USER'S MANUAL

MODEL: 5403
MODEL: 5403FG

76MM ELECTROMAGNET

Date Sold: _______________

Serial number: ___________

PROPRIETARY
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This manual is for the model 5403 electromagnet with serial numbers 200 and above.
For the model 5403 electromagnet with serial numbers below see manual M5403e

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Section 1
SPECIFICATIONS
Table 1. Model 5403 Specifications

Pole Diameter:	76 mm (3 inch)
Pole Gap: (variable gap setting)	0 – 86 mm (0 to 3.4 inch)
Coil Gap:	86 mm (3.4 inch)
Standard Pole Face:	76 mm (3 inch) cylindrical 38 mm (1.5 inch) tapered
Coils (series connection)	
coil resistance (20°C)	0.45 ohm
max resistance (hot)*	0.55 ohm
max continuous power (air cooled)	20A/10V (0.2kW)
max intermittent power (air cooled) duty cycle 1:3, 4 minute max ON	40A/20V (0.8kW)
max continuous power (water cooled)	50A/25V (1.25kW)
max intermittent power (water cooled) duty cycle 1:2, 10 minute max ON	70A/35V (2.5kW)
Self Inductance	approx 60mH
Water Cooling (18°C)	2 liters/m (0.5 US gpm) 0.5 bar (8 psid)
Overtemperature Interlock	Elmwood 3450G thermostat part number 3450G 611-1 L50C 89/16 mounted on each coil and wired in series. Contact rating 120Vac, 0.5A. Closed below 50° C.
Dimensions	Drawing 11901200 604 mm W x 282 mm D x 359 mm H 23.8 inch W x 11.1 inch D x 14.1 inch H
Mass	130 kg (286 lb)

***CAUTION - The value of maximum coil resistance given should not be exceeded. At this resistance the coils are at maximum safe temperature for continuous operation.**

Section 1
SPECIFICATIONS
Table 1. Model 5403FG Specifications

Pole Diameter:	76 mm (3 inch)
Pole Gap: (gap fixed with spacers)	0 – 86 mm (0 to 3.4 inch)
Coil Gap:	86 mm (3.4 inch)
Standard Pole Face:	76 mm (3 inch) cylindrical 38 mm (1.5 inch) tapered
Coils (series connection)	
coil resistance (20°C)	0.45 ohm
max resistance (hot)*	0.55 ohm
max continuous power (air cooled)	20A/10V (0.2kW)
max intermittent power (air cooled) duty cycle 1:3, 4 minute max ON	40A/20V (0.8kW)
max continuous power (water cooled)	50A/25V (1.25kW)
max intermittent power (water cooled) duty cycle 1:2, 10 minute max ON	70A/35V (2.5kW)
Self Inductance	approx 60mH
Water Cooling (18°C)	2 liters/m (0.5 US gpm) 0.5 bar (8 psid)
Overtemperature Interlock	Elmwood 3450G thermostat part number 3450G 611-1 L50C 89/16 mounted on each coil and wired in series. Contact rating 120Vac, 0.5A. Closed below 50° C.
Dimensions	Drawing 11901100 536 mm W x 282 mm D x 35 9mm H 21.1 inch W x 11.1 inch D x 14.1 inch H
Mass	130 kg (286 lb)

***CAUTION - The value of maximum coil resistance given should not be exceeded. At this resistance the coils are at maximum safe temperature for continuous operation.**

Section 1
SPECIFICATIONS
Table 2. Model 5403 Electrical and Water Connections

DC Current (as seen from the front refer to Drawing 11901200/11901100)

Left hand terminal:	Positive
Right hand terminal:	Negative

Ground

An M6 screw (Item 16 on drawing 11901200/11901100) is inside the terminal cover to enable the magnet frame to be grounded according to local safety regulations. It is normally appropriate to connect the magnet frame to the power supply ground.

Interlocks (refer to Drawing 11901200/11901100).

The temperature interlock wiring connections are made directly onto the temperature thermostats (Item 10 on drawing 11901200/11901100).

Water (refer to Drawing 11901200/11901100).

Outlet	1/8 inch NPT
Inlet	1/8 inch NPT
	(mating couplings for 0.25 inch id hose provided)

CAUTION - Ensure that the high current connections are tight. Loose connections may lead to oxidation and overheating. The field stability may be degraded and the current terminations damaged.

Section 2

WARNINGS

REFER TO WARNINGS BELOW BEFORE OPERATING ELECTROMAGNET

1 Personnel Safety

In operation the magnet fringing field is in excess of 0.5mT (5G). This can cause malfunctioning of heart pacemakers and other medical implants. We recommend that the fringing field should be mapped and warning signs be placed outside the 0.5mT (5G) contour. Entry to this region should be restricted to qualified personnel.

2 Pole Gap

Ensure that the poles are arranged so that that pole gap is approximately centered between the coils.

3 Ferromagnetic Objects

During operation the magnet exerts strong magnetic attraction towards ferromagnetic objects in the near vicinity of its pole gap or coils. Loose objects can be accelerated to sufficient velocity to cause severe personnel injury or damage to the coils or precision pole faces if struck. Keep ferromagnetic tools clear!

4 Arcing

This magnet stores considerable energy in its field during operation. Do not disconnect any current lead while under load or the magnetic field energy will be discharged across the interruption causing hazardous arcing.

5 Coil Hot Resistance

Do not exceed the maximum coil hot resistance given in the specifications or coil overheating and possible damage may occur.

6 Interlocks

These should ***always*** be connected if the magnet is operated unattended, to avoid the possibility of coil overheating caused by excessive power dissipation or inadequate cooling.

7 Watches, Credit Cards, and Magnetic Disks

Do not move magnetically sensitive items into the close vicinity of the magnet. Even some anti-magnetic watches can be damaged when placed in close proximity to the pole gaps during operation. Credit cards, and magnetic disks are affected by magnetic fields as low as 0.5mT (5G). Depending on the previous operating field and the pole gap, the remanent field in the gap can be in excess of 5mT (50G) with the magnet power supply off or disconnected.

Section 3

INSTALLATION

Caution: This is a heavy system. All movement, lifting and installation of the 5403 Electromagnet must be under the supervision of an experienced person to prevent the possibility of serious injury or damage to the Electromagnet and associated equipment.

Unpacking Instructions and Damage Inspection

To unpack the electromagnet please use the following procedure (Refer to Drawing 18900770).

1. First remove all of the "Hex Head Screws" located at the lower edge of all the side panels of the "Crate Top Cover".
2. Gently rock the "Crate Top Cover" to work it loose from the shipping crate base.
3. Grip the side panels of the Crate Top Cover. Lift "Crate Top Cover" high enough to clear top of electromagnet, walk cover sideways to a clear area and place on floor.
4. Inspect the magnet to ensure that no damage has occurred to the magnet in shipment. If damage is evident report the damage in detail to the shipper for claim and simultaneously notify GMW in case assessment of the damage must be made. If no damage is found proceed with magnet unpacking and installation.
5. Remove the M12 hex head coach bolts that secure the magnet to the shipping crate base".
6. Install M12 lifting eyebolt and washer to top of magnet yoke, screw down firmly.
7. The magnet is now prepared for final installation. Follow the appropriate procedure for direct or base mounting listed below.

Direct Mounting

1. With suitable lifting equipment e.g. 250kg (550 lb) minimum safe lifting rating, lift magnet 50mm (2") clear of shipping crate base.
2. Slide shipping crate base clear.
3. Lower magnet to 50mm (2") above floor.
4. Move magnet to final location and bolt magnet down through the four mounting holes provided in the magnet angle bracket (Item 8 on drawing 11901200/11901100).

Rolling or Rolling/Rotating Base Mounting (refer to Drawing 11902380 or 11902390)

Caution do not attempt to move magnet and rolling base or rolling/rotating base until the magnet has been firmly bolted down to the base.

1. To mount on rolling base or rolling/rotating base lift magnet from BOTH EYEBOLTS high enough to clear top of base.
2. Slide rolling base or rolling/rotating base underneath, lower magnet to 12mm (0.5") above base top surface.
3. Position rolling base or rolling/rotating base so the tapped holes in the base are aligned with the angle mounting bracket holes. Lower the rolling base support legs until they contact the floor, to prevent the base from accidentally moving horizontally.
4. Lower magnet onto rolling base or rolling/rotating base assembly.
5. Secure magnet to rolling base or rolling/rotating base with M10 x 25 long Hex Head Bolts.
6. Raise the support legs and move magnet and rolling base or rolling/rotating base to desired location.

Rolling or Rolling/Rotating Base Mounting (Continued)

7. Screw down the four support legs located on each corner of the rolling or rolling/rotating base until the wheels clear the floor by 6mm (.25").
8. Secure the support legs with the locknut.
9. Secure rolling/rotating base to an adequate concrete floor to prevent movement and possible injury to personnel during an earthquake.

Pole Selection and Installation (Refer to drawing 11901200/11901100**).**

Using the field uniformity and induction curves determine the most desirable pole; cylindrical or tapered. In general:

If a uniform field is required use a cylindrical pole.
If a high field is required use a tapered pole.

Pole Removal 5403 only (refer to drawing 11901200).

1. Turn off the power supply.
2. Adjust the 5403 magnet for maximum pole gap, i.e. 86mm (3.4 inch). To adjust the pole gap insert the 17mm hex key wrench (item 2 on drawing 1890030) into the pole gap adjustment drivescrew. Rotate clockwise until the pole is fully retracted. Repeat this operation for the other pole.
3. Remove the eight cap securing screws (item 12 on drawing 11901200).
4. Pull the pole and cap assembly about 75mm (3 inches) out of the magnet yoke.
5. Grip the cap with one hand and support the pole with the other hand. Remove the pole and cap assembly taking care that the pole face is not damaged by contacting the magnet yoke.
6. Remove the cap (item 1 on drawing 11902370) by undoing the drive screw.

