DUAL V-GROOVE WELD WHICH HAS UNDERGONE THE MECHANICAL TESTS DESCRIBED BY THE ASME BOILER AND PRESSURE VESSEL CODE AND BEEN ACCEPTED BY THE FERMILAB QUALIFIED WELDING DOCUMENTATION REVIEWER IS QUALIFIED TO PERFORM THIS WELD IN PRODUCTION FOR A PERIOD OF 6 MONTHS UNLESS HE HAS

11.0.1)NOT PERFORMED THE PROCESS DURING A PERIOD OF 3 MONTHS EXCEPT IF HE IS WELDING ON ANOTHER PROCESS, IN WHICH CASE, THE PERIOD MAY BE EXTENDED TO SIX MONTHS

11.0.2) WHEN HE HAS NOT WELDED WITH ANY PROCESS DURING A PERIOD OF 3 MONTHS, ALL HIS QUALIFICATIONS SHALL BE EXPIRED INCLUDING ANY WHICH MAY EXTEND BEYOND 3 MONTHS BY VIRTUE OF ITEM 11.0.1

11.0.3) IF THERE IS A SPECIFIC REASON TO QUESTION THE ABILITY TO MAKE WELDS THAT MEET SPECIFICATION, HIS QUALIFICATION, WHICH SUPPORTS THE WELDING THAT HE IS DOING, SHALL BE CONSIDERED EXPIRED

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.

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5. BREAK ALL SHARP EDGES.
6. DO NOT SCALE DRAWING.
7. MAX. ALL MACH. SURFACES 63
8. DIMENSION IDENTIFICATION: MILLIMETER ; MILLIMETER/INCH [INCH]

ORIGINATOR	ERIC HAGGARD	8-19-91
DRAWN	ERIC HAGGARD	8-19-91
CHECKED	W. Ramstein	9-16-91
APPROVED	[illegible]	[illegible]
USED ON	0102-ME-292451	
MATERIAL		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY
SSC

SSC 50MM LONG COLD MASS
YOKE AND SKINNING
WELD OPERATION SPECIFICATION

SCALE	FILMED	DRAWING NUMBER	REV.
AS NOTED		0102-ES-2398	

CREATED WITH I-DEAS 4.1 | USER NAME: JOHNE

REV.	DESCRIPTION		DATE

12.0)WELD WILL CONFORM IN ALL APPLICABLE RESPECTS TO THE INTENT OF THE ASME BOILER AND PRESSURE VESSEL CODE

12.1)APPLICABLE PARTS OF THE CODE:

12.1.1)SEC. 8; PART UG; GENERAL REQUIREMENTS FOR ALL METHODS OF CONSTRUCTION

12.1.2)SEC. 8; PART UW; REQUIREMENTS FOR PRESSURE VESSELS FABRICATED BY WELDING

12.1.3)SEC. 8; PART UHA: REQUIREMENT FOR VESSELS CONSTRUCTED OF HIGH-ALLOY STEEL

12.1.4)SEC. 9; PART QW; WELDING

QW-100: WELDING GENERAL REQUIREMENTS

QW-200: WELDING PROCEDURE QUALIFICATIONS

QW-300: WELDING PERFORMANCE QUALIFICATIONS

12.2)WELD SPECIFIC PARAMETERS

QW-121.2 HORIZONTAL POSITION 2G

QW-422 P-NUMBERS FOR BASE METAL: S83; P NUMBER 8; GROUP 1; SPEC NO. SA-240

QW-432 F-NUMBERS FOR WELDING ROD:F #6; AWS/SFA 5.9; ER 308L

12.3) ESSENTIAL VARIABLES THAT IF CHANGED REQUIRE RECERTIFICATION OF WELD

P-NUMBER, P-NUMBER GROUP NO., CHANGE IN THICKNESS > 2T

F-NUMBER, CHEMICAL COMPOSITON, AMOUNT FILLER WIRE USED > 2T, PRE-HEAT

CHANGE IN PWHT, CHANGE IN GAS OR MIXTURE, CHANGE IN GAS FLOW RATE,

CHANGE IN TYPE OF CURRENT OR POLARITY,INCREASE IN HEAT INPUT, INCREASE IN

WELD METAL PER UNIT LENGTH (SEE PRESSURE VESSEL CODE FOR MORE INFORMATION)

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.

