MODULAR WELDING GUNS INDEX

GLOBAL STANDARD COMPONENTS
NAAMS™
Assembly 01/12/17

MODULAR WELDING GUNS INDEX

GLOBAL STANDARD COMPONENTS
NAAMS™
Assembly 03/30/09

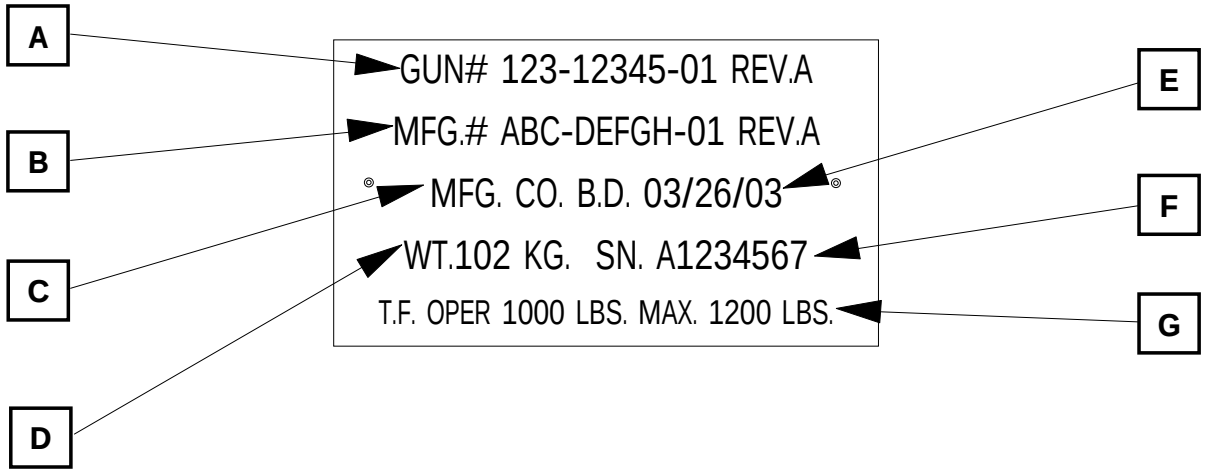
GUN IDENTIFICATION TAG

GLOBAL STANDARD COMPONENTS
NAAMS™

Assembly 10/23/03

Gun Identification Tag

Size: 60mm x 100mm
Five lines of information with an 8mm (0.31in.) font
Lettering shall be engraved
Tag Colors:
- Inch fasteners - white with black letters
- Metric fasteners - blue with white letters



A = Customers number with revision level
B = Gun Manufacture number with revision level
C = Manufacture Name
D = Gun weight
E = Date gun was manufactured
F = Serial number
G = Tip Force (Units specified by user)

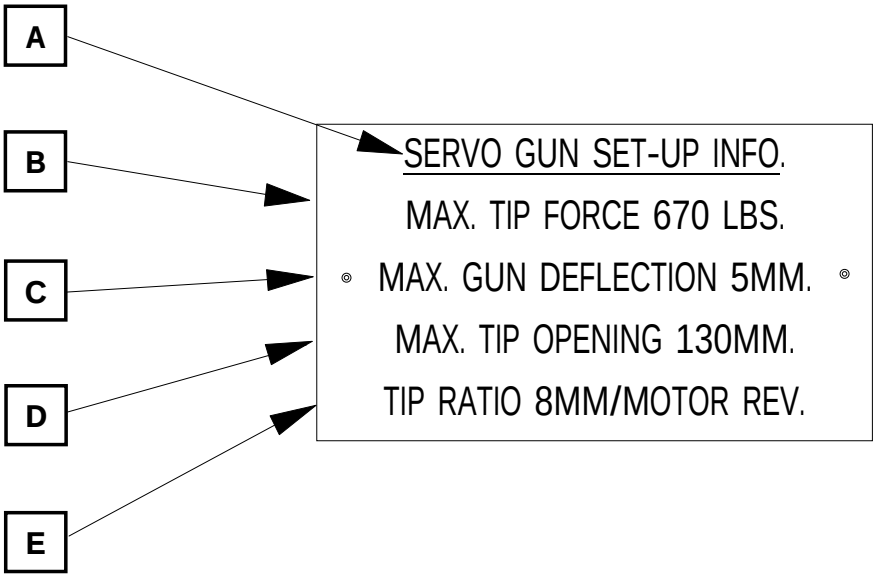
SERVO GUN IDENTIFICATION TAG

GLOBAL STANDARD COMPONENTS
NAAMS™

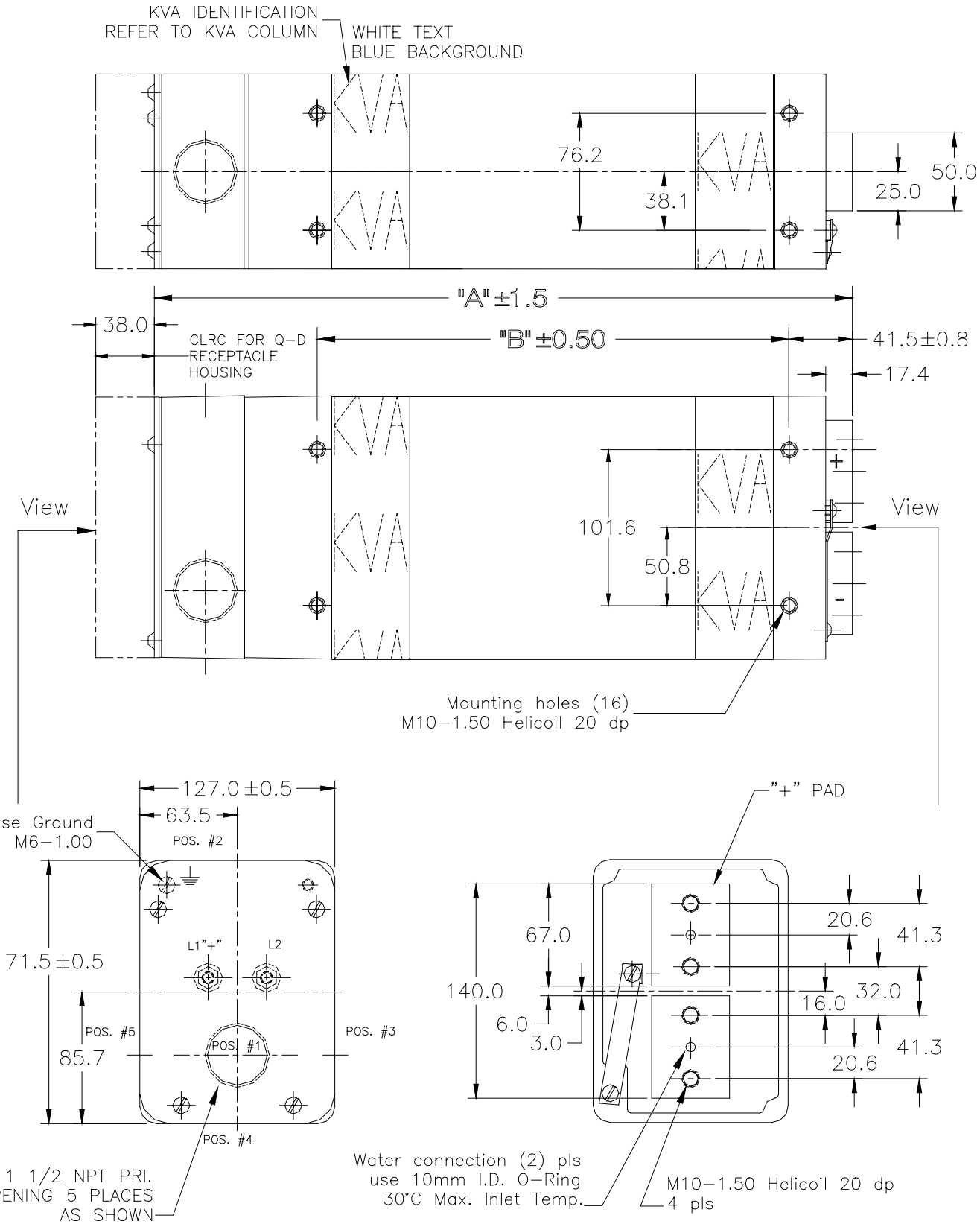
Assembly 10/23/03

Gun Identification Tag

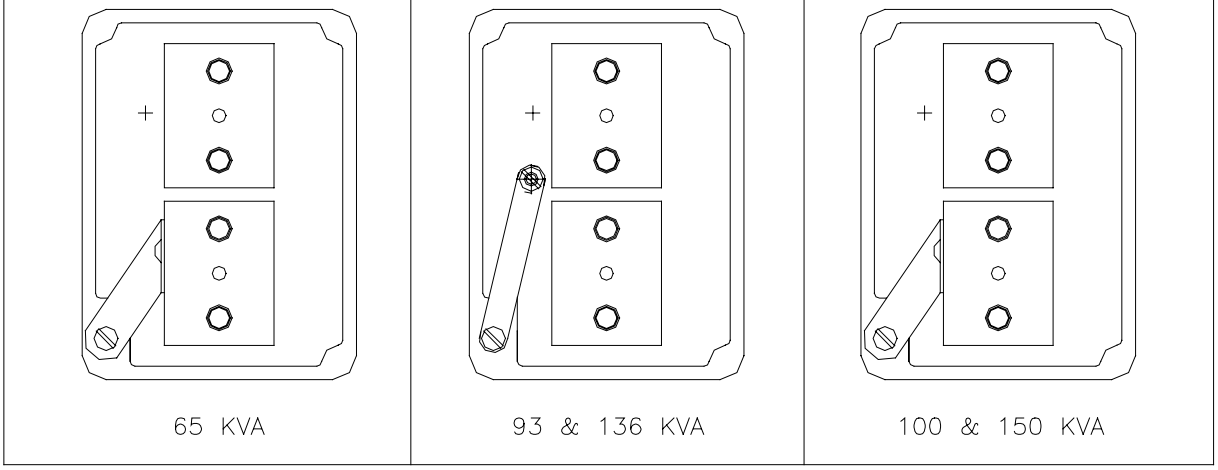
Size: 60mm x 100mm
Five lines of information with an 8mm (0.31in.) font
Lettering shall be engraved
Tag Colors:
- Inch fasteners - white with black letters
- Metric fasteners - blue with white letters

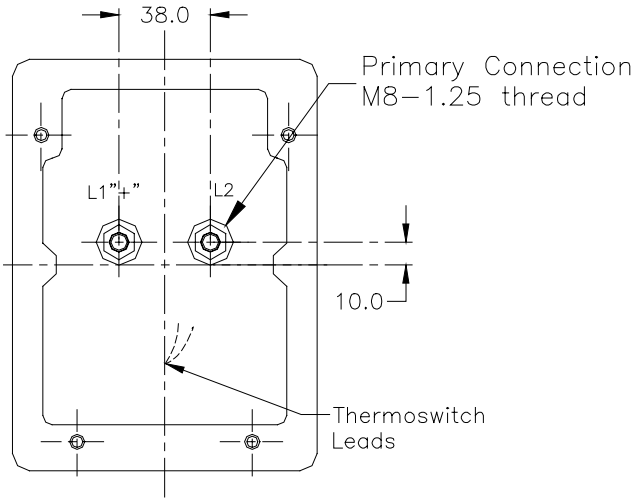


A = Title
B = Operating Tip Force (Units specified by user)
C = Maximum movement of the actuator due to gun deflection
D = Maximum Tip Opening
E = Tip Displacement Ratio


KVA IDENTIFICATION
REFER TO KVA COLUMN
WHITE TEXT
BLUE BACKGROUND
76.2
38.1
25.0
50.0
"A" ±1.5
38.0
CLRC FOR Q-D
RECEPTACLE
HOUSING
"B" ±0.50
41.5±0.8
17.4
View
View
101.6
50.8
+
-
Mounting holes (16)
M10-1.50 Helicoil 20 dp
127.0 ±0.5
63.5
Case Ground
M6-1.00
POS. #2
171.5 ±0.5
L1"+"
L2
POS. #5
POS. #1
POS. #3
85.7
POS. #4
1 1/2 NPT PRI.
OPENING 5 PLACES
AS SHOWN
"+" PAD
67.0
140.0
6.0
3.0
20.6
41.3
16.0
32.0
20.6
41.3
Water connection (2) pls
use 10mm I.D. O-Ring
30°C Max. Inlet Temp.
M10-1.50 Helicoil 20 dp
4 pls

DIRECT GROUNDING OF SECONDARY





PRIMARY COVER
REMOVED FOR VIEWING

1. ALL DIMENSIONS ARE IN MILLIMETERS TOLERANCES ARE ±0.3 MM UNLESS OTHERWISE SPECIFIED
2. THE LOAD APPLIED TO THE SECONDARY TERMINALS OF THIS DEVICE SHALL NOT EXCEED THE MANUFACTURERS SPECIFICATION
3. CONTACT THE MANUFACTURER FOR PERFORMANCE SPECIFICATIONS

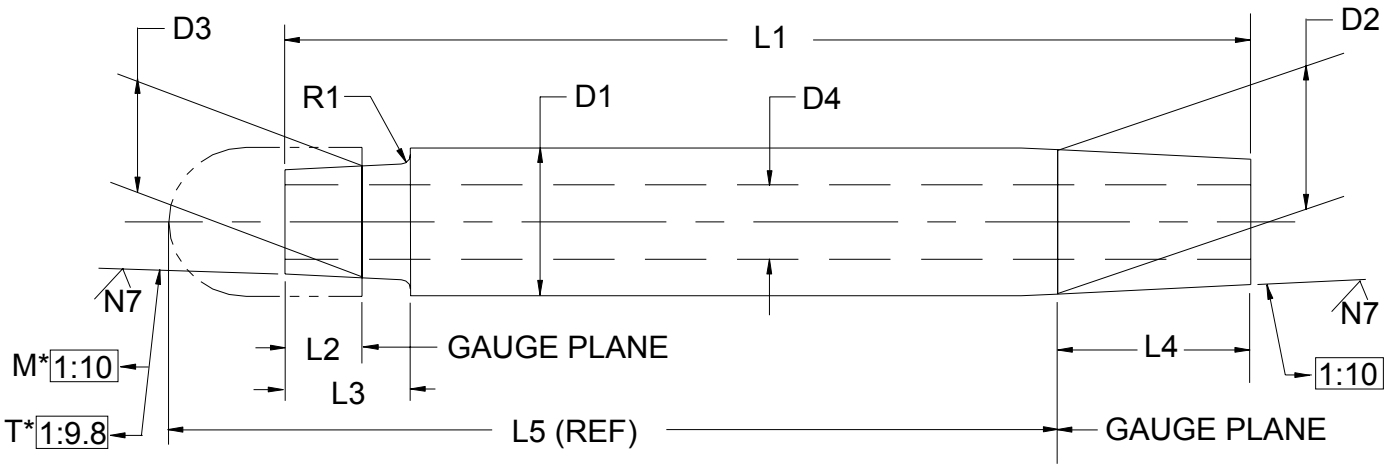
A

KVA	NAAMS	PRI V / FREQ	Turns Ratio	V Sec	MAX. WEIGHT KG (LBS)	Dim "A" mm	Dim "B" mm	MAX. △ P Bar (PSI)	Flow Rate LPM
65	AT0001	480 / 60	76:1	6.3	39.9 (88)	425	279	0.27 (4)	4
	AT0006	575 / 60	91:1						
93	AT0002	480 / 60	88:2	10.9	42.1 (93)	425	279	0.55 (8)	4
	AT0007	575 / 60	104:2						
136	AT0003	480 / 60	60:2	16.0	55.3 (112)	530	381	0.55 (8)	4
	AT0008	575 / 60	71:2						
100	AT0004	650 / 1000	72:1	9.0	33.5 (74)	425	279	0.96 (14)	7.5
	AT0009	800 / 1000	88:1						
150	AT0005	650 / 1000	50:1	13.0	33.5 (74)	425	279	0.96 (14)	7.5
	AT0010	800 / 1000	61:1						

STRAIGHT FEMALE CAP ADAPTER
ASF SERIES

GLOBAL STANDARD COMPONENTS
NAAMS™

Assembly 07/27/07



*M = Metric Version; T = Transition Version

Version	D_1 (h11)	D_2	D_3 (+0.025/-0.000)	D_4	L_2 (+/-0.5)	L_3	L_4 (+/-0.5)	R_1
T16	16	15.5	12.75	8	9.12	11.3	20	3
T19	19	19	16.08	10.5	10.19	12.5	25	3
T22	22	21.5	16.08	10.5	10.19	12.5	30	3
M22	22	21.5	15.00	10.5	10.00	15.0	30	3

	T16		T19		T22		M22	
L_5 (REF)	NAAMS CODE	L_1	NAAMS CODE	L_1	NAAMS CODE	L_1	NAAMS CODE	L_1
30	ASFXT16030	32.8	--		--		--	
40	ASFXT16040	42.8	ASFXT19040	49.8	--		--	
50	ASFXT16050	52.8	ASFXT19050	59.8	ASFXT22050	64.8	ASFXM22050	68
60	ASFXT16060	62.8	ASFXT19060	69.8	ASFXT22060	74.8	ASFXM22060	78
70	ASFXT16070	72.8	ASFXT19070	79.8	ASFXT22070	84.8	ASFXM22070	88
80	ASFXT16080	82.8	ASFXT19080	89.8	ASFXT22080	94.8	ASFXM22080	98
100	ASFXT16100	102.8	ASFXT19100	109.8	ASFXT22100	114.8	ASFXM22100	118
120	ASFXT16120	122.8	ASFXT19120	129.8	ASFXT22120	134.8	ASFXM22120	138
140	ASFXT16140	142.8	ASFXT19140	149.8	ASFXT22140	154.8	ASFXM22140	158
160	--	162.8	ASFXT19160	169.8	ASFXT22160	174.8	ASFXM22160	178
180	--	182.8	ASFXT19180	189.8	ASFXT22180	194.8	ASFXM22180	198
200	--	202.8	ASFXT19200	209.8	ASFXT22200	214.8	ASFXM22200	218