Pole Fitting (refer to drawing 11901200 & 11902370).

1. Ensure the poles and pole sleeves are clean and free from debris.
2. Reverse the above pole removal sequence above.

Pole Removal 5403FG only (refer to drawing 11901100).

1. Turn off the power supply.
3. Remove the eight cap securing screws (item 12 on drawing 11901100).
4. Remove pole retainer (item 26 on drawing 11901100).
5. Remove the pole, take care that the pole face is not damaged by contacting the magnet yoke while it is being removed.

Pole Fitting and setting Pole Gap (refer to drawing 11901100).

1. Ensure the poles and pole sleeves are clean and free from debris.
2. Reverse the above pole removal sequence above.
3. To increase pole gap pole spacers (item 4 on drawing 11901100) are inserted between the yoke and end flange of the pole.

continued

INSTALLATION

Symmetrical Pole Gap

Is used for optimum maximum field and field uniformity. Each pole gap spacer is of equal thickness and is half the desired pole gap. For a 20mm pole gap the pole spacer thickness is 10mm, and it is Part No 17901400-10. The suffix of the part no denotes the pole spacer thickness.

Asymmetrical Pole Gap

For special applications and geometry requirements the pole gap can be asymmetrical in the yoke. In this case the pole spacers will be of unequal thickness, Refer to drawing 17901400 for pole spacer dimensional details.

Variable Gap Mechanism (5403FG only refer to drawing 11901100).)

To convert the 5403FG to variable gap electromagnet follow procedure listed below.

1. Turn off the power supply.
2. Remove the eight cap securing screws (item 12 on drawing 11901100).
3. Remove pole retainer (item 26 on drawing 11901100)..
4. Remove the pole, take care that the pole face is not damaged by contacting the magnet yoke while it is being removed.
5. Remove pole spacer (item 4 on drawing 11901100) from pole.
6. Screw the variable gap mechanism drivescrew into the thread on the rear of the pole. Continue screwing in the drivescrew until the pole is fully retracted into the cap.
   Refer to drawing no: 11901100 & 11902370.
7. Grip the cap with one hand and support the pole with the other hand. Insert the pole into the yoke taking care that the pole face is not damaged by contacting the magnet yoke.
8. Secure the cap onto the yoke with eight socket head cap screws (item 13 on drawing 11901100)
9. Set the magnet gap by rotating the drivescrew with the hex key wrench provided in the magnet toolkit (refer to drawing no: 18900030). Ensure that the poles are arranged so that that pole gap is approximately centered between the coils.

Electrical Circuit

Never connect or remove cables from the magnet with the power supply connected. The stored energy in the magnet can cause arcing resulting in severe injury to personnel or equipment damage.

The magnet has two coils which are connected in series, (Refer to drawing 11901200/11901100). The power supply cables should be connected directly to the dc current terminals marked + and -. Recommended current cable for the 5403 is stranded copper of 20 mm^2 cross section (4 AWG).

Because the magnet stores a significant amount of energy in its magnetic field, special care should be taken to insure that the current terminations are secure and cannot work loose in operation. Local heating at the terminations can cause rapid oxidation leading to a high contact resistance and high power dissipation at the terminals. Often this will result in unstable current regulation and poor field stability. If left unattended this can cause enough local heating to damage the terminals and the coils.

INSTALLATION

The 5403 Interlocks

The Model 5403 has two thermostats, Elmwood 3450G Part Number 3450G611-1 L50C 89/16. They are located on the center coil cooling plate of each coil and wired in series. The thermostats are normally closed, opening when the coil central cooling plate temperature exceeds 50°C +/3°C.

Cooling

The Model 5403 can be operated to an average coil temperature of 70°C. Assuming an ambient laboratory temperature of 20°C and a temperature coefficient of resistivity for copper of 0.0039/°C, the hot resistance of the coil should not exceed 20% more than the ambient temperature "cold" resistance. The coil thermostat will open when either center coil cooling plate temperature exceeds approximately 50° C . Clean, cool (16°C - 20° C) water at 2 *l*/min at 0.5 bar (8 psid) should be used to cool the 5403 magnet.

The cooling copper tubes are electrically isolated from the coils to avoid electrochemical corrosion. A 30 micron filter should be placed before the input to the magnet to trap particulates and avoid unreliable operation of the water flow switch interlock (if fitted).

For continuous operation of the magnet it may be appropriate to use a recirculating chiller to reduce water and drainage costs. The chiller capacity will depend on whether cooling is required for the magnet alone or magnet and power supply. For the Model 5403 Electromagnet alone a suitable chiller is the Bay Voltex model: MC-50 Chiller with 1764W capacity. Suggested options are: MC-HI-30 30 micron filter; MC-J1 Flow Meter with Control; MC E1 Control Package.

For recirculating cooling systems use distilled or deionized water with a biocide to prevent bacterial growth and corrosion. Do not use corrosion inhibitors in high quality electrical systems since the water conductivity is increased which can result in increased leakage currents and electrochemical corrosion.

At currents of approximately 20A and below the Model 5403 can be operated safely without water cooling. However the coil temperature will vary with the power dissipation. This results in dimensional changes of the magnet yoke and air cooling is not suitable when high field stability is required.

Freon, oil, ethylene glycol or other cooling mediums can be used. The flow required will be approximately inversely proportional to their specific heats. An experimental determination of the flow and pressure required will be necessary.

Avoid cooling the magnet below the dew point of the ambient air. Condensation may cause electrical shorts and corrosion.

During operation the resistance can be checked using a voltmeter across each coil. The voltage will rise to a constant value once thermal equilibrium has been reached. If it is desired to save water, the flow can be reduced until the hot resistance is approached. NOTE: This adjustment must be made slowly enough to allow for the thermal inertia of the coils.

continued

Section 4

OPERATION

Cooling

Intermittent operation to high currents is possible by utilizing the thermal mass of the coils to absorb the additional energy. Some guidance for intermittent high current operation is given in Section 1 Specifications. It is recommended that the maximum instantaneous power is limited to 70A/35V (2.5 kW). CAUTION it is essential the the coil thermal interlocks be connected and tested to ensure that the power supply will be switched to zero current in the event of coil overheating.

Section 4

OPERATION

General

The magnet operates as a conventional electromagnet.

1. Adjust the poles to the desired gap with the poles approximately symmetrical about the center magnet line. To reduce mechanical backlash when the magnetic field is applied, it is best to set the poles by increasing the gap.
2. Adjust the cooling water flow to about 2 liters/min (0.5 USgpm) for the 5403. For operation at less than maximum power the water flow may be correspondingly reduced. Note that the inlet water temperature will determine the actual flow rate required. The above specified flow rates were determined with a water inlet temperature of approximately 18°C.
3. Turn on the power supply and increase the current until the desired field is reached.

Calibration

The induction curves may be used to estimate the field in the air gap to within four or five percent. More accurate field determination may be obtained by deriving experimentally a calibration curve for the particular pole and air gap combination being used. Magnetic hysteresis in the yoke and poles can cause an error of 30 to 70G (3 to 7mT) with an arbitrary application of such a calibration curve. This effect may be reduced to less than one percent by following a prescribed 'current setting schedule' designed to make the magnet 'forget' its prior magnetic history. The schedule should of course be used both in establishing the calibration curve and in its subsequent use. A possible schedule would be:

From zero current, increase to maximum current and reduce again to zero current. Increase again to maximum current and reduce to the current to give the desired field setting. Approaching the desired field from a higher setting will typically produce better field uniformity. This is because the field changes at the pole edges will normally lag the field change at the center thereby helping to compensate the radial decrease in field.

Greater precision in setting up the calibration curve will be achieved with the use of a digital teslameter and by making a numerical table. This table used with an interpolation routine will eliminate the error associated with reading a graph.

In any event, three points need to be remembered:

1. A calibration curve or table is only as good as the precision employed in generating it.

2. The field is defined only at the point it is measured. It will generally be different at a different point in the air gap. For example, the induction curves refer to the field on the pole axis and at the center of the air gap (median plane).

3. The field is most directly a function of the current in the magnet coils. Voltage across the coils is not a good measure of field since the electrical resistance of the coils depends on the temperature (about 0.4% per degree celsius).

Section 4

OPERATION

Field Control Operation

The necessity to use calibration curves can be avoided by using a field controller to sense the magnetic field and provide a corresponding power supply control signal through the power supply programming inputs. Contact GMW for suitable instrumentation.

Section 5

MAINTENANCE

Periodically check that the pole adjustment mechanism is clean, properly lubricated and free of grit and dirt, which may cause binding of the mechanism. (5403 only) Be very careful not to damage the relatively soft pole surface since this may degrade the magnetic field uniformity in the gap.

Note that the surface treatments used provide good corrosion protection but in order to maintain the inherent mechanical precision of the magnet, heavy build-up of plating materials is deliberately avoided. As a result, high humidity or otherwise seriously corrosive atmospheres can cause corrosion. Periodically apply an appropriate corrosion protection, particularly when the magnet is stored for an extended period.

Check the cooling water circuit to ensure the water is clean and free of debris and bacterial growth. Ensure the in-line water filter is clean.