PARTS LIST

UNLESS OTHERWISE SPECIFIED:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. TOLERANCES: ± 1 mm.
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982.
4. INCH DIMENSIONS ARE FOR REFERENCE ONLY.
5. BREAK ALL SHARP EDGES.
6. DO NOT SCALE DRAWING.
7. MAX. ALL MACH. SURFACES
8. DIMENSION IDENTIFICATION: MILLIMETER (MILLIMETER/INCH) INCH

ORIGINATOR	ERIC HAGGARD	8-19-91
DRAWN	ERIC HAGGARD	8-19-91
CHECKED	W. G. Ramstein	9-6-91
APPROVED	[illegible]	9/12/91
USED ON	0102-ME-292451	
MATERIAL		

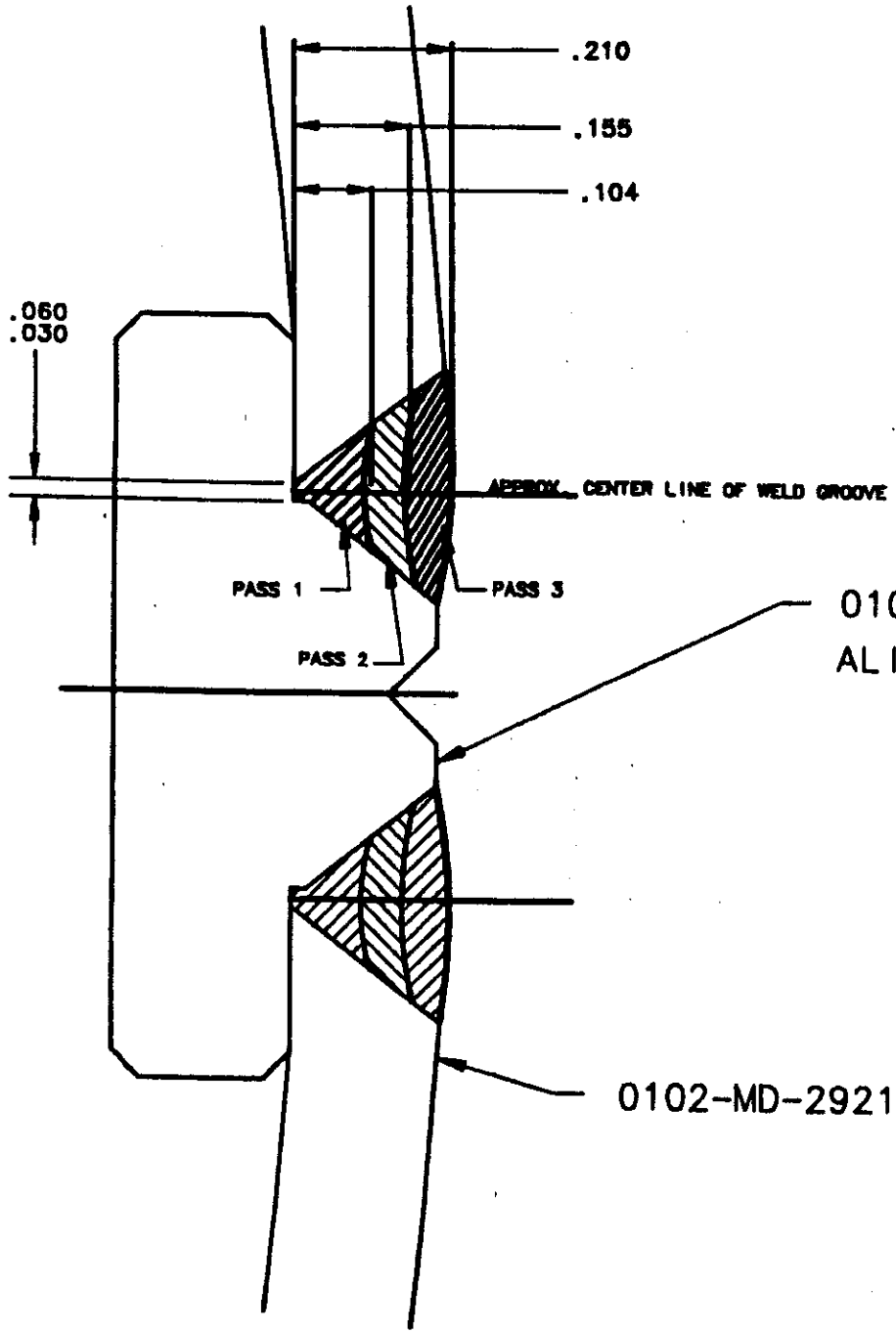
FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY
SSC