L_1 dimension is based on standard length cap length

Notes: $L_1 = L_5 + L_4$ - cap length

Cap length =12 (ISO5821-F20x22)
=13.23 (0.52" for RWMA #5 Cap Taper - 0.88" long cap)
=15.21 (0.60" for RWMA #6 Cap Taper - 1.00" long cap)

ASF2 = RWMA Class 2 Copper
ASF3 = RWMA Class 3 Copper

SEE PAGE B-1.1 FOR GLOBAL MATERIALS CHART

A

HEX ADAPTER

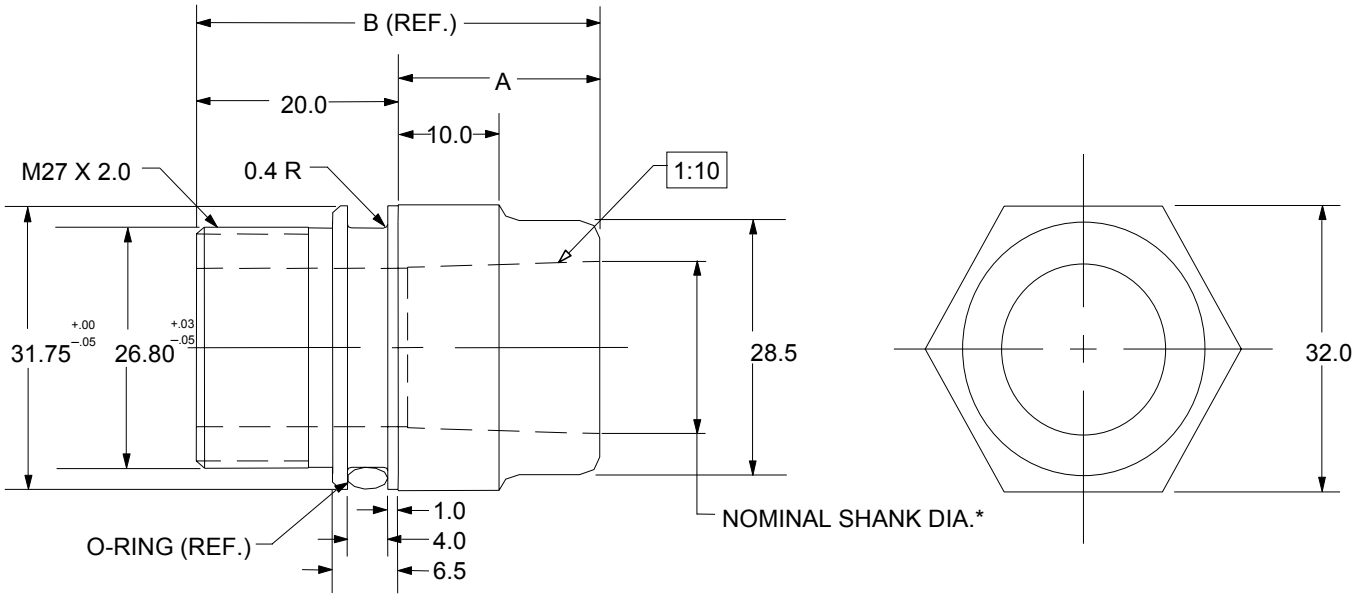
GLOBAL STANDARD COMPONENTS
NAAMS™

Assembly 07/27/07

Tolerances unless otherwise noted: 1 PLACE ± 0.3
Material: Class 3 copper
O-Ring (REF) : ORM-0300-02600-N-70
3.0 mm x 26 mm ID
SEE PAGE B-1.1 FOR GLOBAL MATERIALS CHART

* NAAMS Code	Nominal Shank Dia
AHA1XXX	13 mm
AHA2XXX	16 mm
AHA3XXX	19 mm
AHA4XXX	22 mm

A
B



TABULATED INFORMATION ON FOLLOWING PAGE

HEX ADAPTER CODING

GLOBAL STANDARD COMPONENTS
NAAMS™

Assembly 05/13/04

NAAMS CODE	A	B REF	NOM SHANK DIA
AHA1010	10	30	13
AHA2010	10	30	16
AHA3010	10	30	19
AHA4010	10	30	22
AHA1020	20	40	13
AHA2020	20	40	16
AHA3020	20	40	19
AHA4020	20	40	22
AHA1030	30	50	13
AHA2030	30	50	16
AHA3030	30	50	19
AHA4030	30	50	22
AHA1040	40	60	13
AHA2040	40	60	16
AHA3040	40	60	19
AHA4040	40	60	22
AHA1050	50	70	13
AHA2050	50	70	16
AHA3050	50	70	19
AHA4050	50	70	22
AHA1060	60	80	13
AHA2060	60	80	16
AHA3060	60	80	19
AHA4060	60	80	22
AHA1070	70	90	13
AHA2070	70	90	16
AHA3070	70	90	19
AHA4070	70	90	22

NAAMS CODE	A	B REF	NOM SHANK DIA
AHA1080	80	100	13
AHA2080	80	100	16
AHA3080	80	100	19
AHA4080	80	100	22
AHA1090	90	110	13
AHA2090	90	110	16
AHA3090	90	110	19
AHA4090	90	110	22
AHA1100	100	120	13
AHA2100	100	120	16
AHA3100	100	120	19
AHA4100	100	120	22
AHA1110	110	130	13
AHA2110	110	130	16
AHA3110	110	130	19
AHA4110	110	130	22
AHA1120	120	140	13
AHA2120	120	140	16
AHA3120	120	140	19
AHA4120	120	140	22
AHA1130	130	150	13
AHA2130	130	150	16
AHA3130	130	150	19
AHA4130	130	150	22
AHA1140	140	160	13
AHA2140	140	160	16
AHA3140	140	160	19
AHA4140	140	160	22

NAAMS CODE	A	B REF	NOM SHANK DIA
AHA1150	150	170	13
AHA2150	150	170	16
AHA3150	150	170	19
AHA4150	150	170	22
AHA1160	160	180	13
AHA2160	160	180	16
AHA3160	160	180	19
AHA4160	160	180	22
AHA1170	170	190	13
AHA2170	170	190	16
AHA3170	170	190	19
AHA4170	170	190	22
AHA1180	180	200	13
AHA2180	180	200	16
AHA3180	180	200	19
AHA4180	180	200	22
AHA1190	190	210	13
AHA2190	190	210	16
AHA3190	190	210	19
AHA4190	190	210	22
AHA1200	200	220	13
AHA2200	200	220	16
AHA3200	200	220	19
AHA4200	200	220	22
AHA1210	210	230	13
AHA2210	210	230	16
AHA3210	210	230	19
AHA4210	210	230	22
AHA1220	220	240	13
AHA2220	220	240	16
AHA3220	220	240	19
AHA4220	220	240	22

SEE DRAWING ON PRECEEDING PAGE

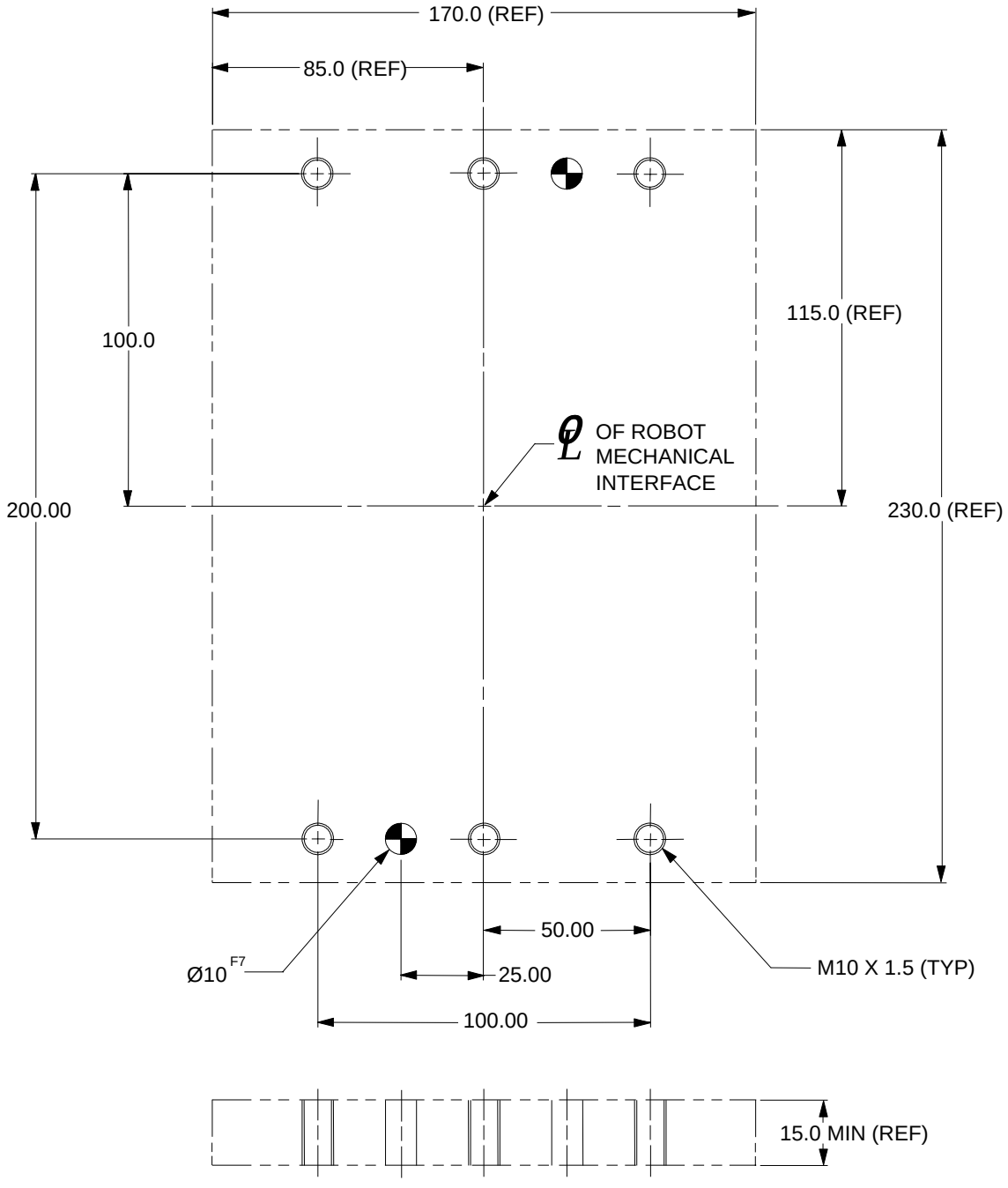
ROBOT GUN MOUNTING HOLE PATTERN

GLOBAL STANDARD COMPONENTS
NAAMS™

Assembly 06/03/04

A

Tolerances unless otherwise noted:
1 PLACE ± 0.3
2 PLACE ± 0.13



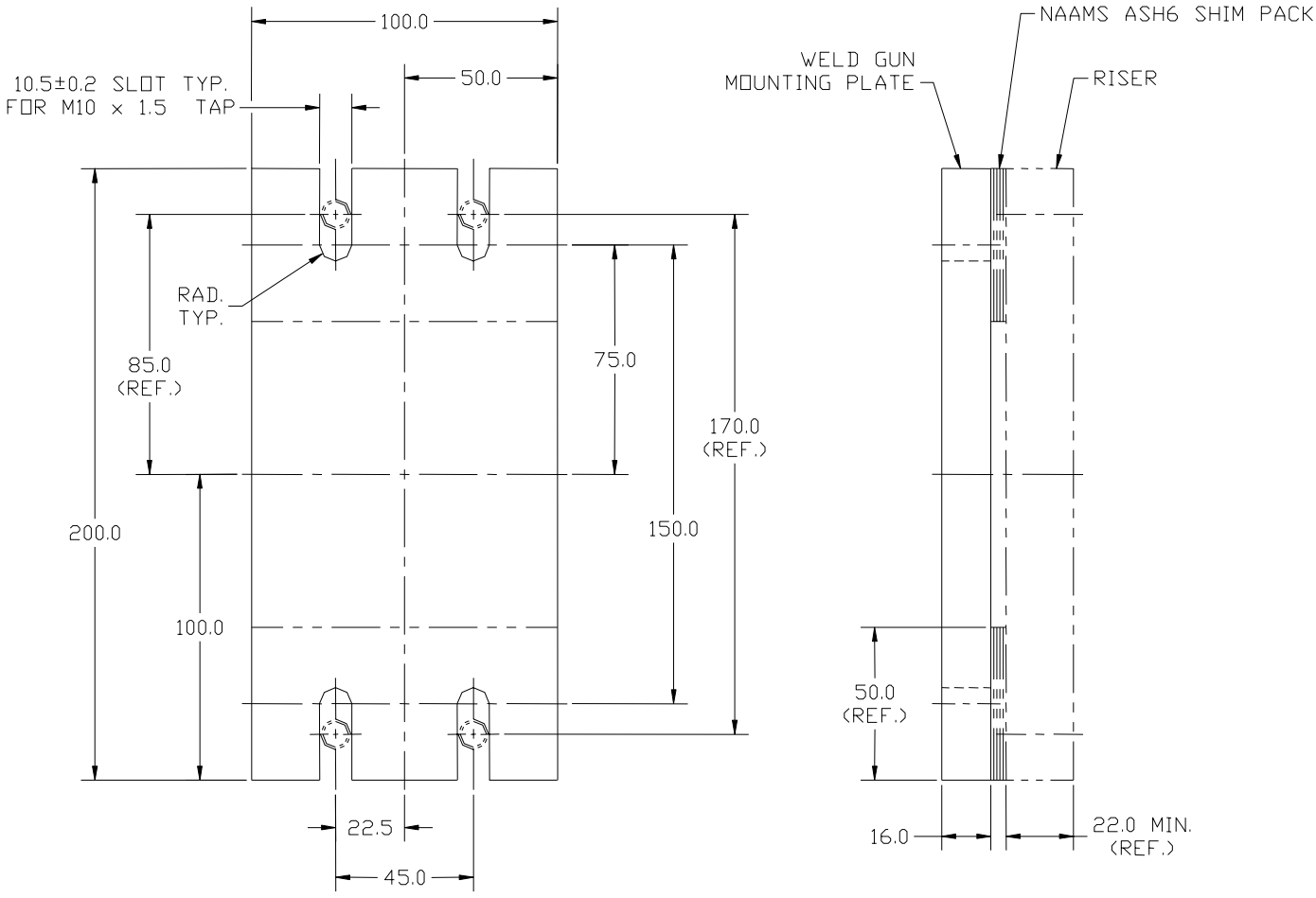
B

FIXTURE GUN MOUNTING PATTERN

GLOBAL STANDARD COMPONENTS
NAAMS™

Assembly 11/18/04

Tolerances unless otherwise noted:
1 PLACE ± 0.3



A

B

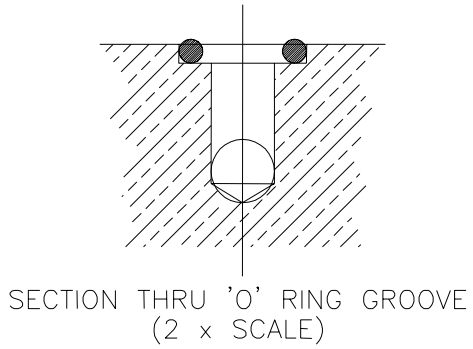
STANDARD OVER-UNDER TRANSFORMER ADAPTER ™