Section 6

STANDARD OPTIONS

Motorized Rotating Drive

Drawing 11900800 Motorized Rotating Drive installed on Rolling/Rotating Base
Drawing 11900810 Motor Drive Assembly
Drawing 11900820 Spool Assembly
Drawing 11900840 Stop Block Assembly
Drawing 11900850 Worm Mount Assembly
Drawing 11901020 Electrical Assembly
Drawing 13900350 Electrical Wiring

Probe Mount

Drawing 11901280 Probe Mount General Assembly

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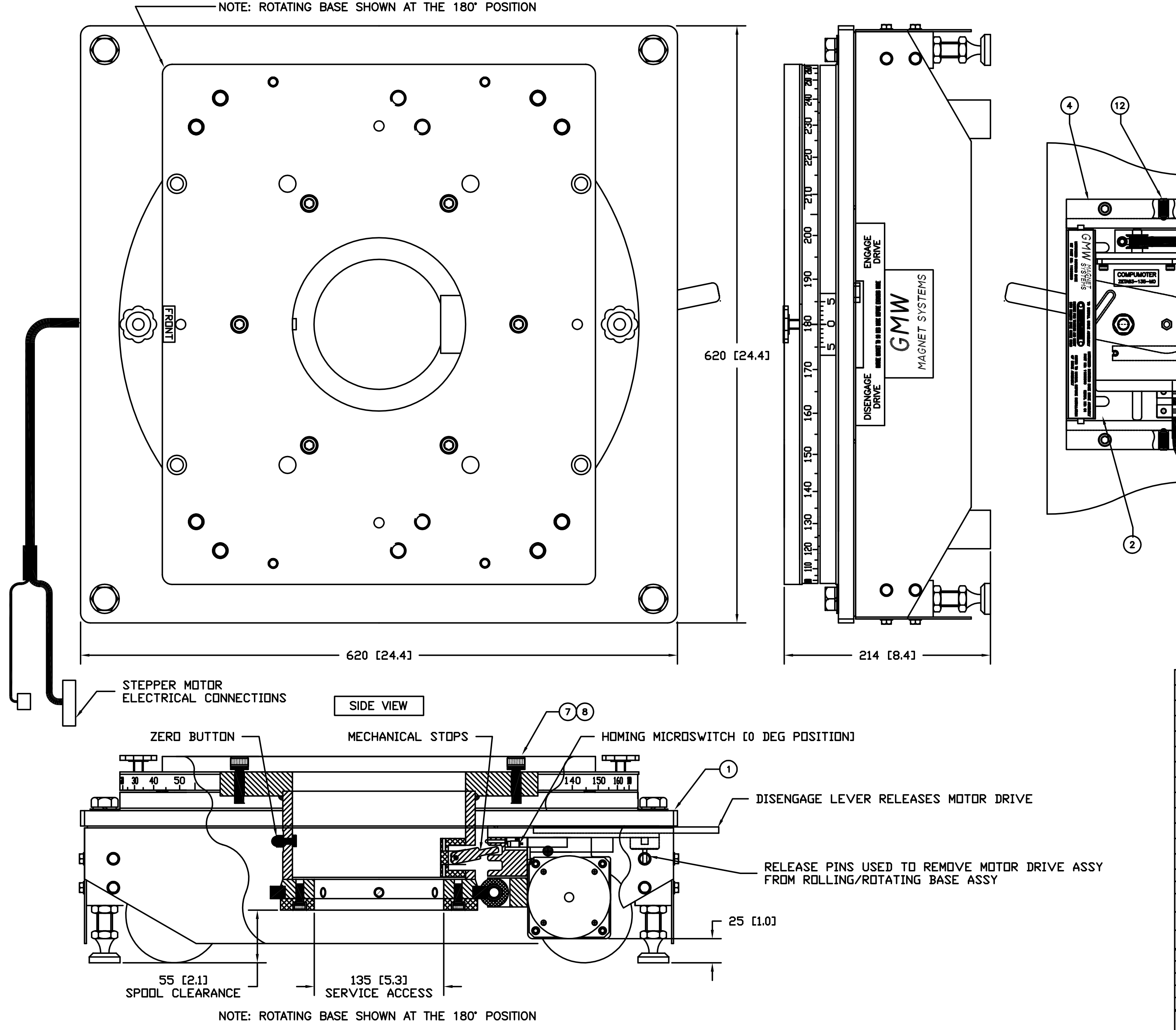
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		02/16/98	G.DOUGLAS
B	CORRECT 45° MTG HOLES LOCATION		10/20/98	G.DOUGLAS



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
13	1		GROMMET 25MM OD X 20MM ID	
12	2	SBMH-ION	BALL PLUNGER, M6 S/S	
11	1	DIN 433	WASHER. FLAT M6 X 1.6 S/S	
10	5	BN-792	WASHER, M8 X XX RIBBED SPRING/STEEL	
9	6	BN 792	WASHER, M10 X XX RIBBED SPRING/STEEL	
8	5	DIN 912	SHCS, M8 X 20 S/S	
7	6	DIN 912	SHCS M10 X 30 S/S	
6	1	17901230	CABLE CLAMP	
5	1	10900161	RELEASE/ENGAGE LABEL	
4	2	17901020	BASE PLATE GUIDES	
3	1	11900820	SPOOL ASSY	
2	1	11900810	MOTOR DRIVE ASSY	
1	1	11900980	ROLLING/ROTATING BASE ASSY	

PARTS LIST

DRAWN G.DOUGLAS	DATE 02/16/98	
CHECK	DATE	
ENGINEERING	DATE	

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

NEXT ASSY	SYSTEM
11900800	5403
11900800	3472
11900800	3473

SOFTWARE AUTOCAD 2000

THIRD ANGLE PROJECTION

GMW
P.O. Box 2578, Redwood City, CA 94064
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
MOTORIZED.ROT.DRIVE
3473/3472/5403

SIZE A1 | DRAWING NO. 11900800 | REV B

SCALE 1:2 | WT kg | SHEET 1 OF 1

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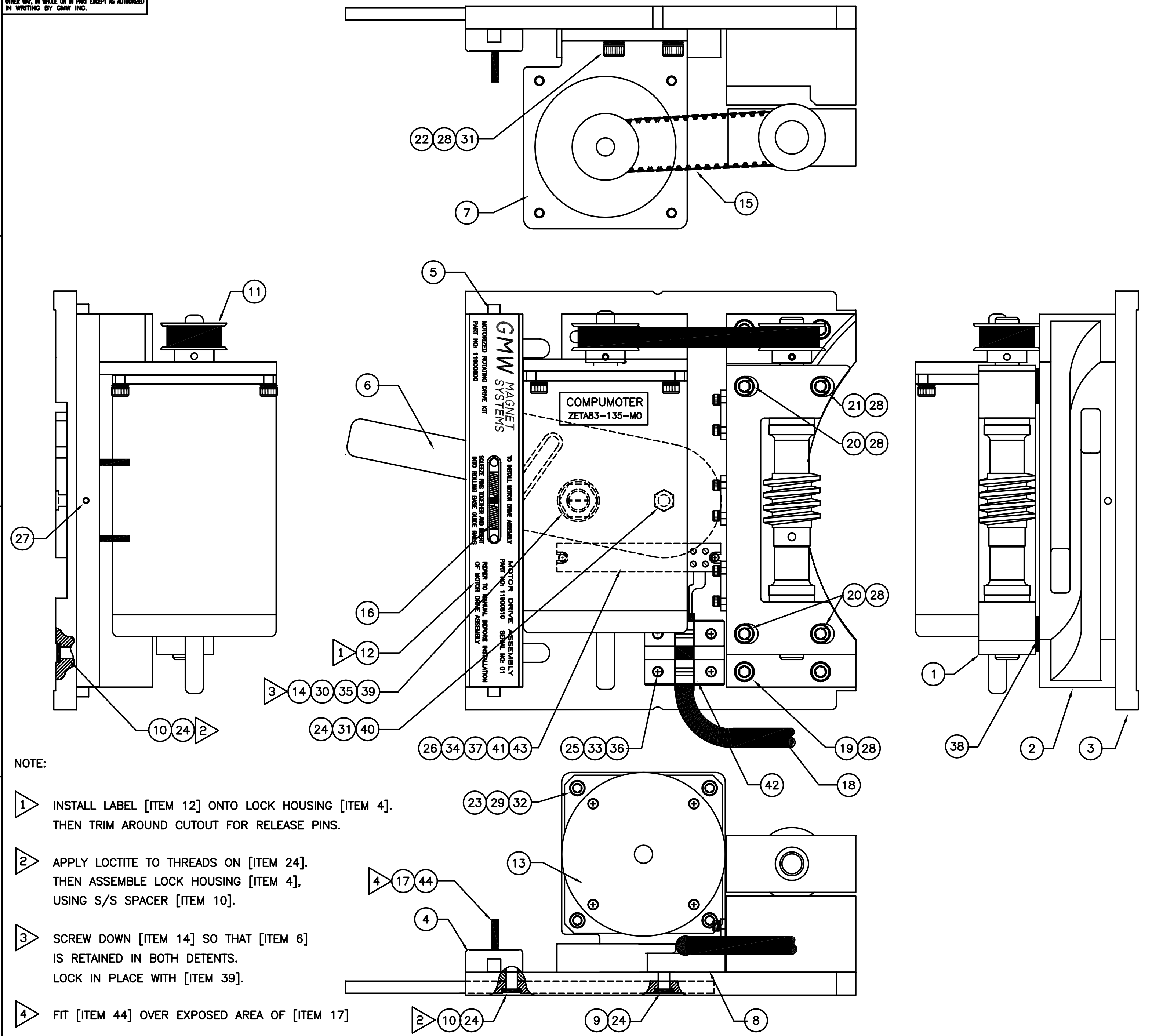
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		07/07/97	G.DOUGLAS
B	ADD ITEMS 43,44, CHG NOTES, ITEM 13		11/29/97	G.DOUGLAS
C	CHG ITEM 11,44, ADD NOTE: 4		04/07/98	G.DOUGLAS