SSC 50MM LONG COLD MASS
YOKE AND SKINNING
WELD OPERATION SPECIFICATION

SCALE	FILMED	DRAWING NUMBER	REV.
AS NOTED		0102-ES-292398	

CREATED WITH I-DEAS 4.1 | USER NAME: JOHNE

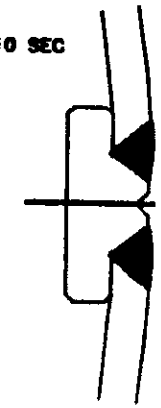
REV.	DESCRIPTION	DRAWN / APPD.	DATE



4X SCALE

DESCRIPTION OF WELDING PASSES

PASS 1: DC STRAIGHT CURRENT 150 AMPS (REF.)
PASS 2: DC STRAIGHT CURRENT 150 AMPS
(OPTIONAL)PULSED MODE OPERATION 50% BACKGROUND
HIGH PULSE-.20 SEC/LOW PULSE-.10 SEC
PASS 3:PULSED MODE OPERATION
50% BACKGROUND
HIGH PULSE-.20 SEC/LOW PULSE-.10 SEC



FULL SCALE

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.

PARTS LIST

UNLESS OTHERWISE SPECIFIED:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. TOLERANCES: ± 1 mm.
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982.
4. INCH DIMENSIONS ARE FOR REFERENCE ONLY.
5. BREAK ALL SHARP EDGES.
6. DO NOT SCALE DRAWING.
7. MAX. ALL MACH. SURFACES
8. DIMENSION IDENTIFICATION: MILLIMETER/INCH

ORIGINATOR	ERIC HAGGARD	8-19-91
DRAWN	ERIC HAGGARD	8-19-91
CHECKED		9-16-91
APPROVED		9/12/91
USED ON	0102-ME-292451	
MATERIAL		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY
SSC

SSC 50MM LONG COLD MASS YOKE AND SKINNING WELD OPERATION SPECIFICATION

SCALE	FILMED	DRAWING NUMBER	REV.
AS NOTED		0102-ES-29.	B

CREATED WITH I-DEAS 4.1 | USER NAME:JOHNE

REV.	DESCRIPTION	DRAWN / APPD.	DATE / DATE
	E.R. #6345		

1.0 SCOPE

1.1 This document gives recommendations for Gas-Tungsten-Arc welding of skins to alignment keys for LHC HGQ, and is to be used for reference only.

1.2 The High Pressure Vessel requirements are applied to the welds.

2.0 WELDING PROCESS

2.1 Gas-Tungsten-Arc Welding (G.T.A.W.) shall be done utilizing weld carriage assemblies ME-293948 and ME-301151.

2.2 Just before fitup, clean all edges to be welded, and the surface area extending 1-1/2 inches on each side of the weld joint by first mechanically cleaning with a fresh piece of an abrasive (aluminum oxide sanding cloth, for example) followed by thorough wipe down with clean, lint free, cotton cloths soaked with Alconox or Ethyl Alcohol.

2.3 Gas purge the weld area with the torches before initiating the arc to provide adequate gas shielding.

2.4 Mechanically aim the electrode tip to the middle (see sketch on page 2) of weld groove to achieve the full weld penetration during the first fusion weld pass. No adjustment of electrode allowed during the first fusion weld pass in both horizontal and vertical directions.