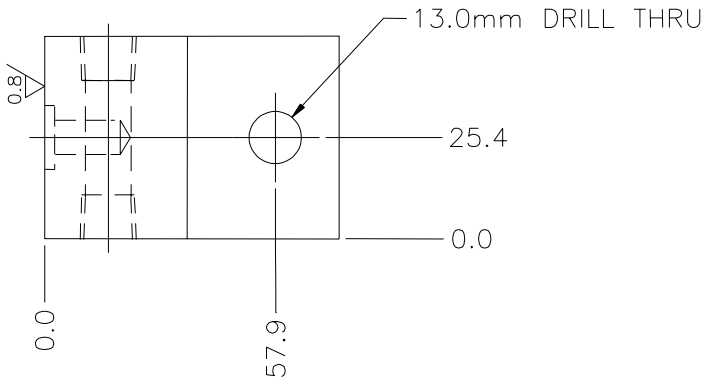
GLOBAL STANDARD COMPONENTS
NAAMS

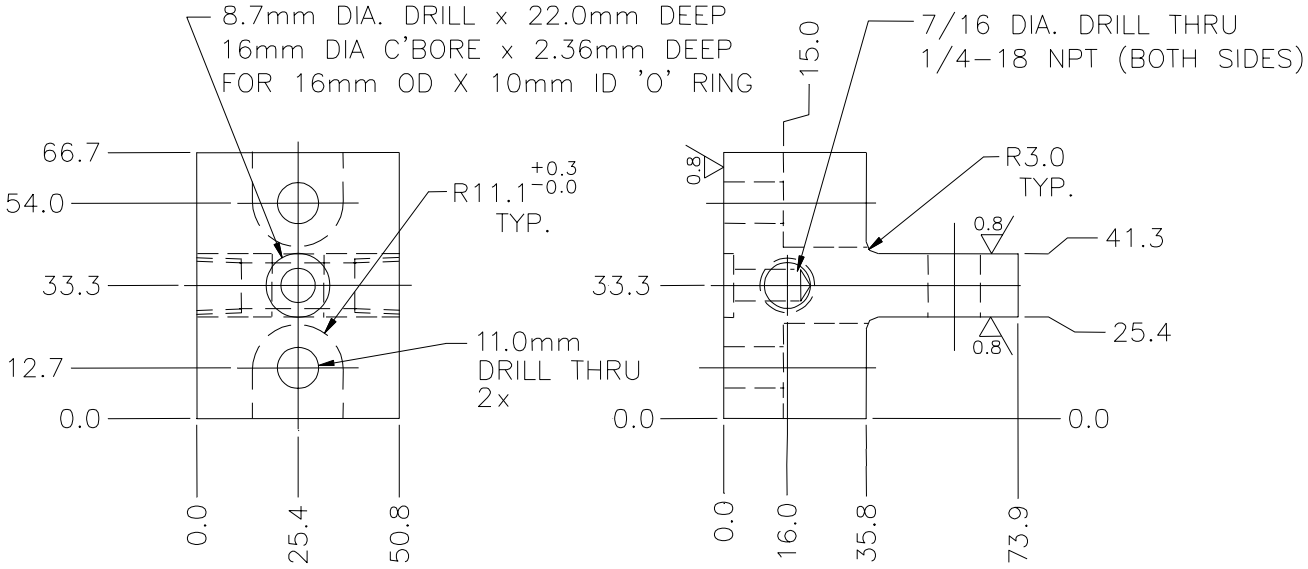
ATA001

Assembly 01/12/17

Tolerances unless otherwise noted:
1 PLACE ± 0.3







Material: Copper C11000
Note: Break all sharp edges 0.8mm MAX
SEE PAGE B-1.1 FOR GLOBAL MATERIALS CHART

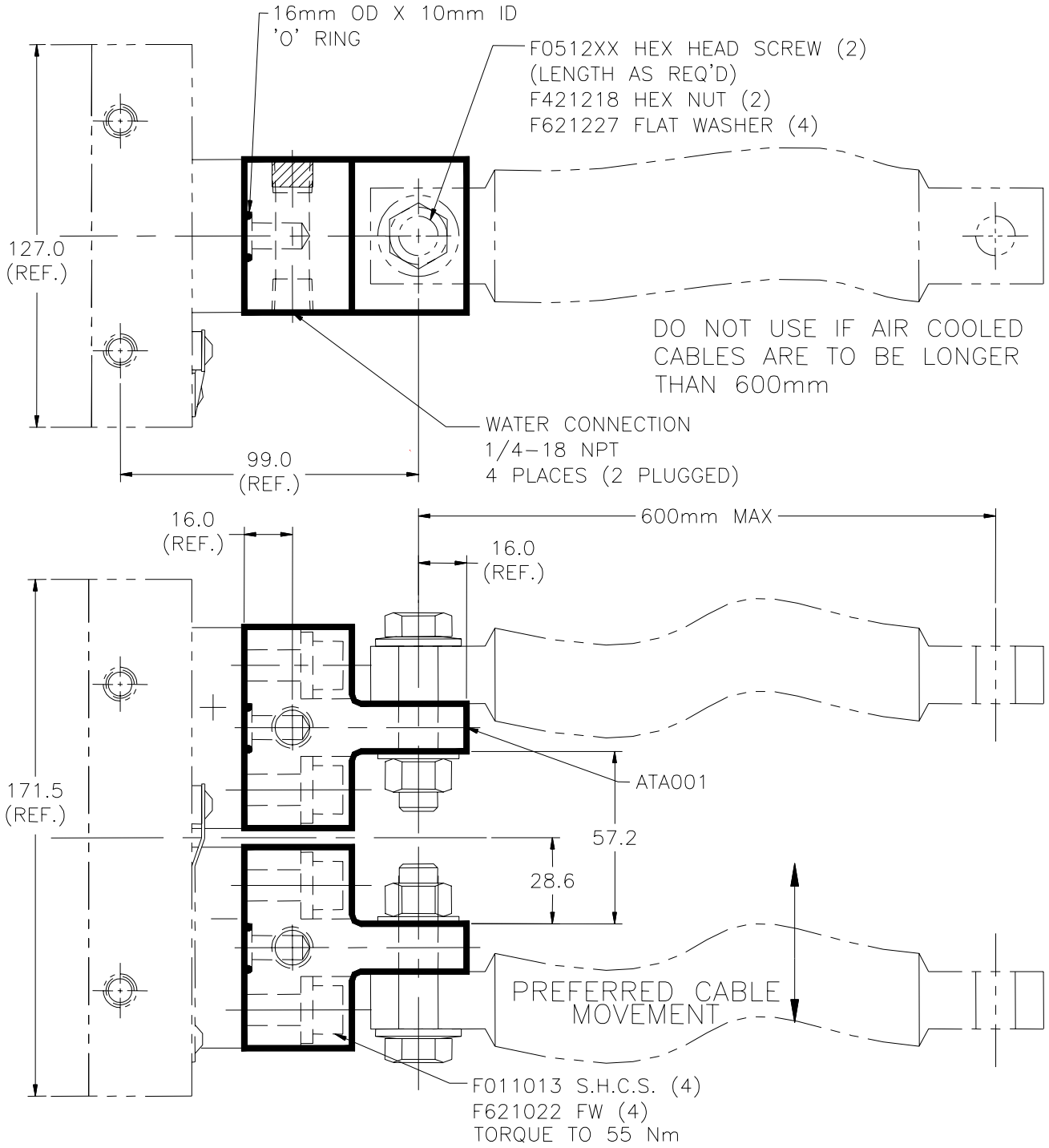
B
E
C
D
A

OVER-UNDER TRANSFORMER ADAPTER ASSEMBLY CONFIGURATION

GLOBAL STANDARD COMPONENTS
NAAMS™

Assembly 10/26/05

Tolerances unless otherwise noted:
1 PLACE ± 0.3



Note: The second terminals of this device are intended as an electrical connection only. Applications must be designed to minimize any forces applied to the secondary terminals. This can be accomplished by transferring forces to a structural member.

STANDARD SIDE-BY-SIDE TRANSFORMER ADAPTER ™

GLOBAL STANDARD COMPONENTS

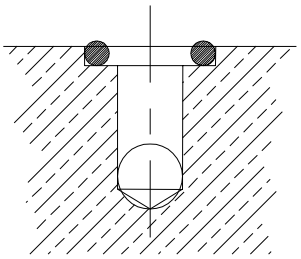
NAAMS

ATA002

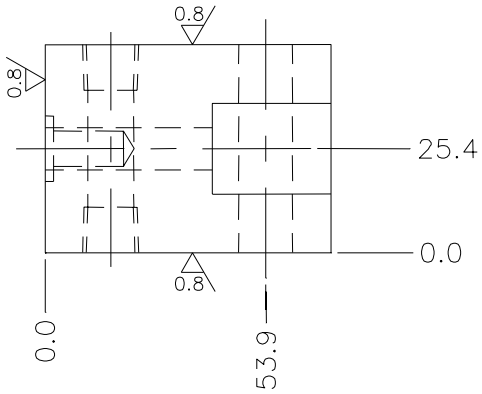
Assembly

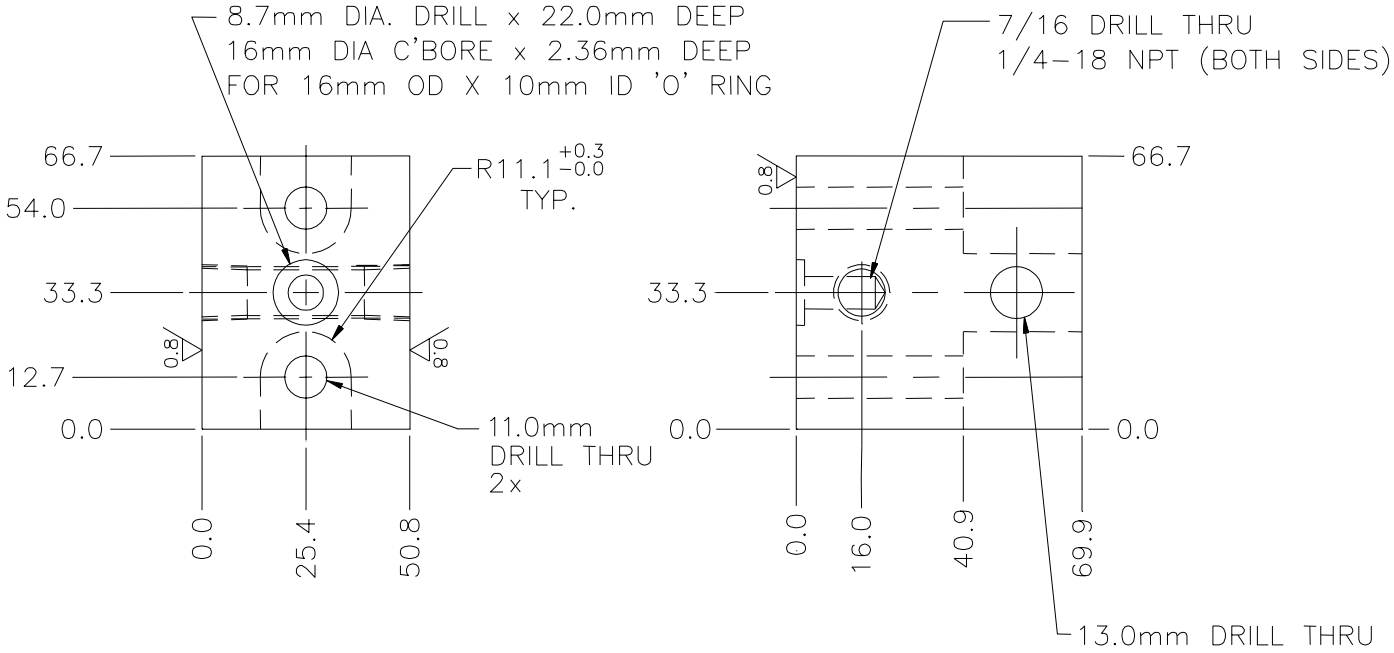
01/12/17

Tolerances unless otherwise noted:
1 PLACE ± 0.3



SECTION THRU 'O' RING GROOVE
(2 x SCALE)



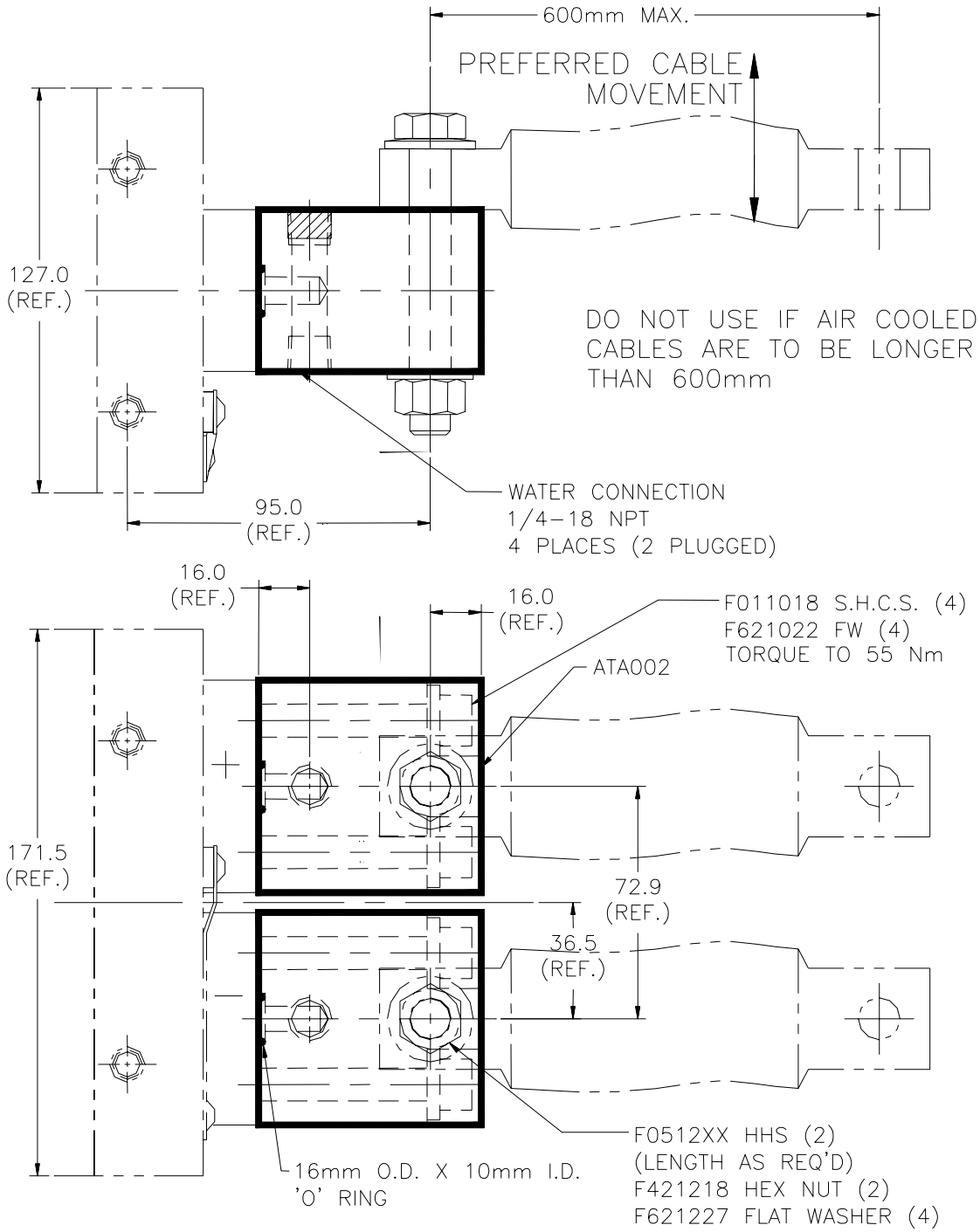


Material: Copper C11000
Note: Break all sharp edges 0.8mm MAX
SEE PAGE B-1.1 FOR GLOBAL MATERIALS CHART

B D A C

SIDE-BY-SIDE TRANSFORMER ADAPTER ASSEMBLY CONFIGURATION

Tolerances unless otherwise noted:
1 PLACE ± 0.3



Note: The second terminals of this device are intended as an electrical connection only. Applications must be designed to minimize any forces applied to the secondary terminals. This can be accomplished by transferring forces to a structural member.

RESISTANCE WELDING GUN GLOSSARY

GLOBAL STANDARD COMPONENTS
NAAMS™

Assembly 10/24/05

A. Resistance Welding Gun Styles

Definition

Resistance welding gun. A device used to apply weld force and current to workpieces. It may be manipulated or an element of a welding machine. See also **fixture gun, manual gun, pedestal gun and robot gun.**

Styles

Fixture gun. A resistance welding gun that is mounted in a tool with a fixed workpiece. Generally has a narrow profile and low duty cycle.

Manual gun. A **resistance welding gun** configured for manual operation.

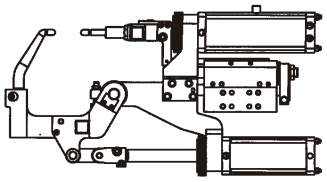
Pedestal gun. A **resistance welding gun** that is mounted in a tool and with a workpiece manipulated manually or by a robot. Generally, resembles **robot gun** and has high duty cycle.

Robot gun. A resistance welding gun that has been adapted for manipulation by a robot.

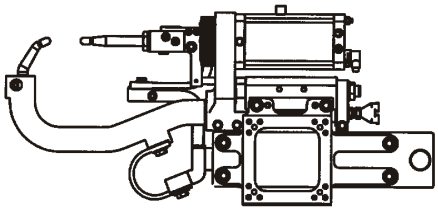
NOTE: any of the above welding gun styles can be adapted to incorporate an integral transformer and/or various types of actuators or cylinders such as: electric, hydraulic, pneumatic, servo, etc.

B. Resistance Welding Gun Types

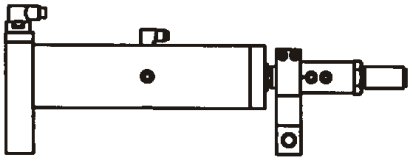
B-Type. Breakaway type gun incorporates a mechanism, such as a secondary cylinder or cam, that swings the stationary or equalizing body into the welding position. This mechanism provides larger opening for part access than the gun would normally allow.



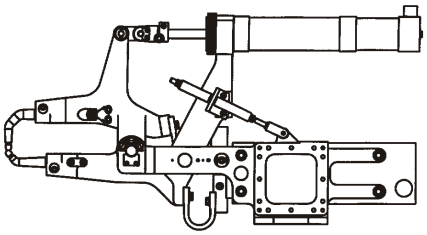
C-Type. Straight-acting welding gun in which the electrode axis is parallel with the actuator rod axis. The stationary electrode opposes the moving electrode causing the body to be in the shape of a letter C.



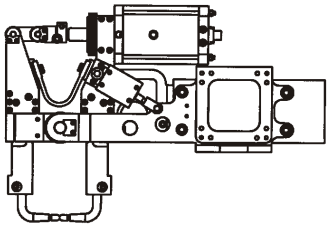
I-Type. This type of inline welding gun has the opposing electrode incorporated into a separate unit or fixture. Sometimes referred to as a cylinder or actuator with a rod-mounted holder.