NOTE:

1. INSTALL LABEL [ITEM 12] ONTO LOCK HOUSING [ITEM 4]. THEN TRIM AROUND CUTOUT FOR RELEASE PINS.
2. APPLY LOCTITE TO THREADS ON [ITEM 24]. THEN ASSEMBLE LOCK HOUSING [ITEM 4], USING S/S SPACER [ITEM 10].
3. SCREW DOWN [ITEM 14] SO THAT [ITEM 6] IS RETAINED IN BOTH DETENTS. LOCK IN PLACE WITH [ITEM 39].
4. FIT [ITEM 44] OVER EXPOSED AREA OF [ITEM 17]

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
44	A/R		HEAT SHRINK SLEEVING, 4MM	
43	1	0.33uF	CAPACITOR	
42	2	OHS	SADLE, COPPER 3/8" 10MM	
41	1	2412.6	TERMINAL BLOCK, 12 WAY WEIDMULLER	
40	1	DIN 934	NUT, M6, HEX HD B S/S	
39	1	DIN 934	NUT, M10, HEX HD S/S	
38	16	BN 748	WASHER, SHIM M6 X 18 X 0.5 S/S	
37	2	DIN 6797	WASHER, INT LOCK M3 X 0.4 S/S	
36	4	DIN 6797	WASHER, INT LOCK M4 X 0.5 S/S	
35	1	DIN 6797	WASHER, INT LOCK M10 X 0.5 S/S	
34	2	DIN 433	WASHER, FLAT M3 X 0.5 S/S	
33	4	DIN 433	WASHER, FLAT M4 X 0.5 S/S	
32	4	DIN 433	WASHER, FLAT M5 X 1.0 S/S	
31	3	DIN 433	WASHER, FLAT M6 X 1.6 S/S	
30	1	DIN 433	WASHER, FLAT M10 X 1.6 S/S	
29	4	BN 792	WASHER, M5 X 1.1, RIBBED SPRING/STEEL	
28	12	BN 792	WASHER, M6 X 1.2, RIBBED SPRING/STEEL	
27	1	DIN 916 A2	SHSC M3 X 16 S/S	
26	2	DIN 7985A	SCREW, PAN HD M3 X 16 S/S	
25	4	DIN 7985A	SCREW, PAN HD M4 X 16 S/S	
24	5	BN 1206	SHCS, M6 X 16,LOW PROFILE HD	
23	4	DIN 912	SHCS M5 X 12 S/S	
22	2	DIN 912	SHCS M6 X 16 S/S	
21	1	DIN 912	SHCS, M6 X 30 S/S	
20	3	DIN 912	SHCS, M6 X 35 S/S	
19	4	DIN 912	SHCS, M6 X 45 S/S	
18	6M	8778	CABLE, 6 SHIELDED PAIRS, 22 AWG, BELDEN	
17	2	DIN 1481	SPRING PIN, M4 X 26L	
16	1	IHI	SPRING, COMPRESSION, 6MM DIA X 50L	
15	1	TB20EF6-50	BELT, TIMING, BERG 10" [250MM]	
14	1	SBMH-10N	BALL PLUNGER, M6	
13	1	12900052	MOTOR, STEPPER, COMPUMOTER	
12	1	10900070	LABEL, SPECIFICATION	
11	1	12900042	PULLEY,TIMING BELT 18 TEETH, 3/8 SHAFT	
10	1	17901202	SPACER, 9MM LONG S/S	
9	1	17901201	SPACER, 4MM LONG S/S	
8	1	17901180	SPACER, CABLE CLAMP	
7	1	17901060	MOTOR MOUNT	
6	1	17901051	DISENGAGE LEVER [For Model 3473 base]	
5	2	17901040	LOCK BAR	
4	1	17901030	LOCK HOUSING	
3	1	17901010	BASE PLATE	
2	1	11900840	STOP BLOCK ASSEMBLY	
1	1	11900850	WORM MOUNT ASSEMBLY	

DRAWN G.DOUGLAS	DATE 05/04/97	DO NOT SCALE FROM DRAWING
CHECK	DATE	DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)
ENGINEERING	DATE	

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

NEXT ASSY	SYSTEM
11900800	5403
11900800	3472
11900800	3473

SOFTWARE AUTOCAD 2000

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
MOTORIZED.ROT.DRIVE
MOTOR DRIVE ASSY

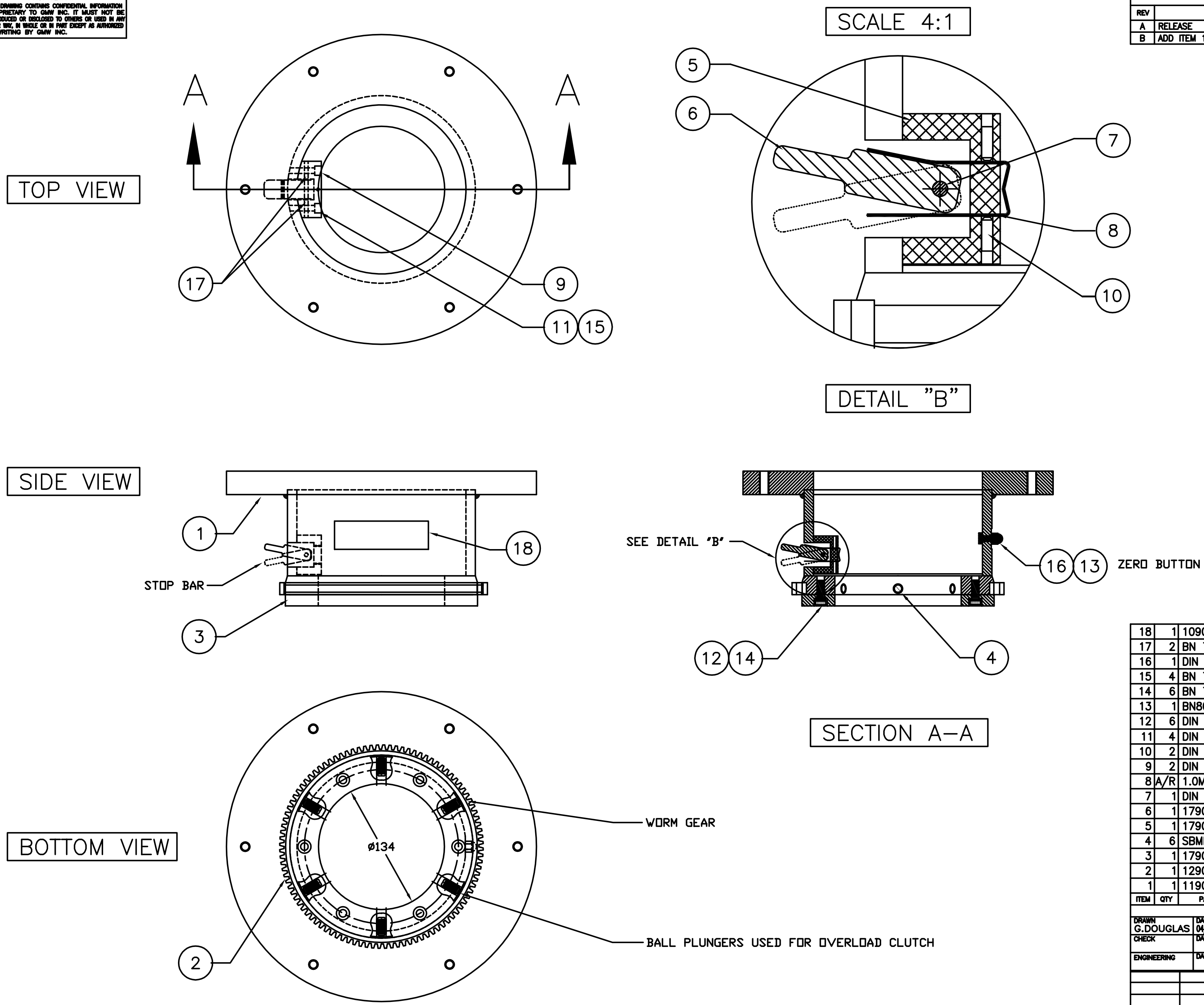
SIZE A1 | DRAWING NO. 11900810 | REV C

SCALE 1:1 | WT kg | SHEET 1 OF 1

PROPRIETARY
THIS DRAWING CONTAINS CONFIDENTIAL INFORMATION PROPRIETARY TO GMW INC. IT MUST NOT BE REPRODUCED OR DISCLOSED TO OTHERS OR USED IN ANY OTHER WAY, IN WHOLE OR IN PART EXCEPT AS AUTHORIZED IN WRITING BY GMW INC.

REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		07/07/97	G.DOUGLAS
B	ADD ITEM 17&18, MOD SPRING SHAPE		11/25/97	G.DOUGLAS



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
18	1	10900170	LABEL, SPOOL IDENTIFICATION	
17	2	BN 792	WASHER, FLAT M6 X 1.6 S/S	
16	1	DIN 1587	NUT, HEX DOMED M6 X 12 S/S	
15	4	BN 792	WASHER, LOCK M6 X 1.2	
14	6	BN 792	WASHER, LOCK M8 X 1.4	
13	1	BN80	BOLT, M6 X 16 HEX NYLON	
12	6	DIN 912	SHCS M8 X 16 S/S	
11	4	DIN 912	SHCS M6 X 25 S/S	
10	2	DIN 913 A2	SHSS M3 X 10 S/S	
9	2	DIN 913 A2	SHSS M4 X 12 S/S	
8	A/R	1.0MM	PIANO WIRE S/S	
7	1	DIN 6325	DOWEL PIN, M6 X 60	
6	1	17901090	STOP BAR	
5	1	17901100	STOP BAR GUIDE	
4	6	SBMH-10N	BALL PLUNGER, VLIER S/S	
3	1	17901130	SPOOL CLAMP RING	
2	1	12900020	WORM GEAR, BRONZE	
1	1	11900830	SPOOL WELDED ASSY	

PARTS LIST

DRAWN G.DOUGLAS DATE 04/27/97
CHECK DATE
ENGINEERING DATE

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
P.O. Box 2578, Redwood City, CA 94064
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
MOTORIZED.ROT.DRIVE SPOOL ASSEMBLY

SIZE	DRAWING NO.	REV
A1	11900820	B

SCALE 1:2 | WT kg | SHEET 1 OF 1

NEXT ASSY	SYSTEM
11900800	

SOFTWARE AUTOCAD 2000

PROPRIETARY
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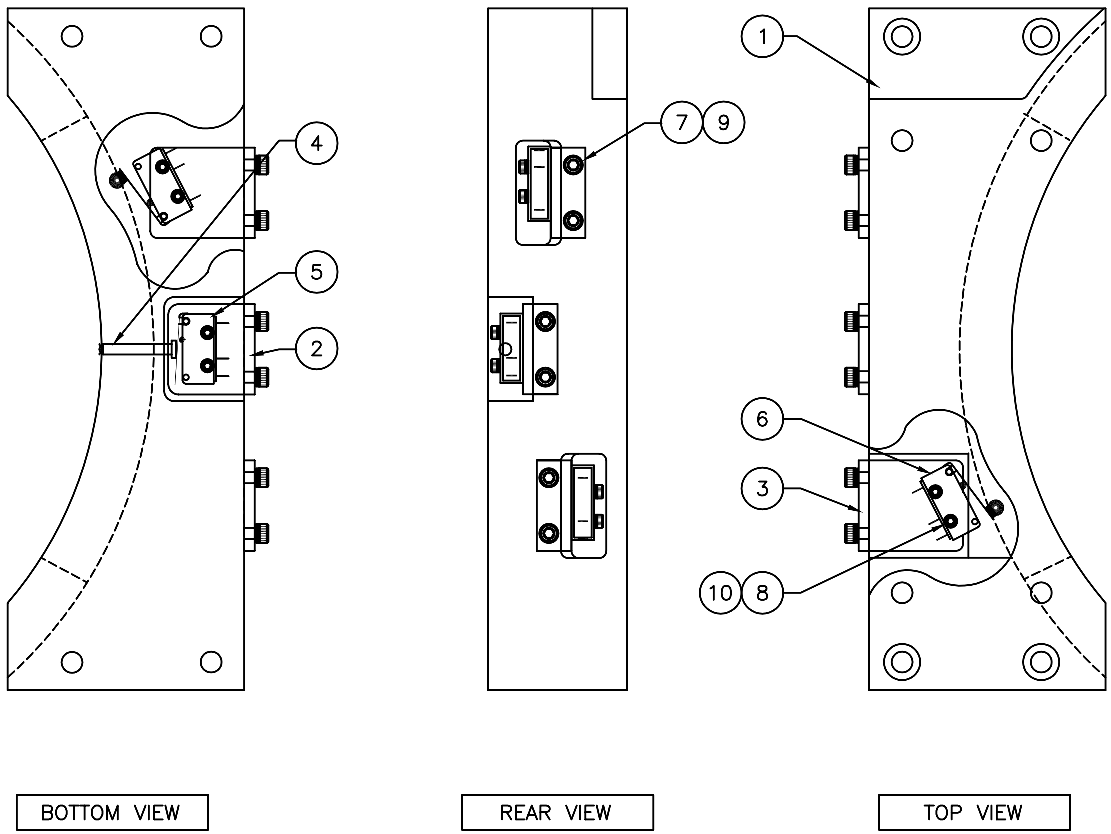
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		07/07/97	G.DOUGLAS



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
10	6	BN 752	WASHER, LOCK SP/S M2 X 0.5 SP/S	
9	6	BN 792	WASHER, LOCK SP/S M3 X 0.9 SP/S	
8	6	DIN 912	BOLT, SHCS M2 X 10 S/S	
7	6	DIN 912	BOLT, SHCS M3 X 10 S/S	
6	2	V4NT7	MICROSWITCH, BURGESS	
5	1	V4NT9	MICROSWITCH, BURGESS	
4	1	17901170	SHAFT, ZERO MICROSWITCH	
3	2	17901160	BRACKET, LIMIT MICROSWITCH	
2	1	17901150	BRACKET, ZERO MICROSWITCH	
1	1	17901070	STOP BLOCK	

PARTS LIST

DRAWN G.DOUGLAS — DATE 05/02/97
CHECK — DATE
ENGINEERING — DATE

NEXT ASSY 11900810 — SYSTEM

SOFTWARE AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
MOTORIZED.ROT.DRIVE STOP BLOCK ASSY

SIZE A2 — DRAWING NO. 11900840 — REV A

SCALE 1:1 — WT kg — SHEET 1 OF 1

PROPRIETARY
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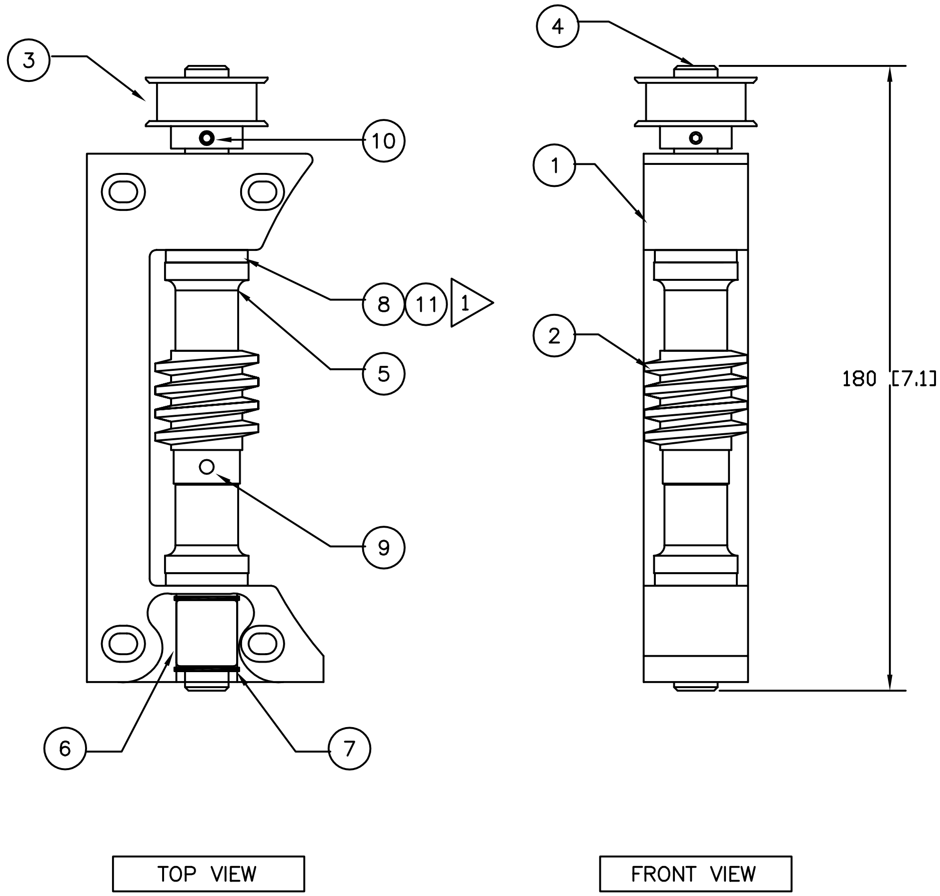
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		07/07/97	G.DOUGLAS
B	ADD ITEM 11 AND NOTE: 1, CHG ITEM 3		11/27/97	G.DOUGLAS
C	CHG ITEM 3		04/08/98	G.DOUGLAS



NOTE:

1. USE ITEM 11 TO PACK WORM DRIVE ASSEMBLY TO REDUCE SHAFT AXIAL MOVEMENT TO MINIMUM POSSIBLE. SHAFT MUST ROTATE FREELY.

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
11	A/R	BN 748	SHIM WASHER, 14 X 26 X 0.1MM THICK	
10	1	DIN 1481	PIN, SPRING, M4 X 28L SP/S	
9	1	DIN 1481	PIN, SPRING M4 X 18L, SP/S	
8	2	BR5-3	BEARING, THRUST, BERG	
7	4	A 9Q28-68	RETAINING RING [CIRCLIP], SDP	
6	2	S99NH2-BN1624	BEARING, NEEDLE ROLLER, SDP	
5	2	17901190	SPACER, WORM	
4	1	12900060	WORM SHAFT	
3	1	12900041	PULLEY, 18 TEETH [FOR 1/2" SHAFT]	
2	1	12900030	WORM	
1	1	17901080	WORM MOUNT	

PARTS LIST

DRAWN G.DOUGLAS	DATE 05/03/97	
CHECK	DATE	
ENGINEERING	DATE	
11800810		
NEXT ASSY	SYSTEM	
SOFTWARE AUTOCAD 2000		

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
MOTORIZED.ROT.DRIVE WORM MOUNT ASSY