2.5 Minimize electrode tip to work surface distances, and weld with as short an arc length as feasible to assure a satisfactory weld.

2.5.1 Use 3/32" MAX weld gap for the first fusion weld pass, 1/8" MAX gap for the filled weld passes.

2.6 Weld, using the lowest heat input parameters (current and voltage) which permits complete fusion to be accomplished.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY

PARTS LIST

UNLESS OTHERWISE SPECIFIED				
.XX	.XXX	ANGLES	ORIGINATOR	J. CARSON
±	±	±	DRAWN	A. MAKAROV 7/31/9
			CHECKED	8/6/9
			APPROVED	8/6/9
			USED ON	
			MATERIAL	

1. BREAK ALL SHARP EDGES .02 MAX.
2. DO NOT SCALE DRAWING.
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982
4. MAX. ALL MACH. SURFACES

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

LHC HGQ SKIN-ALIGNMENT KEY WELDING SPECIFICATION

SCALE	FILMED	DRAWING NUMBER	SHEET	REV
		5525-ES-344959	1 OF 2	

CREATED WITH I-DEAS MS1.3b | USER NAME: MAKAROV

REV.	DESCRIPTION	APPD.	DATE
	E.R. #6345		

2.7 Purge gas shall be "High Purity" grade argon.

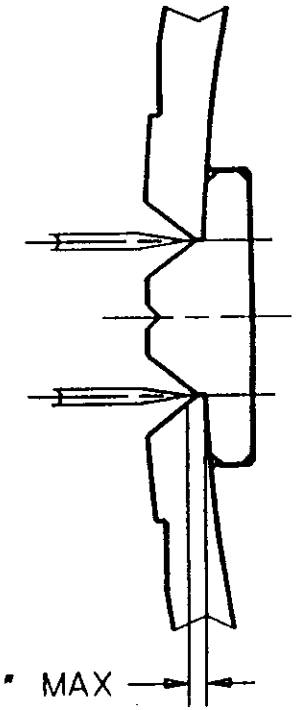
2.8 Do not use copper, zinc, cadmium, lead, tin, or any alloy of these metals on the surfaces of fixtures, alignment devices, etc. Chrome and nickel plating is OK.

2.9 You may only use austenitic stainless steel wire brushing or planishing to condition welds. Do not polish or remove surface weld material.

3.0 MATERIALS

3.1 Base materials to be determined by the part (alignment key and skin) drawings.

3.2 The filler wire shall conform to the requirements of A.W.S./S.F.A. 5.9 (.035" DIA, alloy 308 L, dwg. MA-292401 is recommended for the alloys being welded).



ITEM	PART NO.	DESCRIPTION OR SIZE	QTY

PARTS LIST

UNLESS OTHERWISE SPECIFIED			ORIGINATOR	J. CARSON	
.XX	.XXX	ANGLES	DRAWN	A. MAKAROV	7/31/9
±	±	±	CHECKED		
1. BREAK ALL SHARP EDGES .02 MAX.			APPROVED		
2. DO NOT SCALE DRAWING.			USED ON		
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982					
4. MAX. ALL MACH. SURFACES			MATERIAL		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

LHC HGQ SKIN-ALIGNMENT KEY WELDING SPECIFICATION

SCALE	FILMED	DRAWING NUMBER	SHEET	REV
		5525-ES-344059	2 OF 2	

CREATED WITH I-DEAS MS1.3b | USE[illegible] : MAKAROV

THE SHORT DUMMY MODEL #1
WELDING PROCEDURE

For the welding of short dummy model #1 follow the procedure used for HGQ01 and HGQ02 welding, **except for:**

1. Mechanically set up the torches before welding (the torch tips must aim to the bottom of weld groove). **No vertical adjustment during the first fusion pass allowed!**
2. The top and bottom welds should be performed separately (the current in bottom torches must be reduced to the minimal volume while the top welds performance, and contrariwise, the current in top torches must be reduced to minimum during the bottom welding). The top and bottom weld passes should alternate each other.