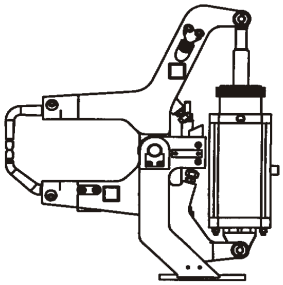
P-Type. In the Pinch-type welding gun the centerline of the cylinder is generally perpendicular to the centerline of the weld caps. When a truly perpendicular condition does not exist, the angle created between the centerline of the cylinder and the centerline of the weld caps must be 45 degrees or greater. The actuator can be rigidly mounted with a bell-crank type linkage or trunnion mounted with a rod clevis.



S-Type. In the Scissor-type gun the centerline of the cylinder is parallel to the centerline of the weld caps. When a truly parallel condition does not exist, the angle created between the centerline of the cylinder and the centerline of the weld caps must be less than 45 degrees.



X-Type. Variation of the S-type in which the actuator is located entirely between the movable and stationary gun bodies and both ends of the cylinder are mounted to allow for pivoting on either end.



C. Construction

Cast Welding Guns. Primary structural and current carrying components are made up of castings.

Fabricated Welding Guns. Components are manufactured by processes such as cutting, forming and welding.

Machined Welding Guns. Components are precision machined and/or formed from wrought or cast materials.

D. Design Philosophy

Configurable Welding Gun Design. Modular gun with adjustable or configurable core components. Incorporates adjustment or alternative assembly configuration to eliminate some of the arm variation found in modular guns.

Custom Welding Gun Design. Designs are application specific and might be a unique welding gun design for each welding location.

Modular Welding Gun Design. Defined set of core components are combined and then adapted to suit the welding application. The degree of modularity lies between custom and standard and can be tailored to suit user business objectives. The fewer gun chassis combinations the more successful spare gun management will be. Complex guns assembled from many components may increase need to stock complete assemblies to support production. The more gun chassis combinations allowed, the less unique the gun arms will be.

Standard Weld Gun Design. Designs are cataloged with limited options.

E. Welding Gun Elements

Base Gun. The portion of a resistance welding gun that consists of the Gun Module less the Actuator and Power Supply.

Gun Module. Resistance welding gun less the Configurable Secondary.

Configurable Secondary. This term describes the portion of the resistance welding gun consisting of the arms, holders, adapters, shanks and caps.

F. Welding Gun Modules

Actuator Module. The actuator module consists of an electric, hydraulic or pneumatic cylinder with all fittings and any mounting connections such as a clevis.

Arm Module(s). The arm module consists of the arms, holders, adapters and electrode caps with respective fittings, clamps and seals.

Chassis Module. The chassis module consists of the gun body (bodies), equalizer module and mounting bracket module.

Dress Package Module. The dress package module consists of an assemblage of components that are mated with the welding gun to provide for control, operation and monitoring. This package may include components such as: communication devices, manifolds, regulators, sensors, switches and valves.

Equalizer Module. The equalizer module consists of the equalizer and its respective mounting hardware and fittings.

Mounting Bracket Module. The mounting bracket module consists of the mounting bracket, auxiliary bracket (if applicable), adapter plates (if applicable), fulcrum pin assembly and all related hardware including transformer mounting hardware.

Power Supply Module. The power supply module consists of the transformer, shunt adapters, shunts and cables with respective fittings and seals**.**

G. Welding Gun Components

Actuator. A device that converts electric, hydraulic or pneumatic energy into movement and force that is translated to a movable arm. The actuator provides gun movement and weld force.

Adapter. A device that may be used to fit an electrode to a holder (i.e. hex adapter, straight adapter, offset adapter, cap adapter, etc.)

Arm. A structural component moved by the actuator that transfers current from the shunt/cable to the electrode/shank.

Barrel Lock. A cylindrical split cam that is positioned into a component to intersect a secondary component in order to secure it in place. This device clamps down the secondary component using a bolt or screw.

Cable (single-conductor). A conductive wire rope that transfers a single conductor of electricity from the transformer to the weld gun. The cable may be cooled by ambient air or through internal water lines.

Cable (kickless). Copper component that transfers two (2) conductors of electricity from the transformer to the weld gun. The two (2) poles are wrapped in a fashion as to minimize the movement that occurs from reactance when the weld gun current is passed. Kickless cables are used in manual gun designs.

Clevis. The component that connects the end of the actuator to a link or movable gun body.

Deflector Tube. This is used to direct cooling water towards the electrode.

Electrode. That part of the secondary circuit responsible for the transmission of welding current and force to the workpieces. The electrode may be in the form of a rotating wheel, rotating roll, bar, cylinder, plate, clamp or modification thereof.

Electrode Cap. A replaceable tip mounted to the end of an adapter, which contacts the workpiece. This is a component that is consumed in the welding process.

Equalizer. A device that permits the equalizing side of the welding gun to move relative to its stationary mount in a controlled fashion. The movement is provided so that the welding gun can make minor electrode position adjustments during the welding process to account for tip wear and minor workpiece variation.

Fulcrum Pin Assembly. The component of the P-Type, S-Type and X-type welding gun that connects the movable and stationary gun bodies to the mounting bracket.

Gun Body (Equalizing). The main structural element of the resistance welding gun that supports an arm, holder or adapter, and which has limited range of motion that is provided for dynamic compensation of the electrode position.

Gun Body (Movable). The main structural element of the resistance welding gun that supports an arm, holder or adapter, and which is driven through a wide range of motion by the actuator.

Gun Body (Stationary). The main structural element of the resistance welding gun that supports an arm, holder or adapter and does not move while the weld gun is operating.

Holder. A device used for mechanically holding and conducting current to an adapter or electrode.

Link/Link Assembly. The component that is used to connect the linear actuator to a rotating body in a P-Type or S-Type welding gun. The link can be lengthened or shortened in assisting to achieve a desired weld gun opening.

Mounting Bracket. A cradle that holds the power supply and equalizer. The mounting bracket can also be mounted to a fixture or robot or other mechanical systems. It can also be mounted to an auxiliary bracket or robot plate before being mounted to a robot.

Resistance Welding Transformer. An electrical device that converts high-voltage low-current into low-voltage high-current suitable for resistance welding.

Shank. See **Adapter.**

Shunt. A flexible component that is used to transfer current from a shunt adapter to an arm or gun body. The shunt is generally made up of thin leaves of copper. It can also be made of braided copper layers.

Shunt Adapter. A component that transfers current from the transformer to the shunt. The shunt adapter is directly connected to the transformer and dictates location of the shunt. This component is water cooled.

Tip. See **Electrode.**

Transformer. See **Resistance Welding Transformer**.

Weld Cap. See **Electrode Cap**.

LABELING FOR AIR AND WATER PORTS

CYLINDER PORT LABELING					
		# OF PORTS			
SYMBOL	DESCRIPTION	2	3	4	5
B	BOOST FORWARD				X
RF	RETRACT FORWARD		X	X	X
RR	RETRACT RETURN			X	X
R	RETURN		X		
WF	WS FORWARD	X	X	X	X
WR	WS RETURN	X		X	X
V	VENT		X		

Symbol or description may be used to indicate cylinder ports

EQUALIZER PORT LABELING	
SYMBOL	DESCRIPTION
A	EQ FORWARD
B	EQ RETURN

Symbol or description may be used to indicate equalizer ports

WATER PORT LABELING	
SYMBOL	DESCRIPTION
IN, 	WATER IN
OUT, 	WATER OUT

Symbol or description may be used to indicate water ports

S22 - S31 DESCRIPTION

The documents on pages S-22 – S-31provide a consistent set of forms that are not OEM, plant, or project specific. Their use will make the buyoff and inspection processes more consistent and allow for some automation of form filling and data archiving. The set of documents consists of:

S-22 Resistance Welding Gun Buyoff Report. This one-page form provides for auditing of the inspection process.

S-23 – S-25 Resistance Welding Gun Inspection Report. This comprehensive three-page form consists of compliance checks, test data collection, and note taking. Each item has a unique code assigned that corresponds to an instruction or performance requirement detailed in the Resistance Welding Gun Acceptance Criteria document (Pages S-28 – S-31). Each item can also be linked to a Note number on the third page of the form so that the forms are, for the most part, self-contained.

S – 26 Manual Resistance Welding Gun Inspection Report. This one-page form incorporates inspection items that are unique to manual resistance welding guns.

S – 27 Resistance Welding Servogun Inspection Report. This one-page form incorporates inspection items that are unique to resistance welding servoguns.

S-28 – S-31 Resistance Welding Gun Acceptance Criteria. This four-page form details the acceptance criteria that are to be applied to the Resistance Welding Gun, Manual Resistance Welding Gun and Resistance Welding Servogun Inspection Reports.

GLOBAL STANDARD COMPONENTS

NAAMS™

Assembly

RESISTANCE WELDING GUN BUYOFF REPORT

Gun Number: _____ **Serial Number:** _____ **Report Date:** _____

Production Order No.: _____ **Completed By:** _____

Customer Gun No.: _____ **Engineering Revision:** _____

Gun Manufacturer: _____ **User Plant:** _____

Program: _____ **Zone:** _____

Equipment ID: _____ **Integrator:** _____

Test Equipment Calibrated	❑ Current	❑ Flow	❑ Force	❑ Pressure	❑ Other:
Engineering Documentation	❑ Assembly Drawing	❑ BOM	❑ Detail Drawings	❑ Other:	
Quality Documentation	❑ Corrective Action	❑ ECN	❑ Quality Report	❑ Other:	

AUDIT ITEM	VERIFIED	NOTE (List Deficiencies)	Additional Page
Welding gun inspection completed satisfactorily	❑		❑
Specified hardware and tryout items are available	❑		❑
Welding gun is on schedule	❑		❑
	❑		❑

Ship to Location:	
Special Shipping Instructions:	

APPROVAL	NAME	SIGNATURE	DATE
Supplier Quality Assurance			
Weld Gun Representative			
Design House *			
* _____			

Note: * Complete as required.

GLOBAL STANDARD COMPONENTS

NAAMS™

Assembly

RESISTANCE WELDING GUN INSPECTION REPORT

Gun Number: _____ **Serial Number:** _____ **Report Date:** _____

Production Order No.: _____ **Completed By:** _____

Customer Gun No.: _____ **Engineering Revision:** _____

Customer: _____ **Plant:** _____ **Program:** _____

Equipment ID: _____ **Zone:** _____

Gun Type	❑ C-Type	❑ P-Type	❑ S-Type	❑ X-Type	❑ Other:
Gun Application	❑ Fixture	❑ Portable	❑ Robotic	❑ Other:	
Actuator	❑ Hydraulic	❑ Pneumatic	❑ Servo electric	❑ Other:	
Power Supply	❑ AC Transformer	❑ Cable	❑ Inverter Supply	❑ Other:	

INSPECTION ITEM	#	VERIFIED (✓)	NOTE	INSPECTION ITEM	#	VERIFIED (✓)	NOTE
IDENTIFICATION							
Tool tags attached	A1			Transformer tag visible	A4		
All components identified	A2			Transformer color code correct	A5		
Ports (air / water) and connectors are properly identified	A3			Safety labels attached	A6		
WORKMANSHIP							
Weld gun is free of burrs, sharp edges	B1			Insulation is properly installed	B5		
Contact surfaces are properly finished	B2			All un-used ports are plugged or capped	B6		
Proper fasteners used	B3			Electrodes are aligned	B7		
Fasteners are torqued to design specification and paint marked	B4						
FUNCTION							
Proper clearance between conducting parts	C1			Switches properly installed and tested	C8		
Short tested	C2			Components are accessible for maintenance	C9		
Shunt/cable is applied properly	C3			Secondary ground strap properly installed	C10		
Water tubes are properly installed	C4			Lubrication installed	C11		
Water-IN is connected to positive transformer terminal	C5			At the minimum operating pressure, gun operates smoothly, without hesitation	C12		
Flash shield is installed	C6						
Pinch points are guarded	C7						
DOCUMENTATION							
Components match BOM	D1			As-built drawings prepared	D2		

IMPORTANT NOTE: Before completing this Inspection Report you must consult the most recent version of Customer or Program specific requirements for valid acceptance criteria.

	VALIDATION OBJECTIVE	DESIGN VALUE	OBSERVED VALUE Test Bench: _____	UNIT OF MEASURE (circle)	ACCEPT (YES/NO)	NOTE
M1	Welding gun weight			kg / lb		
M2	Sufficient electrode over-travel for cap wear			mm / inches		
M3	Gun total opening matches design			mm / inches		
M4	Gun retract position matches design			mm / inches		
M5	Sufficient water flow in Stationary Arm (At _____ differential)			lpm / gpm		
M6	Sufficient water flow in Moveable Arm (At _____ differential)			lpm / gpm		
M7	Sufficient water flow in Transformer (At _____ differential)			lpm / gpm		
M8	Total welding gun water flow (At _____ differential)			lpm / gpm		
M9	Measured weld force (At _____ bar / psi / Amps / % / N-m)			dN / lbf		
M10	Required air pressure/current to achieve tip dress force of _____ lbf / dN			Amps / bar / psi / % / N-M		
M11	Time to close from retract position to _____ lbf / dN weld force (>95%) (At _____ bar / psi / Amps / % / N-m)			seconds		
M12	Time to return from closed position to fully open position (At _____ bar / psi / Amps / % / N-m)			seconds		
M13	Impedance test	Z _____ X_L _____ R _____		$\mu\Omega$		
M14	Connection resistance test (highest recorded value)			$\mu\Omega$		
M15	Equalizer operating pressure in worst-case gun orientation			bar / psi		
M16	Number of cycles gun has been operated with no concerns reported					
M17	Percent heat to achieve designed welding current OR Current achieved at designed percent heat			% / Amps		
M18	Electrodes are cooling properly (“Yes” or “No”)					
M19	Maximum observed actuator rod extension due to electrode deflection (At _____dN / lbf)			mm / inches		
M20	Maximum radial electrode deflection at force limit			mm / inches		
M21	Maximum sag in all operating floor positions			mm / inches		

NOTE:	COMMENT
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Attach additional sheets if additional comments are required.

Diagram Number	ELECTRICAL	PNEUMATIC	WATER CIRCUIT

KEY COMPONENT	PART NUMBER	SERIAL NUMBER
Transformer/Power Supply		
Actuator		

Supplemental Inspection Sheets attached: ❑ Portable Gun ❑ Servogun ❑ Other _____

Total Number of additional sheets attached: _____

GLOBAL STANDARD COMPONENTS

NAAMS™

Assembly

MANUAL RESISTANCE WELDING GUN INSPECTION REPORT

Please attach this sheet to the RESISTANCE WELDING GUN INSPECTION REPORT

INSPECTION ITEM	#	VERIFIED (✓)	NOTE	INSPECTION ITEM	#	VERIFIED (✓)	NOTE
GUN							
Control handle	E1			Pinch point guarding installed	E3		
Secondary handle	E2			Precautionary labels installed	E4		
BAIL/TRUNNION							
CG properly aligned	F1			Radial position-locking operational	F4		
Gun rotates to required positions	F2			Suspension safety cable is provided	F5		
Pinch points due to rotation are guarded	F3			Fasteners are tightened and secured	F6		
CABLE / TRANSFORMER							
Cable strain-relief installed	G1			Secondary connected properly	G2		

IMPORTANT NOTE: Before completing this Inspection Report you must consult the most recent version of Customer or Program specific requirements for valid acceptance criteria.

	VALIDATION OBJECTIVE	DESIGN VALUE	OBSERVED VALUE Test Bench: _____	UNIT OF MEASURE (circle)	ACCEPT (YES/NO)	NOTE
M25	Sufficient water flow in cable (At _____ differential)			lpm / gpm		

NOTE:	COMMENT
1	
2	
3	

KEY COMPONENT	PART NUMBER	SERIAL NUMBER
Bail/Trunnion Assembly		
Transformer		

GLOBAL STANDARD COMPONENTS

TM NAAMS

Assembly

RESISTANCE WELDING SERVOGUN INSPECTION REPORT

Please attach this sheet to the RESISTANCE WELDING GUN INSPECTION REPORT

INSPECTION ITEM	#	VERIFIED (✓)	NOTE	INSPECTION ITEM	#	VERIFIED (✓)	NOTE
GUN							
Servo Information tag attached/provided	J1			Actuator stroke limits identified	J7		
Calibration information attached	J2			Zero-setting tool supplied	J8		
Motor connectors protected	J3			In shipping position	J9		
Motor connector orientation correct	J4			Actuator lubrication OK	J10		
Servomotor insulated from gun	J5						
Manual override tested	J6						

	VALIDATION OBJECTIVE	DESIGN VALUE	OBSERVED VALUE Test Bench: _____	UNIT OF MEASURE (circle)	ACCEPT (YES/NO)	NOTE
M30	Actuator Ratio (tip travel per motor revolution)			mm/rev / inches/rev		
M31	Approximate tip force per ampere (at _____ volts)			kg / lb		
M32	Maximum tip opening			mm / inches		
M33	Measured deflection stroke (at _____ kgf / lbf)			mm / inches		
M34	Number of cycles of operation (at _____seconds/cycle)					

IMPORTANT NOTE: Before completing this Inspection Report you must consult the most recent version of Customer or Program specific requirements for valid acceptance criteria.