SIZE A2 | DRAWING NO. 11900850 | REV C

SCALE 1:1 | WT kg | SHEET 1 OF 1

PROPRIETARY
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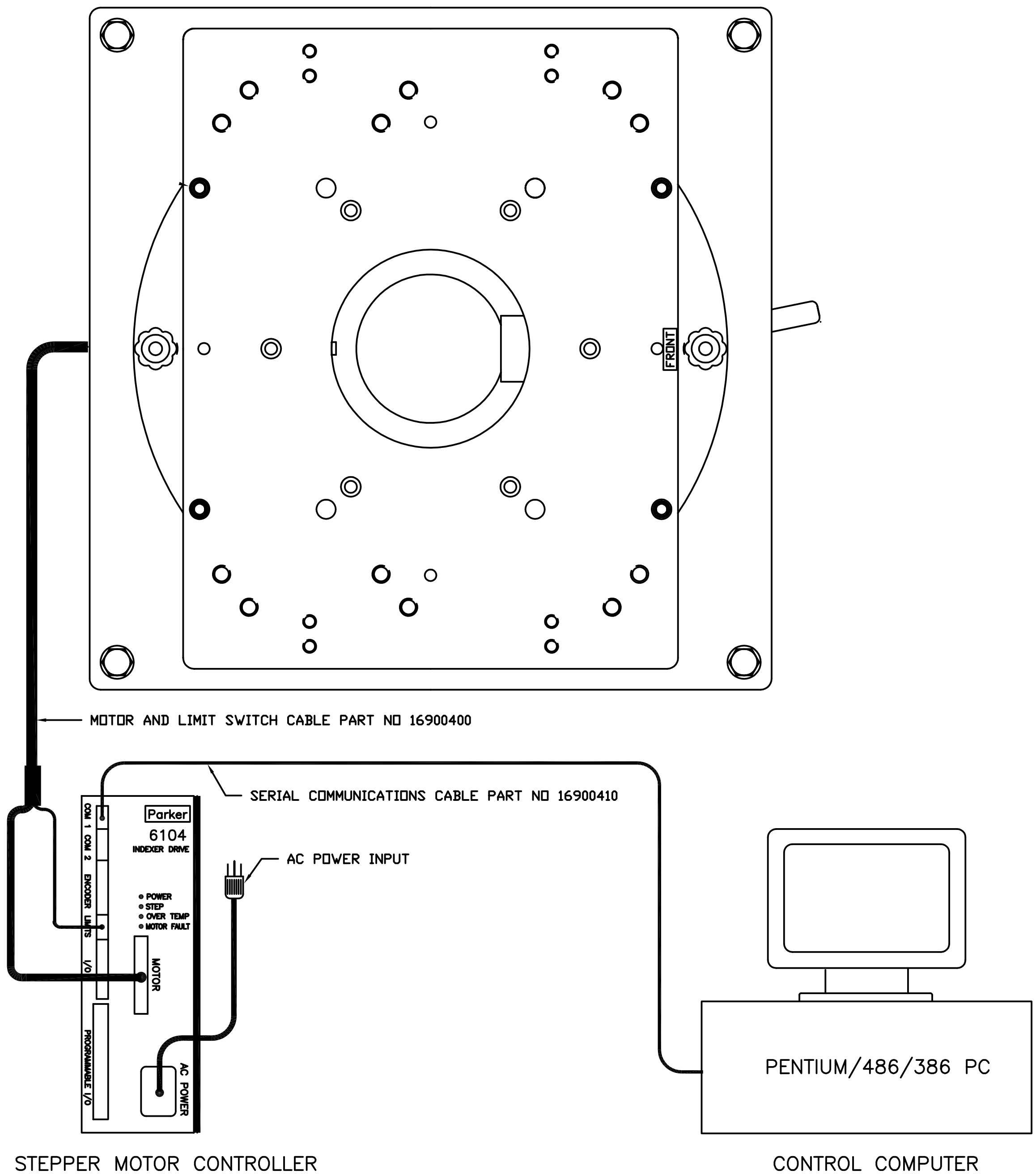
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		02/17/98	G.DOUGLAS
B	INCR SIZE OF TRANSISTION PLATE, ADD 5403EG MTG HOLES		07/02/03	G.DOUGLAS



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN G.DOUGLAS	DATE 02/17/98	
CHECK	DATE	
ENGINEERING	DATE	
NEXT ASSY	SYSTEM	
SOFTWARE AUTOCAD 2000		

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
MOTORIZED.ROT.DRIVE
ELECTRICAL ASSY

SIZE	DRAWING NO.	REV
A1	11901020	B

SCALE 1:2 | WT kg | SHEET 1 OF 1

PROPRIETARY
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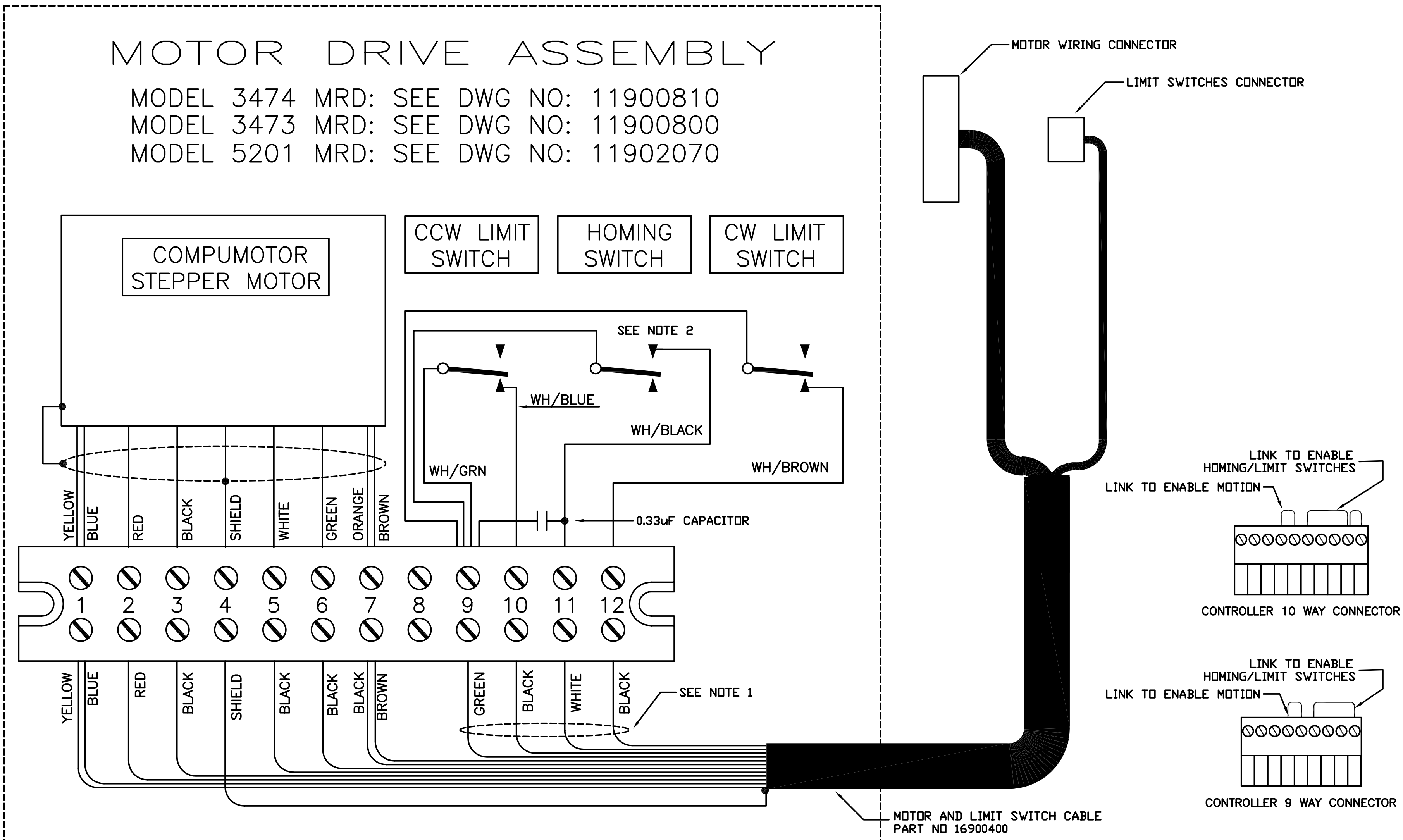
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		02/13/98	G.DOUGLAS
B	ADD CONTROLLER CONNECTOR LINKING		10/12/01	G.DOUGLAS

MOTOR DRIVE ASSEMBLY

MODEL 3474 MRD: SEE DWG NO: 11900810
MODEL 3473 MRD: SEE DWG NO: 11900800
MODEL 5201 MRD: SEE DWG NO: 11902070



NOTE:
1 USE BLACK WIRES FROM GREEN AND WHITE PAIRS. DO NOT MIX WITH BLACK WIRES USED FOR STEPPER MOTOR.
2. HOMING SWITCH USES NORMALLY OPEN CONTACT. LIMIT SWITCHES USE NORMALLY CLOSED CONTACTS.