NOTE:	COMMENT
1	
2	

KEY COMPONENT	PART NUMBER	SERIAL NUMBER
Actuator		
Servomotor		
Feedback (Encoder/Resolver)		

GLOBAL STANDARD COMPONENTS

NAAMS™

Assembly

RESISTANCE WELDING GUN ACCEPTANCE CRITERIA

Standard: _____ Date: _____

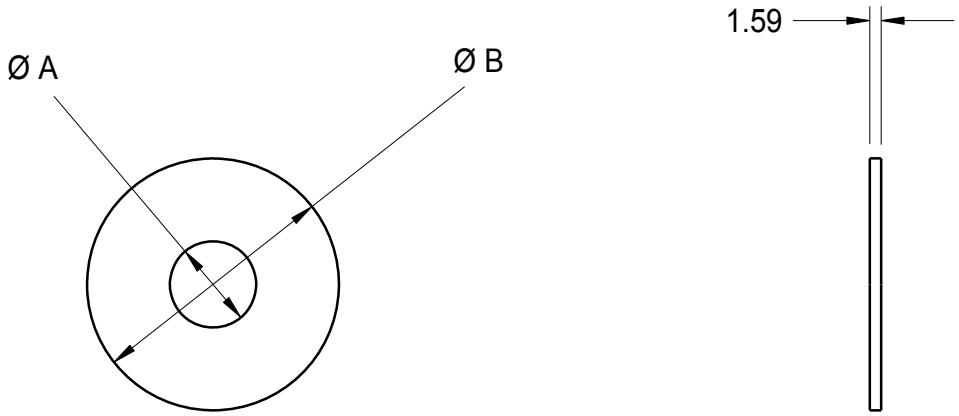
INSPECTION ITEM		ACCEPTANCE CRITERIA
BASIC WELDING GUN		
Identification		
A1	Tool tags	Two Gun Identification tags conforming to NAAMS S-2 are supplied. One tag is to be permanently affixed to the welding gun and a second must be attached to the gun in a bag so that it can be positioned at the time of installation.
A2	Component identification	Where possible all component parts should be identified in a conspicuous location with 6 mm high permanent characters.
A3	Ports identification	All ports must be permanently identified with their function according to NAAMS Standard S-20.
A4	Transformer tag	Transformer tag is visible.
A5	Transformer color	Transformer identification tape matches NAAMS standard. Refer to NAAMS sheet S-4
A6	Safety labels	Precautionary labels are correctly positioned.
Workmanship		
B1	Sharp edges	All sharp edges have been removed.
B2	Contact surfaces	Contact surfaces are flat, clean, bright, and finished to within 0.8 micro-meters (30 micro-inches).
B3	Proper fasteners	Fastener torque has been checked per NAAMS torque audit procedure (F2.3 – F2.5) and witness marks have been applied.
B4	Fasteners	Fasteners outside of the welding loop are steel grade 12.9. Fasteners in the welding loop are stainless steel where appropriate.
B5	Insulation	The insulation extends at least 3 mm beyond the component interface.
B6	Ports	Unused ports have been plugged to prevent dirt from entering the system.
B7	Electrodes alignment	Electrodes are aligned within 0.5 mm.
Function		
C1	Clearance	There is at least 3 mm between conducting parts of different polarities.
C2	Short tested	Welding gun has been checked in the opened position to ensure that its secondary is not shorted anywhere between the transformer and the electrodes. Special attention should be given to laminated shunts because this is the most common cause of failure.
C3	Shunt/cable	Shunts/cables are properly installed such that they: are not binding; are supported where necessary; do not rub against other components
C4	Water tubes	Water tubes are cut on a 45-degree angle and they are installed such that they are touching, or very near, the underside of the electrode.
C5	Cooling circuit direction	Connections have been verified from supply to drain to ensure that the proper water flow direction has been followed when hosing. For the resistance welding transformer the water should flow into the positive terminal.
C6	Flash shield	Flash shield(s) installed.
C7	Pinch guarding	There are no unprotected pinch points that are not identified with precautionary labels.
C8	Switches	Electrical switches have been mounted according to the manufacturers directions and their function has been tested.
C9	Component access	Components can be accessed for replacement or maintenance within 20 minutes.
C10	Ground strap	Secondary ground strap installed to tie one secondary transformer pad to the transformer case. Refer to NAAMS sheet S-5 for an illustration of the strap connection.

C11	Lubrication applied	Lubrication has been applied per manufacturers recommendation to allow maintenance free operation. NO SILICONE-BASED LUBRICANTS ARE PERMITTED - under any circumstances.
C12	Smooth operation	The gun moves smoothly and operates correctly at its minimum recommended operating setting (i.e. pressure or current).
Documentation		
D1	BOM	BOM accurately identifies the components on the welding gun.
D2	Drawings	Drawing(s) have been updated to incorporate any changes necessary during the construction process.
Measurements		
M1	Weight	Total weight of gun as shipped. This should be less any dress items (e.g. cables and hoses) that are adapted in the field, or fluids (e.g. cooling water).
M2	Over-travel	Amount of electrode travel beyond tip touch. This should be a minimum of 10 mm per cap to allow for maximum electrode wear. To verify this requirement, remove the electrode caps and ensuring that the cap adapter tapers will touch. BE CAREFUL not to damage the water tubes when closing the gun with the tip(s) removed.
M3	Gun opening	Distance between the electrodes in the fully opened position corresponds to the assembly blueprint.
M4	Retract position	Distance between the electrodes in the retracted position corresponds to the assembly blueprint.
M5	Water flow –stationary arm	Water flow exceeds 4 lpm (1 gpm) with a 0.7 bar (10 psi) differential pressure between supply and drain.
M6	Water flow – movable arm	Water flow exceeds 4 lpm (1 gpm) with a 0.7 bar (10 psi) differential pressure between supply and drain.
M7	Water flow - transformer	For AC transformers - Water flow exceeds 4 lpm (1 gpm) with a 0.7 bar (10 psi) differential pressure between supply and drain. For Inverters - Water flow exceeds 7.5 lpm (2 gpm) with a 0.7 bar (10 psi) differential between supply and drain.
M8	Water flow – total gun	Water flow corresponds with blueprint or the sum of minimums in M5 thru M7 according to the circuit diagram. The minimum for circuits in series is the highest minimum in the circuit. The minimum for circuits in parallel is the sum of the minimums for the parallel paths.
M9	Weld force check	Weld force is verified to the blueprint design value. A variation of +10/-5% is allowed to account for calibration or measurement error. The welding gun must be able to achieve the expected weld force.
M10	Tip dress force check	The setting required to achieve a tip dress force of 136 kgf (300 lbs) +/- 10%. The minimum recommended operating setting of the welding gun shall not be less than the specified tip dress force.
M11	Time to close from retract	Force must be achieved within the time given by the 11/7 rule. 11 cycles (11/60=18.3 ms for the first 25.4 mm (inch) of travel (i.e. 139 mm/s), plus 7 cycles (7/60=11.7 ms) for each successive 25.4 mm (inch) of travel (i.e. 218 mm/s). Because there is some variation in the force measurement caused by impact and settling the gun is deemed to be at force if the measured value is maintained at a value no less than 95% of the weld force.
M12	Time to open from closed	Travel must be achieved within the time given by the 11/7 rule. 11 cycles (11/60=18.3 ms for the first 25.4 mm (inch) of travel (i.e. 139 mm/s), plus 7 cycles (7/60=11.7 ms) for each successive 25.4 mm (inch) of travel (i.e. 218 mm/s). For example a 80 mm opening would require a maximum of 184 ms.
M13	Impedance test	Value measured with a calibrated impedance meter. The impedance, inductive reactance, and resistance should be recorded for future reference if available. These values should be verified against the blueprint if a value is given.
M14	Connection resistance	With the power off, the electrical resistance of each connection in the secondary circuit should be checked with a micro-ohm meter. No individual value should exceed 5 micro-ohms. The highest value is recorded for future reference.

M15	Equalizer pressure	The highest air pressure required to operate the equalizer – if present – in the orientations that are expected in production. This would be expected to be the position when gravity causes the most weight to be transferred to the equalizer and the equalizer has its least favorable output force capability. The lowest output force capability would correspond to applying the load against the side of the piston with the smallest area.
M16	Test cycles	Record the number of welding cycles performed during the testing process.
M17	Welding current	The resistance welding control heat setting in percent or current that that results in the design weld current.
M18	Electrode cooling	The welding electrodes cool as expected during and after the testing period.
M19	Axial deflection	The difference in actuator rod extension as measured with the electrodes touching without force and subsequently at designed welding force. This deflection value should be less than 5 mm times the welding gun ratio. The welding gun ratio is the actuator force divided by the electrode force.
M20	Radial deflection	The electrode deflection normal to the weld axis. The maximum allowable deflection is 0.5 mm.
M21	Maximum sag	The dimensional difference between the center of the welding tips and the tool center-point. To determine this measurement, a reference is established between the welding gun mounting surface and the center of the electrode welding face(s). As the welding gun orientation is changed through the various operating positions, the weight of the gun components will cause bending and deflection that will create a dimensional position change, or sag value.
MANUAL WELDING GUN		
Manual Gun Components		
E1	Control handle	Control handle is properly installed in the specified location.
E2	Secondary handle	Secondary handle is properly installed in the specified location.
E3	Guarding	Guarding is installed to prevent access to pinch points (except between the electrodes).
E4	Precautionary labels	Precautionary labels are correctly positioned.
Bail/Trunnion		
F1	CG alignment	Trunnion and bail has been adjusted so that the gun hangs in approximately the desired location. Provision should be made to allow field adjustment at installation.
F2	Gun rotation	The welding gun will rotate to the desired operating positions without excessive force or binding.
F3	Guarding	Verify that pinch points are not caused during rotation.
F4	Position-locking	If installed, verify that bail position locking is functional for all operating positions.
F5	Safety cable	Verify that the safety cable is included if specified on the BOM.
F6	Fasteners	Fasteners have been installed and verified according to the NAAMS torque audit procedure (F2.3 – F2.5)
Cable		
G1	Strain-relief	Cable strain relief is installed and properly torqued to prevent strain on the cable terminations during welding gun motion.
G2	Secondary connections	Welding gun connection to transformer secondary is per design documents.
Measurements		
M25	Cable water flow	Verify that cable water flow is per manufacturers' requirements at the operating water pressure.
SERVOGUN		
Servogun/Accessories		
J1	Servo information tag	The Servo Gun Identification tag conforming to NAAMS sheet S-3 is permanently affixed to the welding gun.
J2	Calibration information	Servomotor has been calibrated per the manufacturers instructions and a record of the servo-controller parameters has been provided

J3	Motor connectors	Motor power and feedback connectors and conductors have been protected from common application dangers including strain from actuator or welding gun motion.
J4	Connector orientation	Connectors have been oriented according to contract requirements.
J5	Servomotor insulated	Servomotor has been isolated from the welding gun secondary circuit.
J6	Manual override	Manual override is tested to ensure that it will operate in the field.
J7	Actuator limits identified	Visual indicators of the servo actuator limits are provided if necessary.
J8	Zero setting tool	Components necessary for calibration (e.g. spacers or pins) of the servo actuator are supplied with the welding gun as required by the contract documents. The requirements for, and the configurations of, these components are specific to the servo actuator model or manufacturer.
J9	Shipping position	The servo actuator and gun arms are closed to a position appropriate for shipment.
J10	Lubrication	Servo actuator has been lubed for life.
Measurements		
M30	Actuator Ratio	The ratio of actuator motion to tip motion has been verified to the build documents.
M31	Tip force per ampere	The electrical input to output force ratio is recorded.
M32	Maximum tip opening	The maximum tip opening has been verified to the build documents. This is the same measurement as M3.
M33	Measured deflection stroke	The difference in actuator rod extension as measured with the electrodes touching without force and subsequently at designed welding force. This is the same as measurement M19.
M34	Break-in cycles	Vendor required break-in cycles so that unit requires no break-in after field installation. This might be the same value as entered in M16.