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

NEXT ASSY	SYSTEM
11902070	5201
11900800	3473
11900810	3474

DRAWN G.DOUGLAS — DATE 02/13/98
CHECK — DATE
ENGINEERING — DATE

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION
SOFTWARE AUTOCAD 2000

GMW
955 Industrial Rd San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE MOTORIZED.ROT.DRIVE ELECTRICAL WIRING

SIZE A1 — DRAWING NO. 13900350 — REV B
SCALE 2:1 — WT kg — SHEET 1 OF 1

PROPRIETARY
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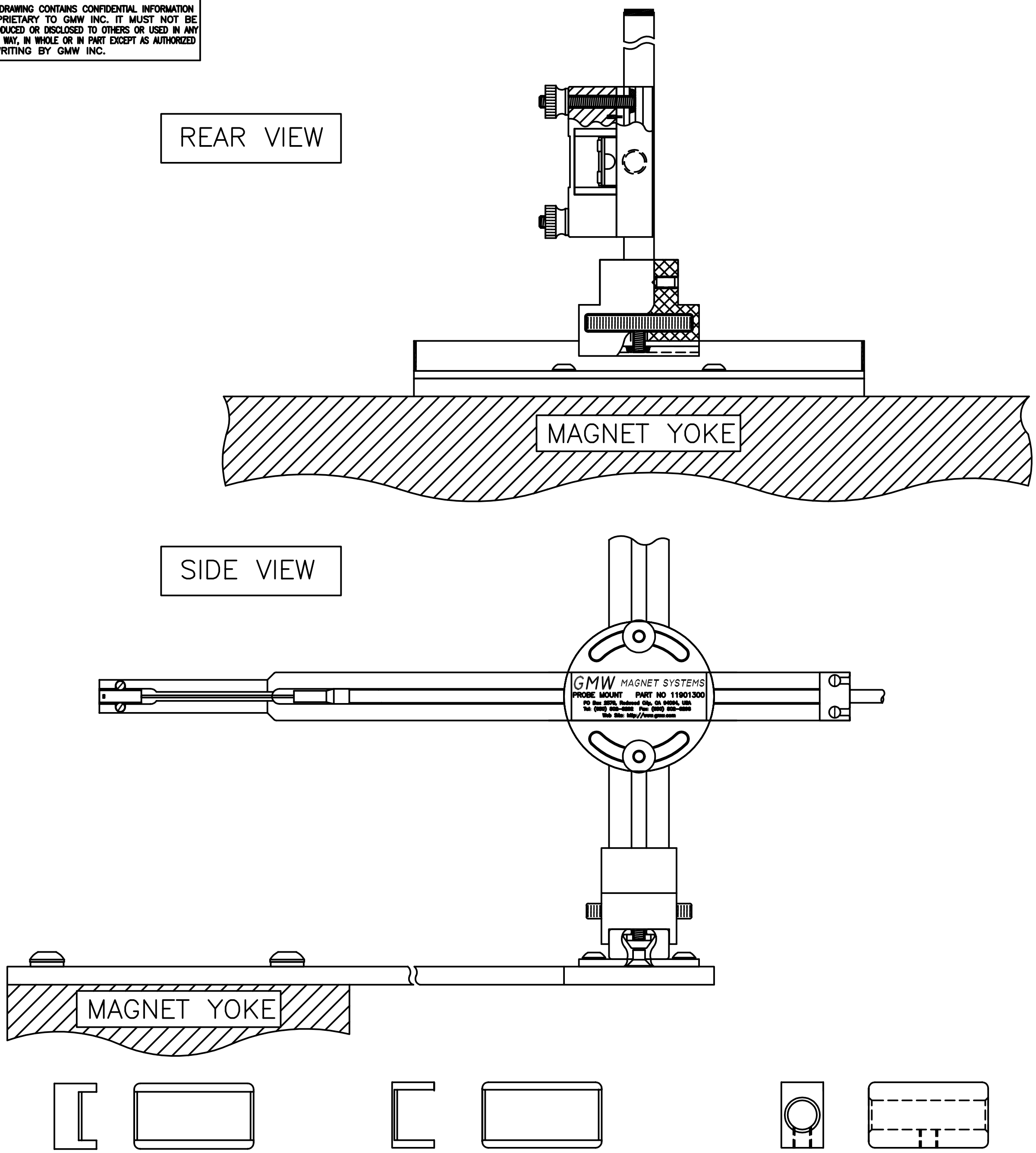


REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		09/16/98	G.DOUGLAS

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
24	4	ISO 7380	SHCS M6 X 12 BUTTON HD S/S	
23	4	DIN 433	WASHER, M6 X 1.6 FLAT S/S	
22	1	17903000	MAGNET MOUNTING PLATE	
21	1	10900320	LABEL, INDENTIFICATION	
20	1	SBMH8	BALL PLUNGER, M8 S/S VLIER	
19	2	VSM 12771B	DOWEL PIN M1 X 5 S/S [Index Pin]	
18	1	BN 1073	SET SCREW, M6 X 5 SLOTTED HD NYLON	
17	4	ISO 7380	SHCS M4 X 8 BUTTON HD S/S	
16	5	DIN 7991	SHCS, M4 X 6 FLAT HEAD S/S	
15	2	DIN 917	SHSS M4 X 8 CONE POINT S/S	
14	2	08M040070TN	THUMB NUT, NYLON	
13	3	18-830	ITEM PRODUCTS, END CAP, PLASTIC	
12	1	17902010	BASE STUD	
11	1	17902000	HUB STUD	
10	1	17901990	HUB INSERT [For Sentron Hall Probes]	
9	1	17901980	HUB INSERT [For Metrolab NMR probes]	
8	1	17901970	HUB INSERT [for Grp3 MPT Hall Probes]	
7	1	17901960	HUB COVER	
6	1	17901950	HUB BASE	
5	1	17901943	VERTICAL MOUNTING EXTRUSION [200mm long]	
4	1	17901930	BASE NUT	
3	1	17901920	BASE SUPPORT	
2	1	17902090	BASE MOUNTING EXTRUSION	
1	1	17902080	BASE MOUNTING PLATE	

DRAWN G.DOUGLAS DATE 09/16/98
CHECK DATE
ENGINEERING DATE

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

NEXT ASSY | SYSTEM
SOFTWARE AUTOCAD 2000

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

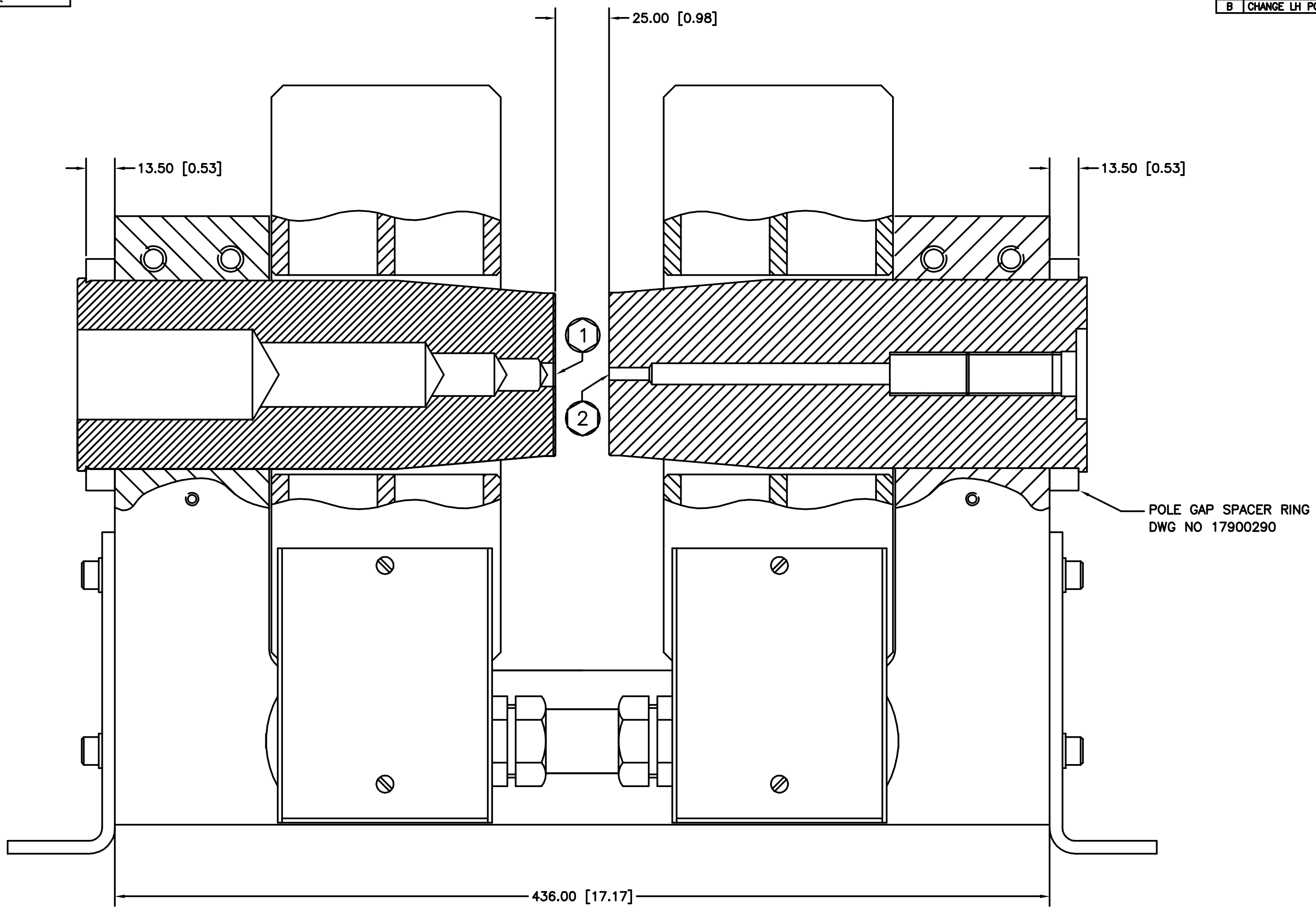
TITLE
PROBE MOUNT MODEL: 5403

SIZE A2 | DRAWING NO. 11901280 | REV A
SCALE 1:1 | WT kg | SHEET 1 OF 1

Section 7

CUSTOM OPTIONS

Model: 5403 Electromagnet with Custom Pole Geometry (older version of 5403 shown)
Drawing 8190000 General Assembly of Pole Geometry
Drawing 17912621 Pole with 11mm hole in pole face
Drawing 17912622 Pole with 6mm hole in pole face
Drawing 17900290 Pole Spacer



PROPRIETARY
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REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		04/19/95	G.DOUGLAS
B	CHANGE LH POLE TO STEPPED DRILLED HOLE		08/31/95	G.DOUGLAS

NOTE:

1. POLE WITH HOLE 11mm AT FACE AND 8° CLEARANCE ANGLE
   SEE DWG 17612621 FOR DETAILS
2. POLE WITH HOLE 6mm AT FACE
   SEE DWG 17612622 FOR DETAILS

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN G.DOUGLAS DATE
CHECK DATE
ENGINEERING DATE
5403
NEXT ASSY SYSTEM
SOFTWARE: AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
P.O. Box 2578, Redwood City, CA 94064
Tel: (415)802-8292. Fax: (415)802-8298.