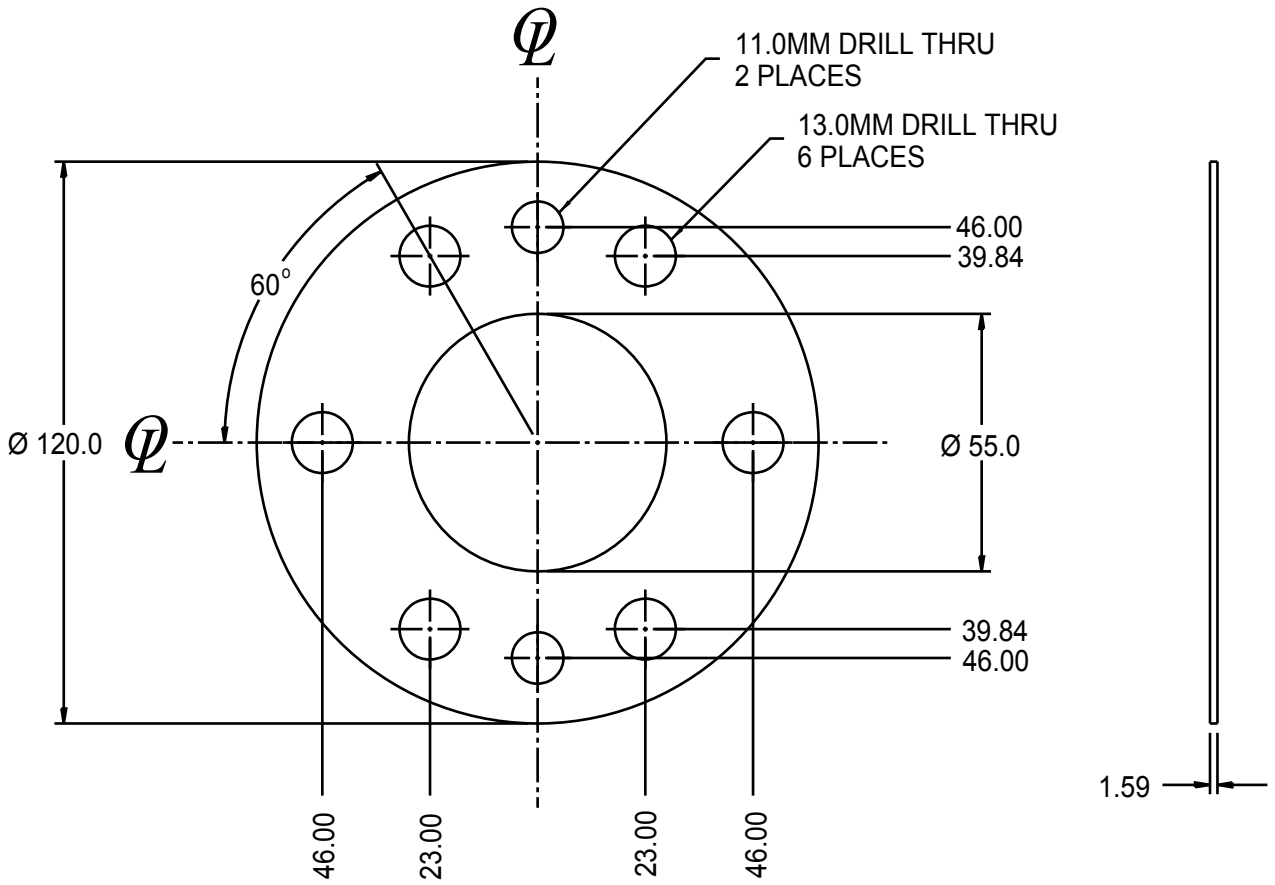
INSULATION WASHER



SHCS SIZE	NAAMS CODE	Ø A	Ø B
M5	AIW005	5	15
M6	AIW006	6	20
M8	AIW008	8	25
M10	AIW010	10	30
M12	AIW012	12	35

MATERIAL:
PHENOLIC G-10

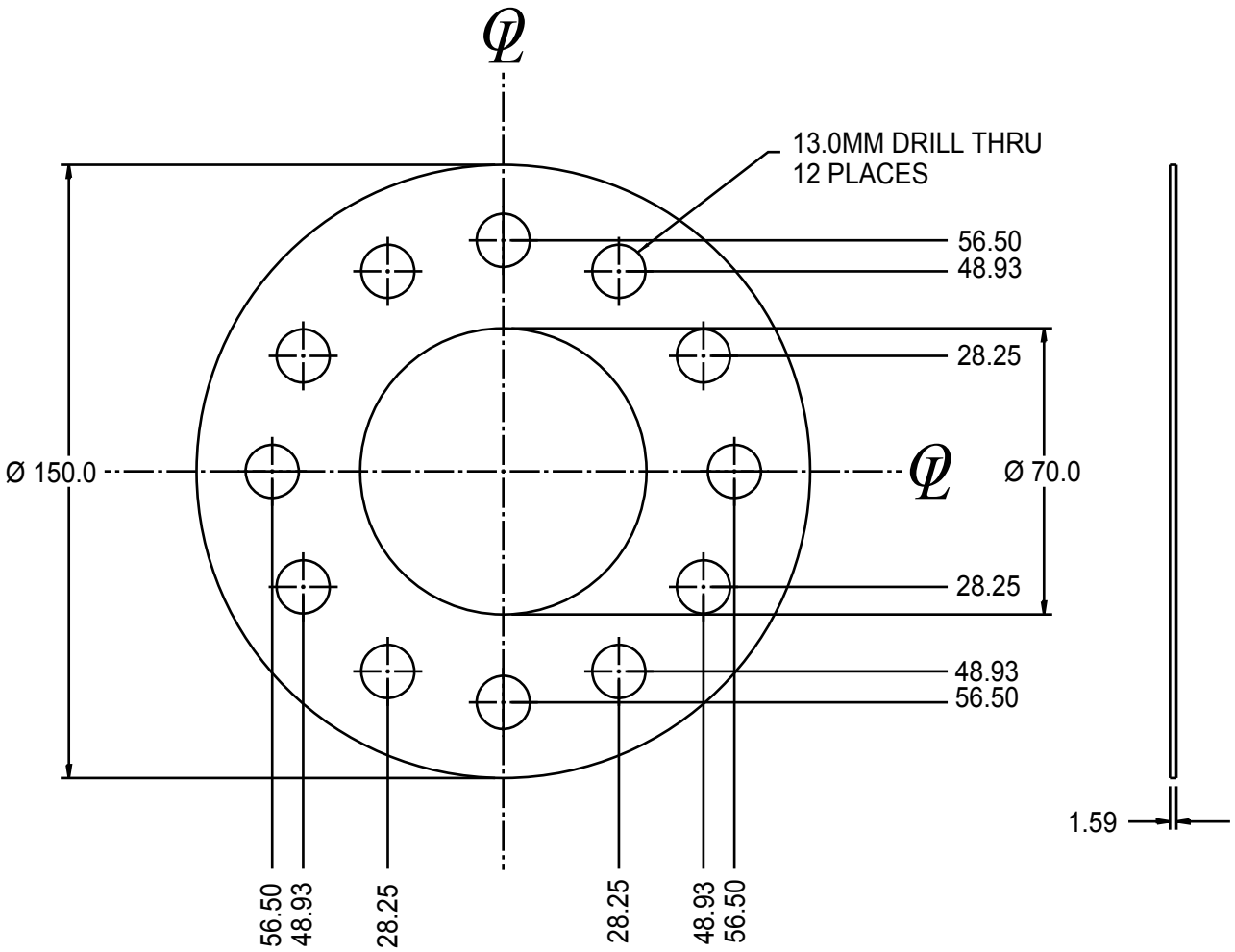
INSULATION DISK
92MM BOLT CIRCLE
AID092



MATERIAL:
PHENOLIC G-10
STK 120 DIA X 1.59" THK

INSULATION DISK
113MM BOLT CIRCLE
AID113

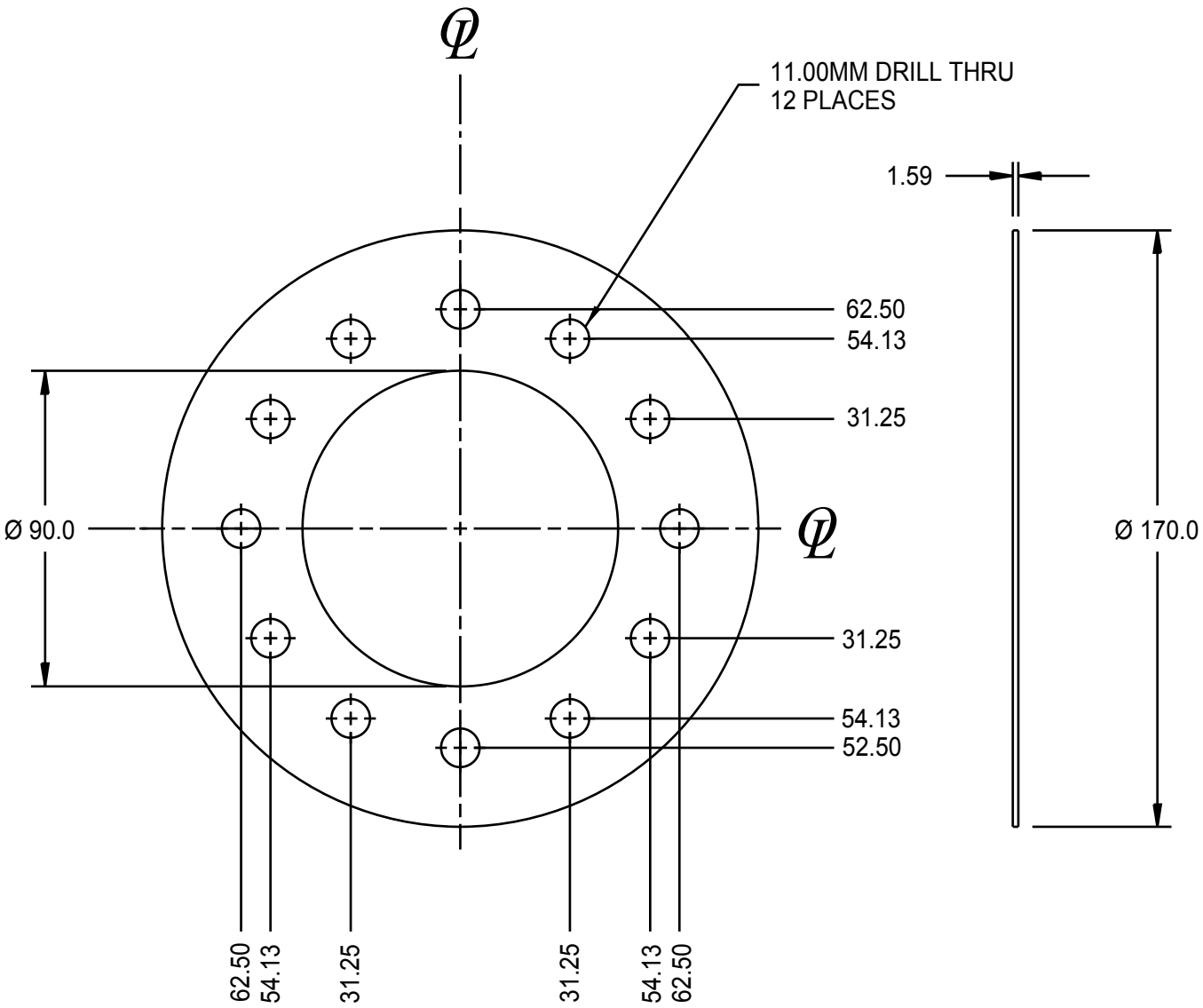
GLOBAL STANDARD COMPONENTS
NAAMS™
Stamping 03/30/09



MATERIAL:
PHENOLIC G-10
STK 150 DIA X 1.59" THK

INSULATION DISK
125MM BOLT CIRCLE
AID125

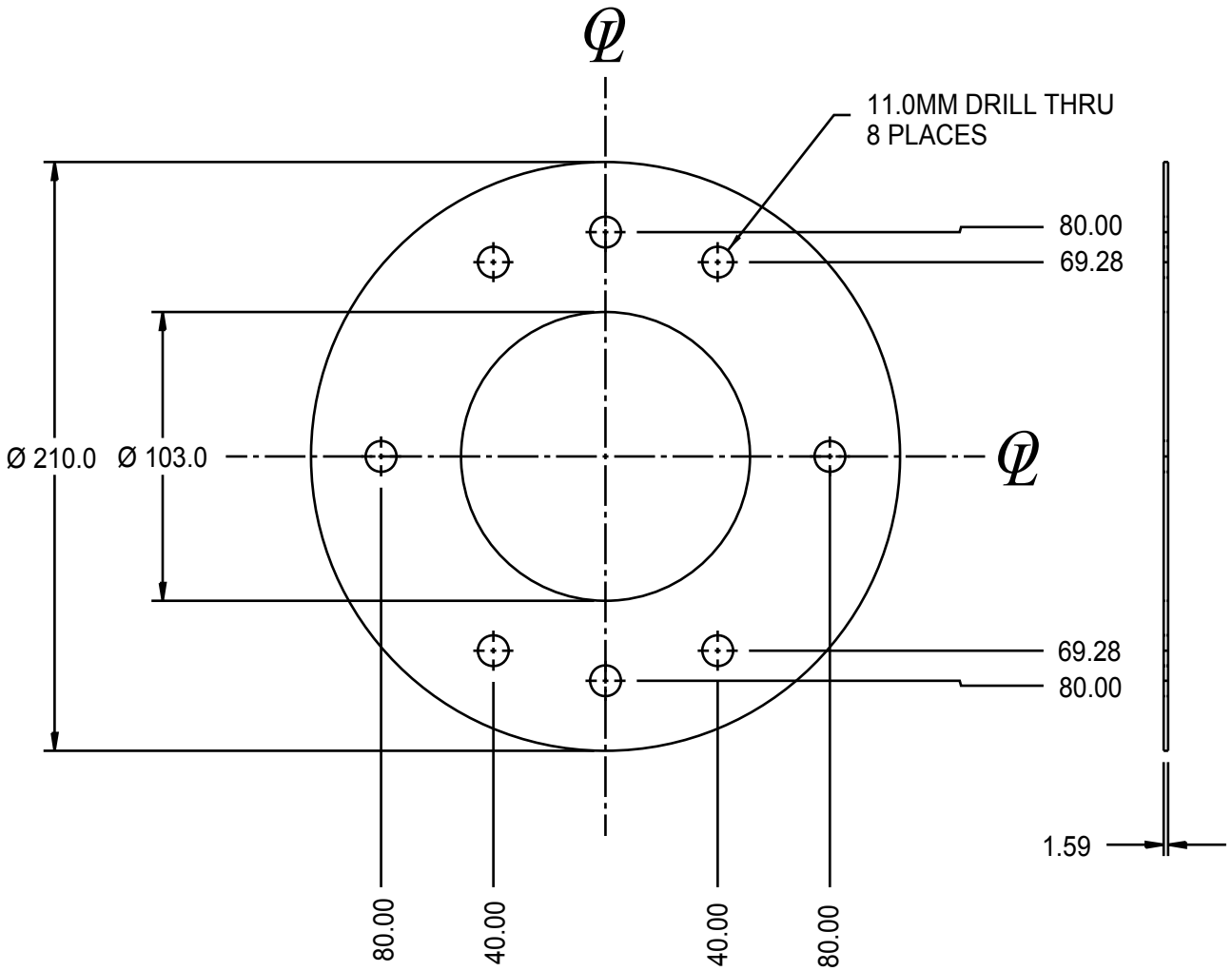
GLOBAL STANDARD COMPONENTS
NAAMS™
Stamping 03/30/09



MATERIAL:
PHENOLIC G-10
STK 170 DIA X 1.59" THK

INSULATION DISK
160MM BOLT CIRCLE
AID160

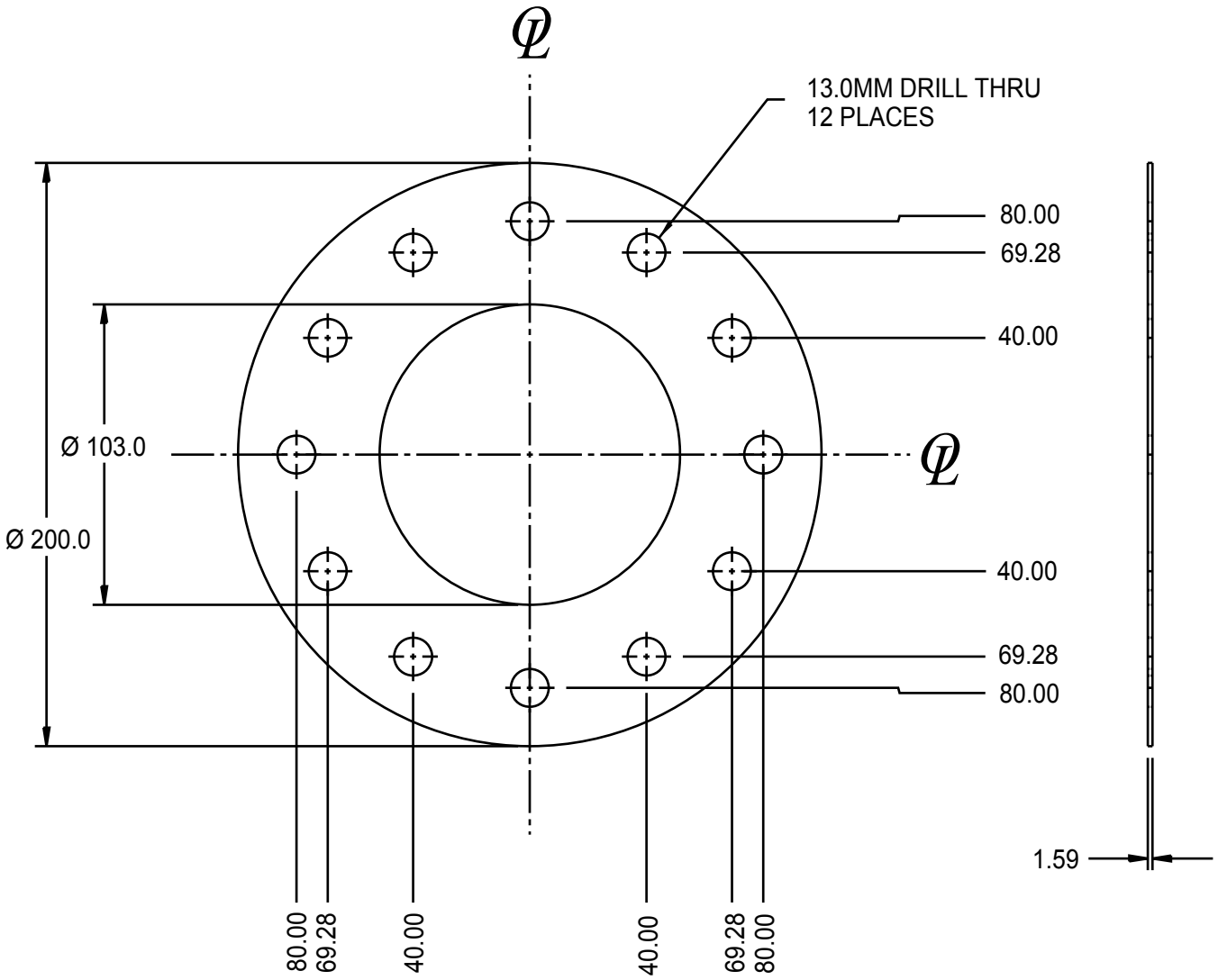
GLOBAL STANDARD COMPONENTS
NAAMS™
Stamping 03/30/09



MATERIAL:
PHENOLIC G-10
STK 210 DIA X 1.59" THK

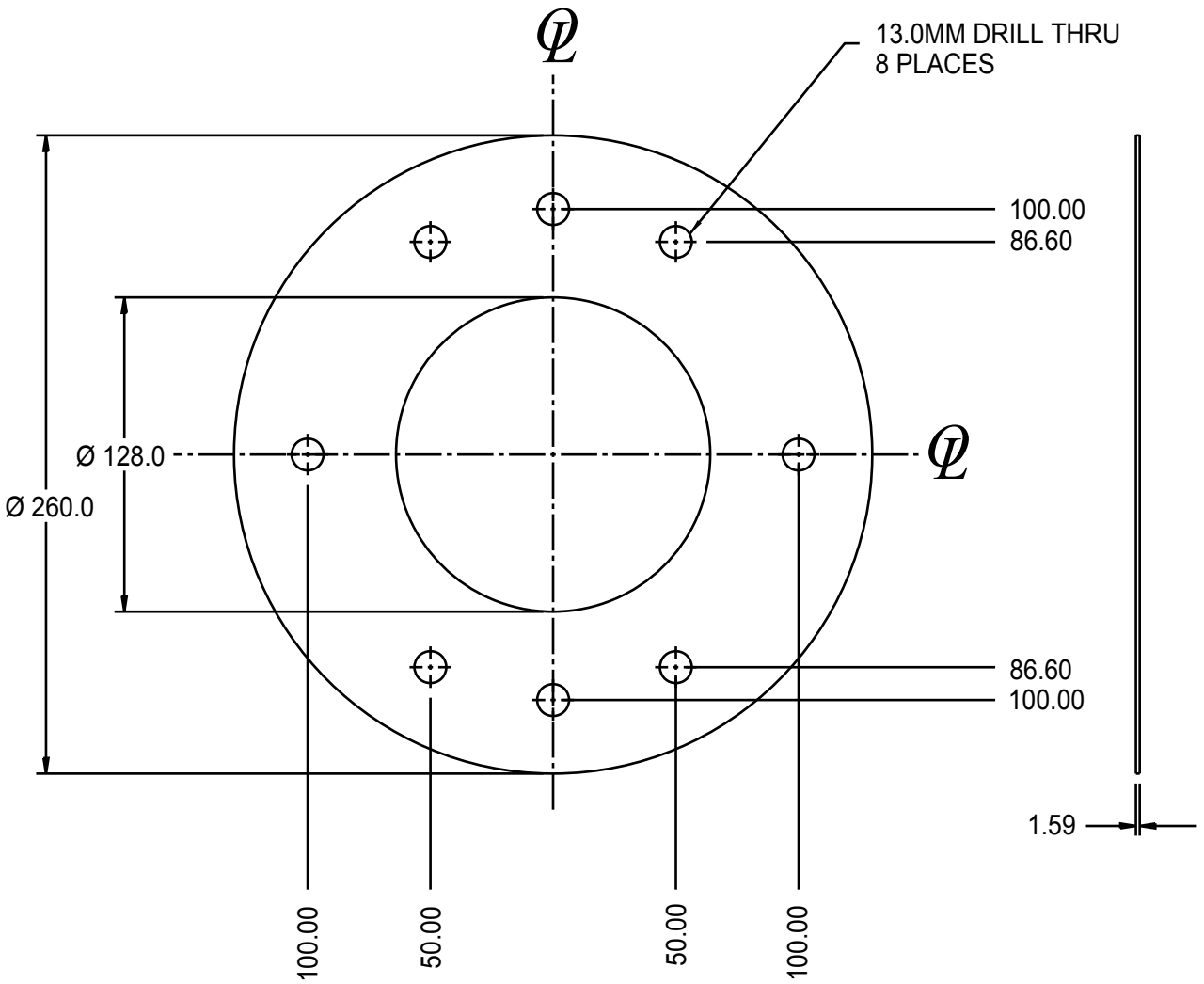
INSULATION DISK
160MM BOLT CIRCLE
AID161

GLOBAL STANDARD COMPONENTS
NAAMS
Stamping 03/30/09



MATERIAL:
PHENOLIC G-10
STK 200 DIA X 1.59" THK

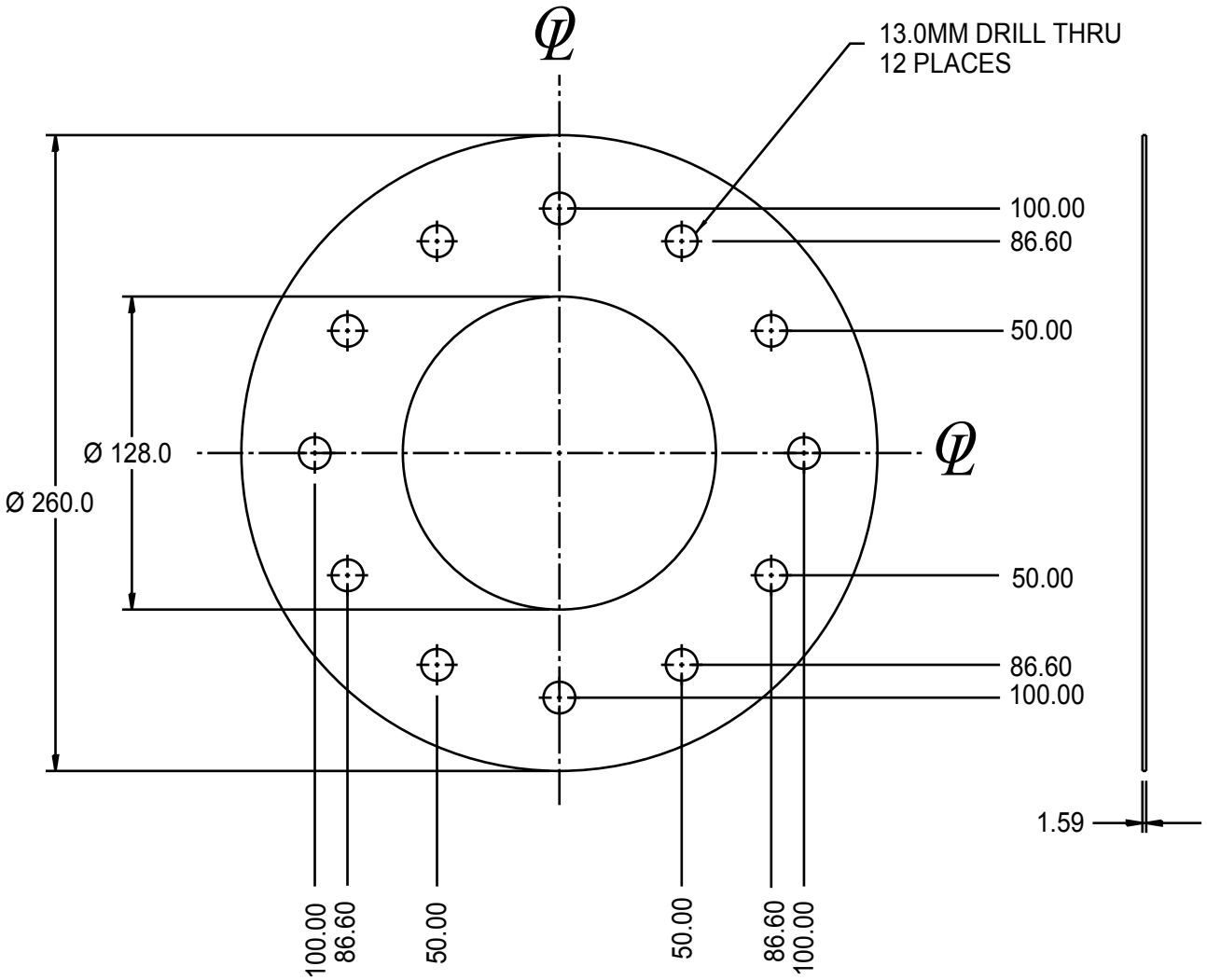
INSULATION DISK
200MM BOLT CIRCLE
AID200



MATERIAL:
PHENOLIC G-10
STK 260 DIA X 1.59" THK

INSULATION DISK
200MM BOLT CIRCLE
AID201

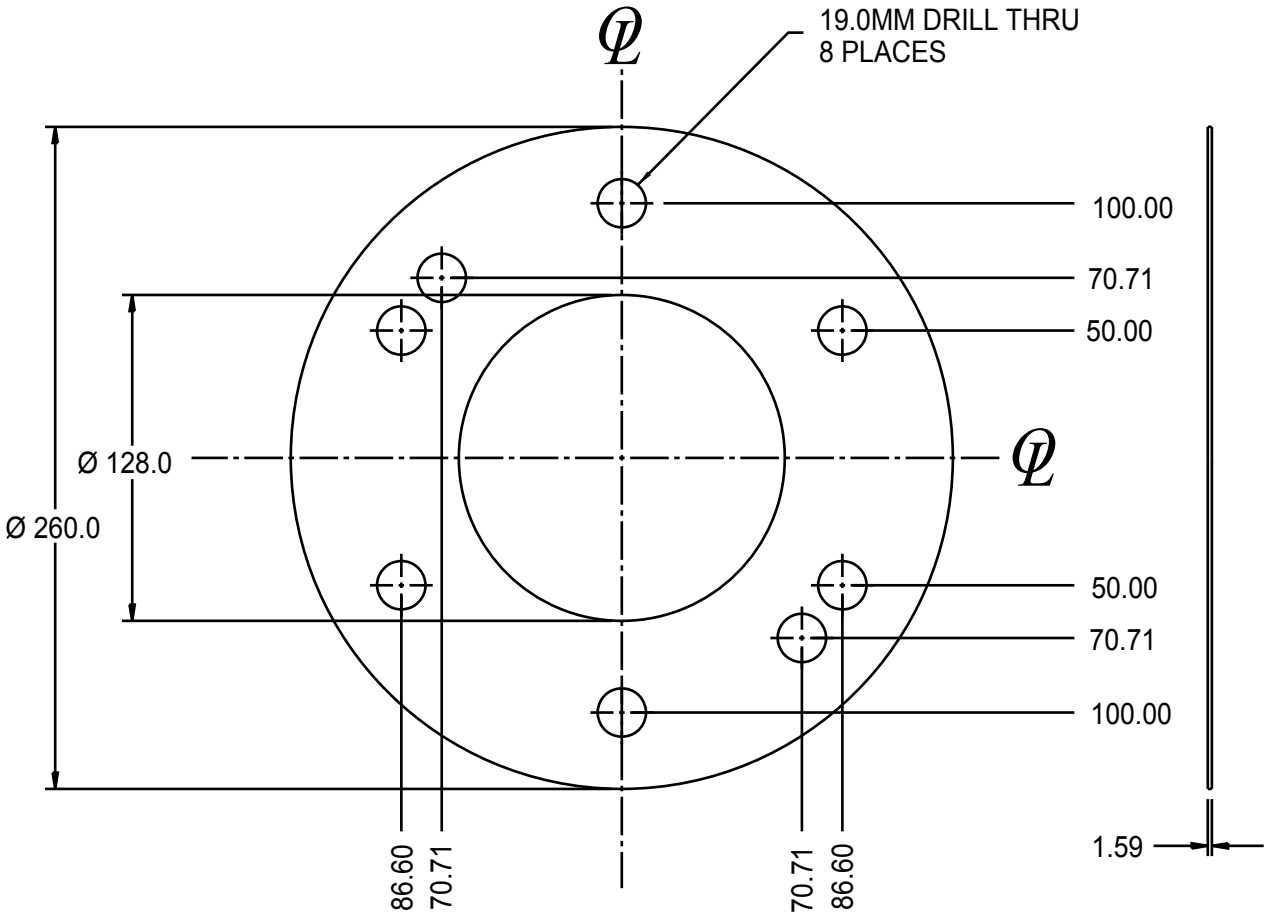
GLOBAL STANDARD COMPONENTS
NAAMS™
Stamping 03/30/09



MATERIAL:
PHENOLIC G-10
STK 260 DIA X 1.59" THK

INSULATION DISK
200MM BOLT CIRCLE
AID202

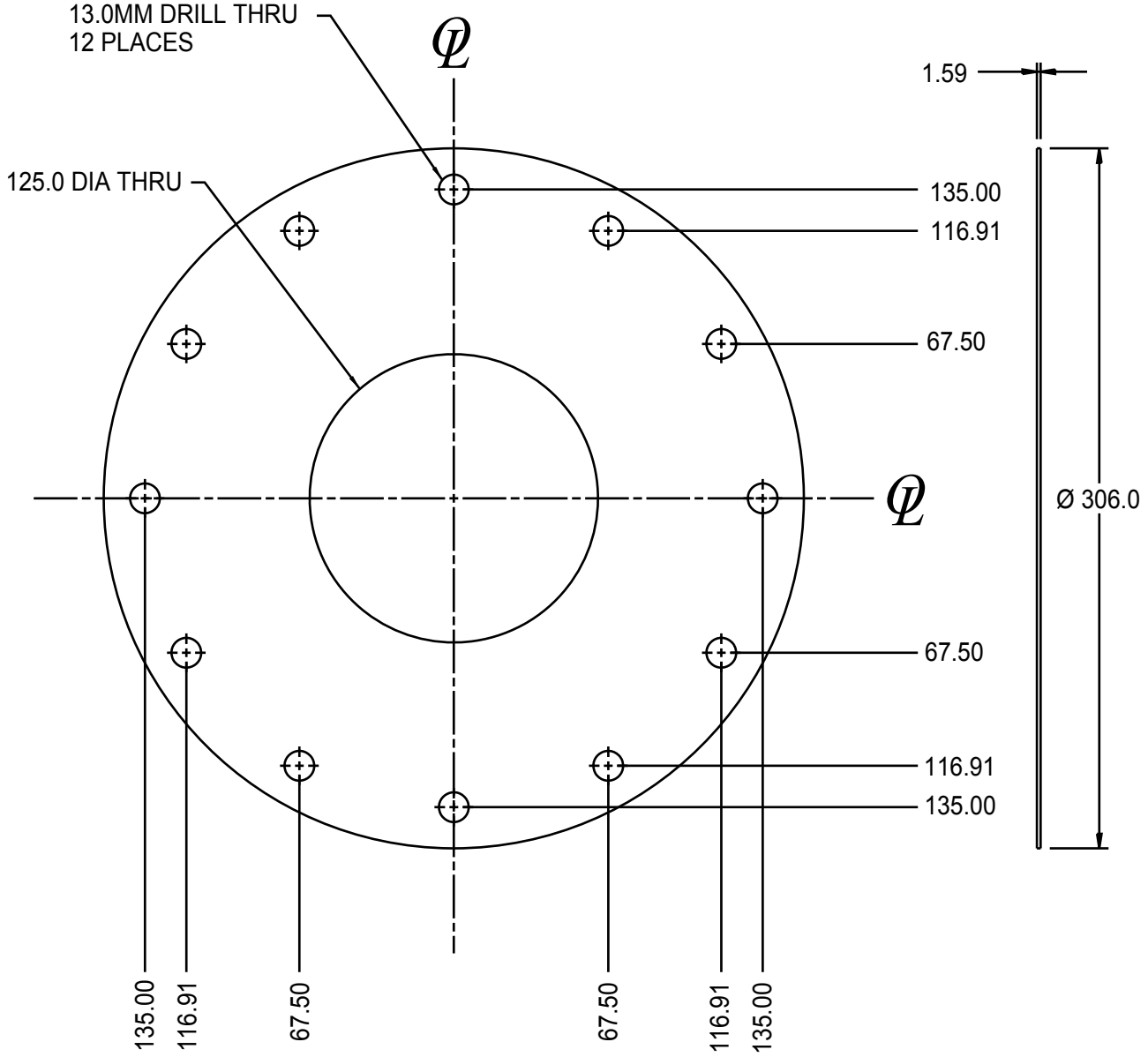
GLOBAL STANDARD COMPONENTS
NAAMS™
Stamping
03/30/09



MATERIAL:
PHENOLIC G-10
STK 260 DIA X 1.59" THK

INSULATION DISK
270MM BOLT CIRCLE
AID270

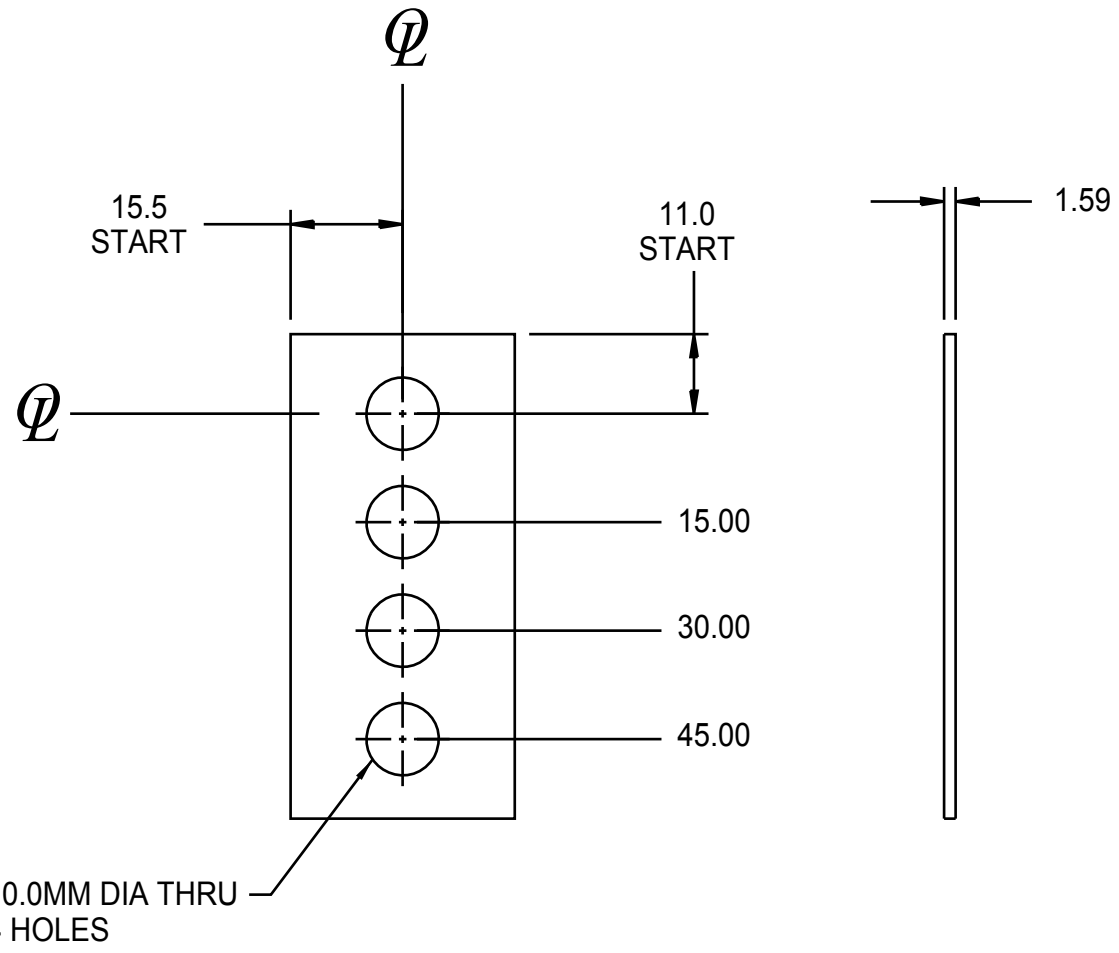
GLOBAL STANDARD COMPONENTS
NAAMS™
Stamping 03/30/09



MATERIAL:
PHENOLIC G-10
STK 306 DIA X 1.59" THK

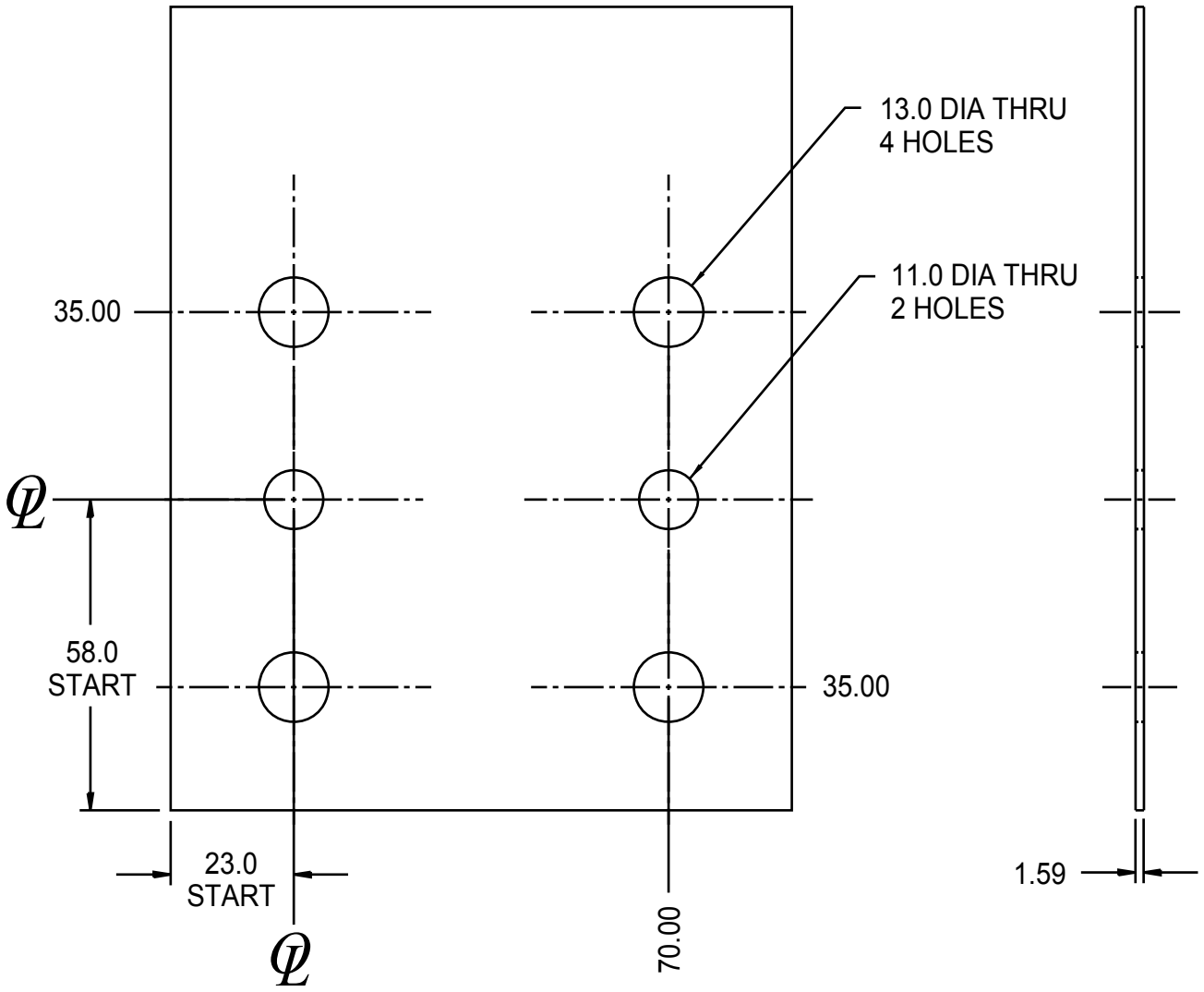
INSULATION DISK
AIR010

GLOBAL STANDARD COMPONENTS
NAAMS™
Stamping 03/30/09



MATERIAL:
PHENOLIC G-10 1.59 X 31.0 X 67.0

INSULATION DISK
AIR020

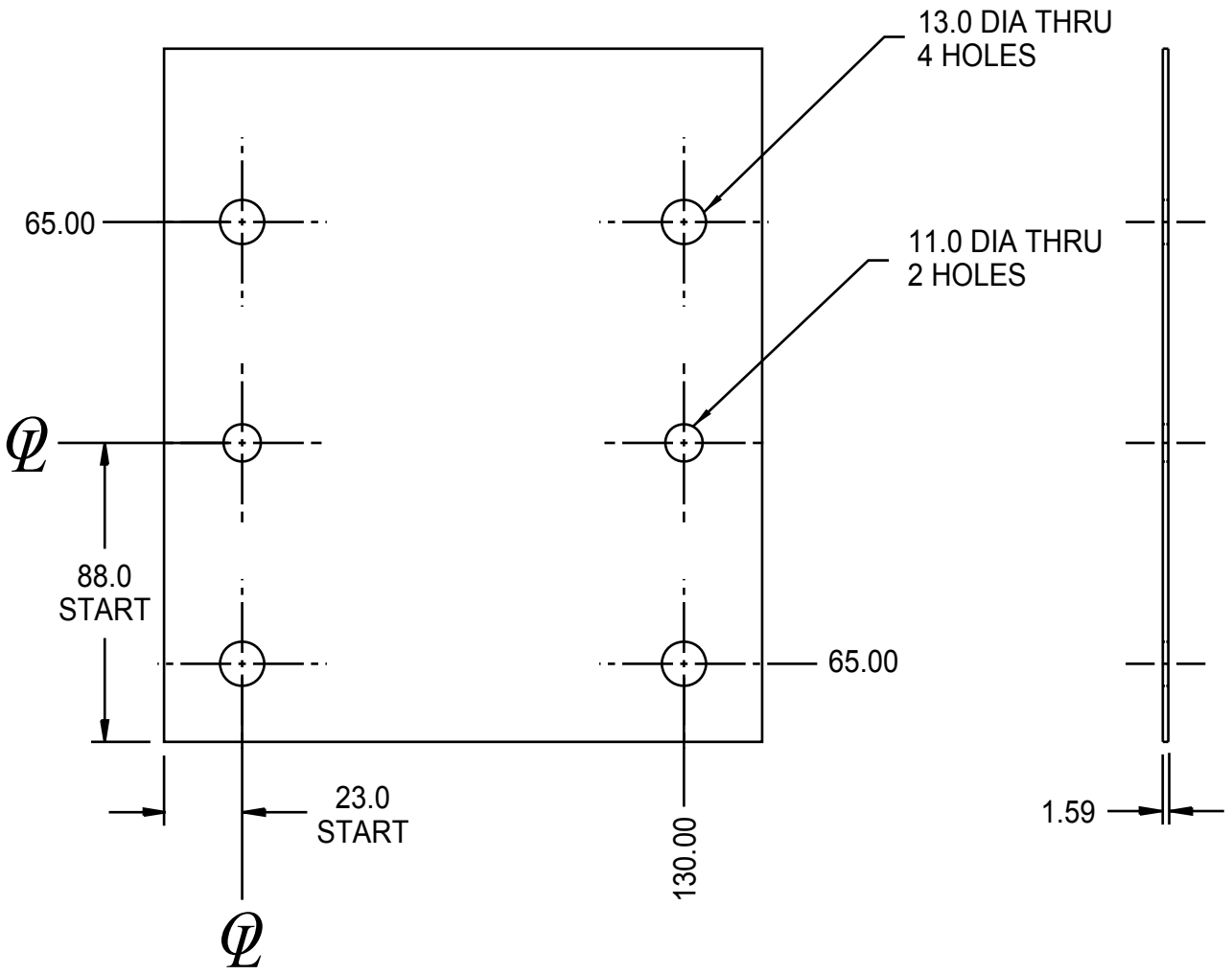


MATERIAL:
PHENOLIC G-10 1.59 X 116.0 X 150.0

INSULATION DISK
AIR030

GLOBAL STANDARD COMPONENTS
NAAMS™

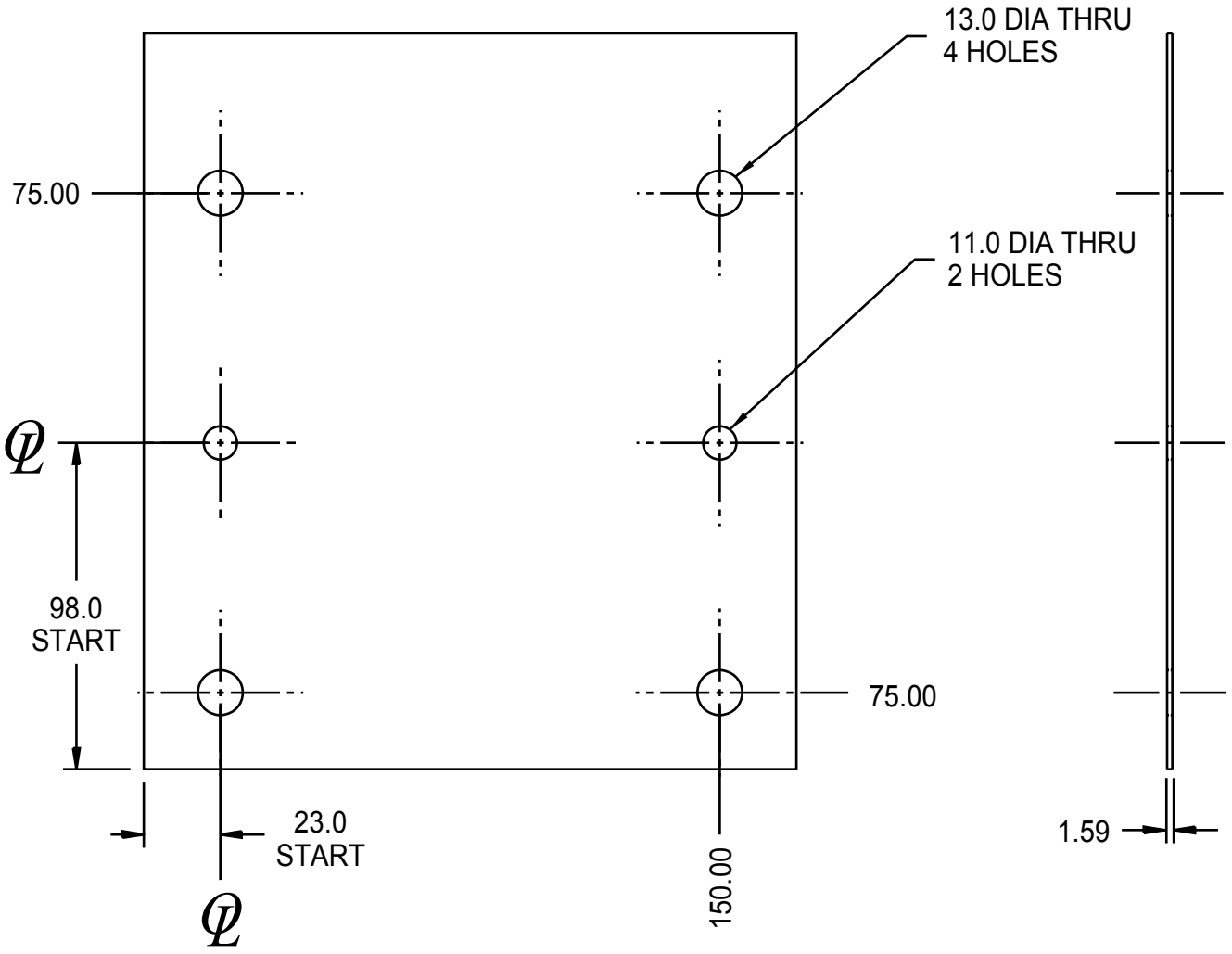
Stamping 03/30/09



MATERIAL:
PHENOLIC G-10 1.59 X 176.0 X 204.0

INSULATION DISK
AIR040

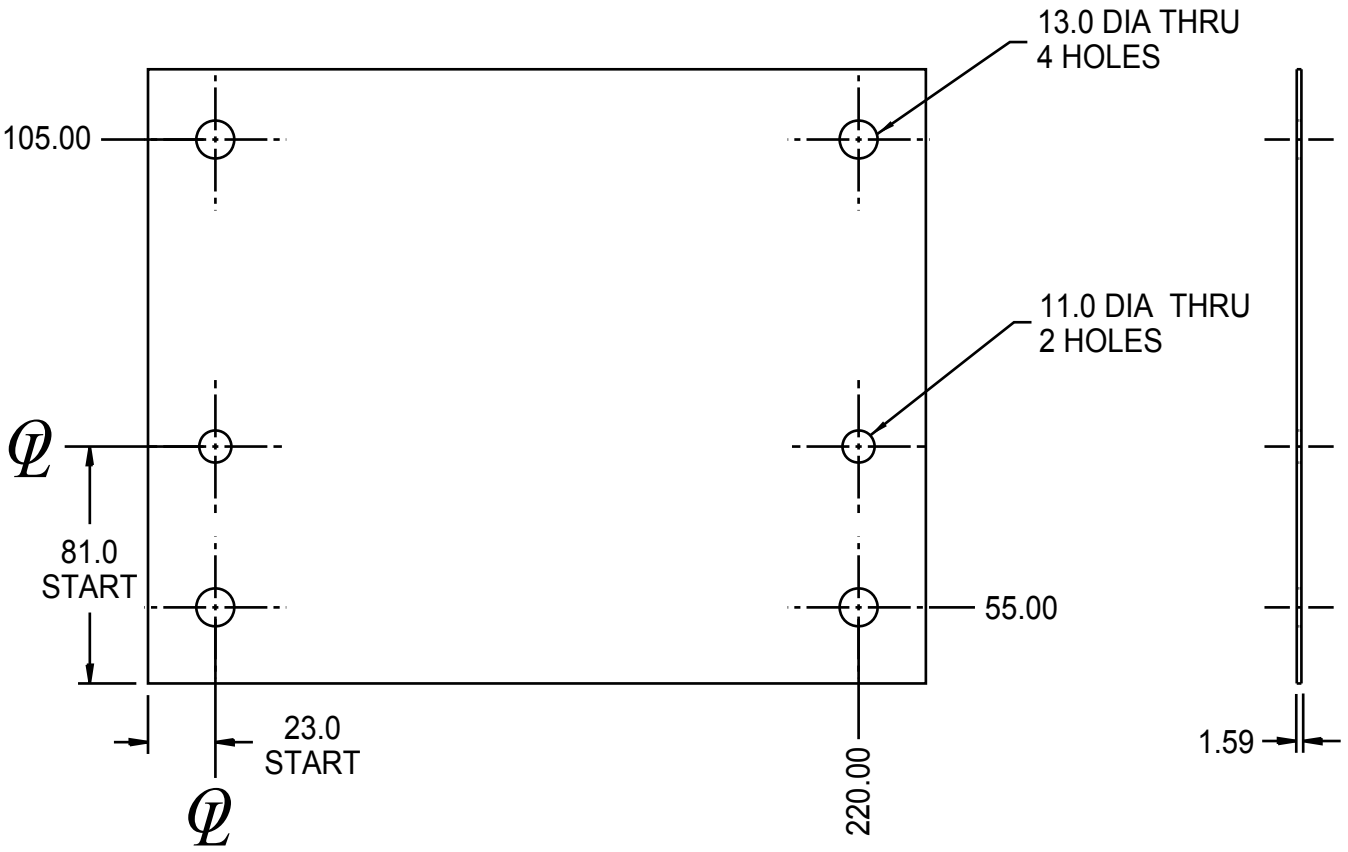
GLOBAL STANDARD COMPONENTS
NAAMS™
Stamping 03/30/09



MATERIAL:
PHENOLIC G-10 1.59 X 196.0 X 221.0

INSULATION DISK
AIR050

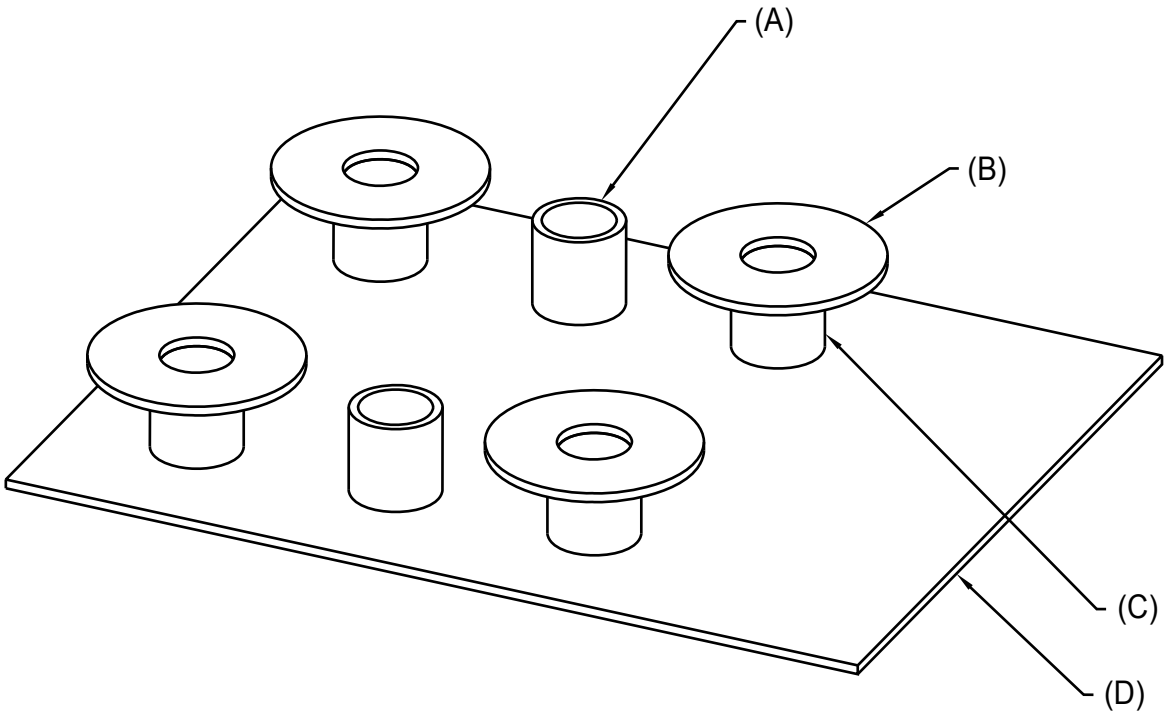
GLOBAL STANDARD COMPONENTS
NAAMS™
Stamping 03/30/09



MATERIAL:
PHENOLIC G-10 1.59 X 210.0 X 266.0

INSULATION ASSEMBLY FOR AAB SERIES RISERS AIA001

GLOBAL STANDARD COMPONENTS
NAAMS™
Stamping 03/30/09



MATERIAL:

(A)	2 REQ'D	NEMA LE GRADE LINEN PHENOLIC	10 ID X 12 OD X LENGTH TO SUIT
(B)	4 REQ'D	AIW012	
(C)	4 REQ'D	NEMA LE GRADE LINEN PHENOLIC	12 ID X 15 OD X LENGTH TO SUIT
(D)	1 REQ'D	AIR020	