TITLE
POLE GEOMETRY
UN OF CAL, C7909

SIZE A1 DRAWING NO. 81190000 REV B
SCALE 1:1 WT kg SHEET 1 OF 1

PROPRIETARY
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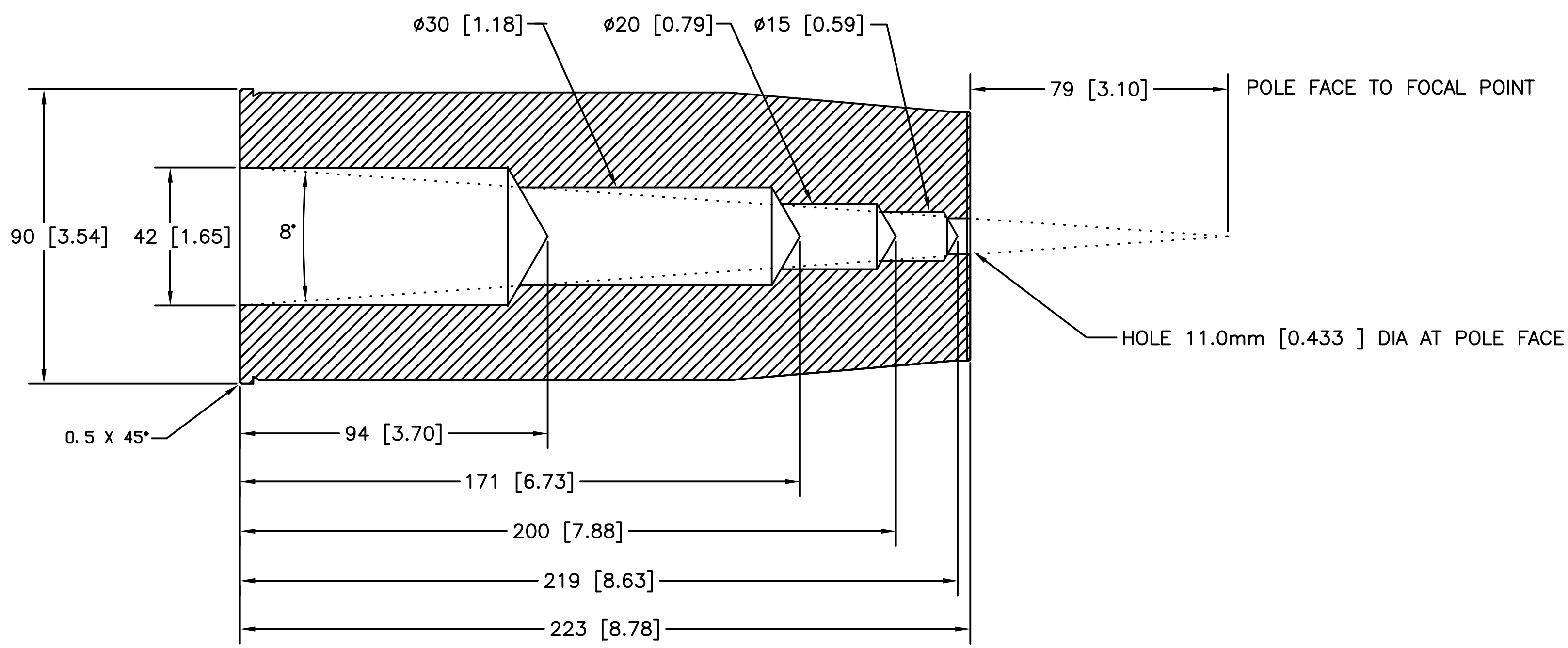
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		05/17/95	G.DOUGLAS
B	CHANGE TO STEPPED DRILLED HOLE		06/17/95	G.DOUGLAS



NOTES

1. ADD MACHINED DETAILS ABOVE TO MODEL: 5403 POLE
   DRAWING NO: 17612620
2. AVOID NICKS SCRATCHS AND MACHINING MARKS
   ON THE POLE FACE AND OUTER SURFACES

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN	G.DOUGLAS — DATE 04/18/95
CHECK	DATE
ENGINEERING	DATE
NEXT ASSY	—
SYSTEM	5403
SOFTWARE	AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63 ✓	1.6 ✓

THIRD ANGLE PROJECTION

GMW
P.O. Box 2578, Redwood City, CA 94064
Tel: (415)802-8292 Fax: (415)802-8298.

TITLE
POLE: CYLINDRICAL
MODEL: 5403

SIZE	DRAWING NO.	REV
A2	17612621	B

SCALE 1:1 | WT kg | SHEET 1 OF 1

PROPRIETARY
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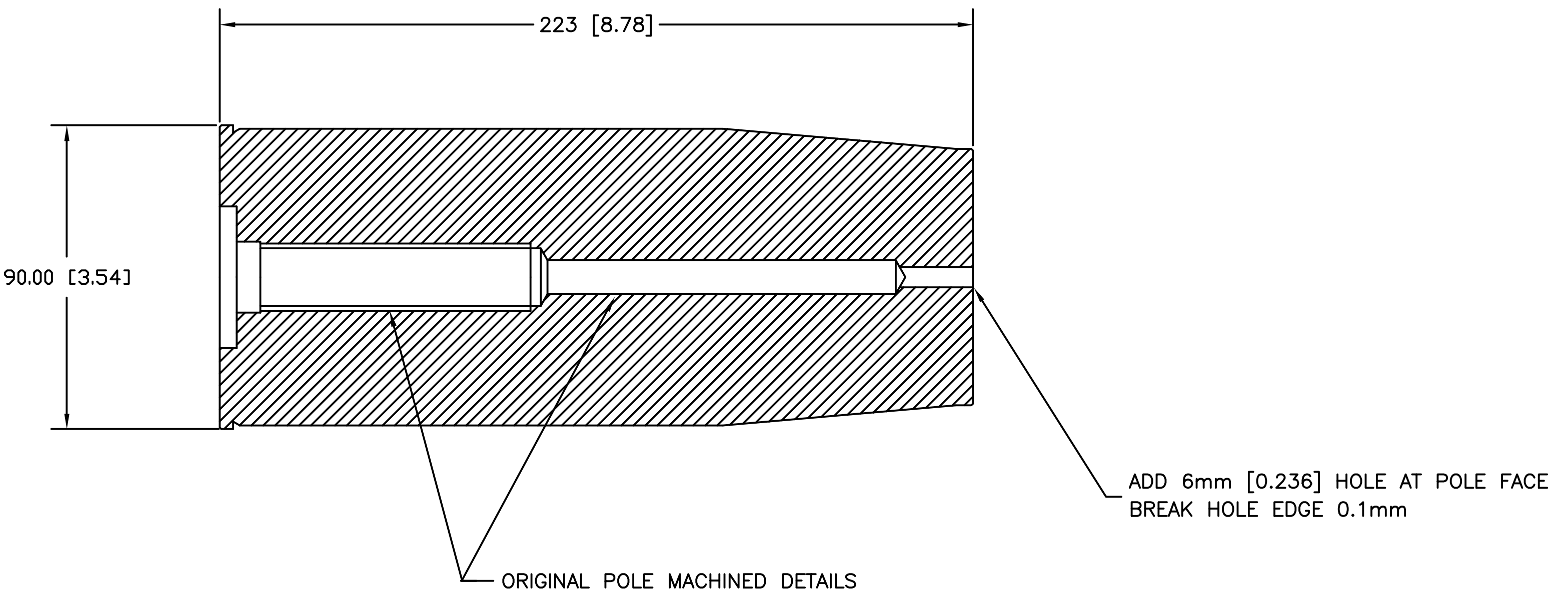
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		04/18/95	G.DOUGLAS



NOTES

1. ADD MACHINED DETAILS ABOVE TO MODEL: 5403 POLE DRAWING NO 1761260
2. AVOID NICKS SCRATCHS AND MACHINING MARKS ON THE POLE FACE AND OUTER SURFACES

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN G.DOUGLAS	DATE 04/18/95	DO NOT SCALE FROM DRAWING DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)	GMW 955 Industrial Rd, San Carlos, CA 94070 Tel: (650)802-8292. Fax: (650)802-8298.
CHECK	DATE		
ENGINEERING	DATE		
	5403		
NEXT ASSY	SYSTEM		
SOFTWARE AUTOCAD 2000		THIRD ANGLE PROJECTION	

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

TITLE
POLE: CYLINDRICAL
MODEL: 5403

SIZE	DRAWING NO.	REV
A2	17612622	A

SCALE 1:1 | WT kg | SHEET 1 OF 1

PROPRIETARY
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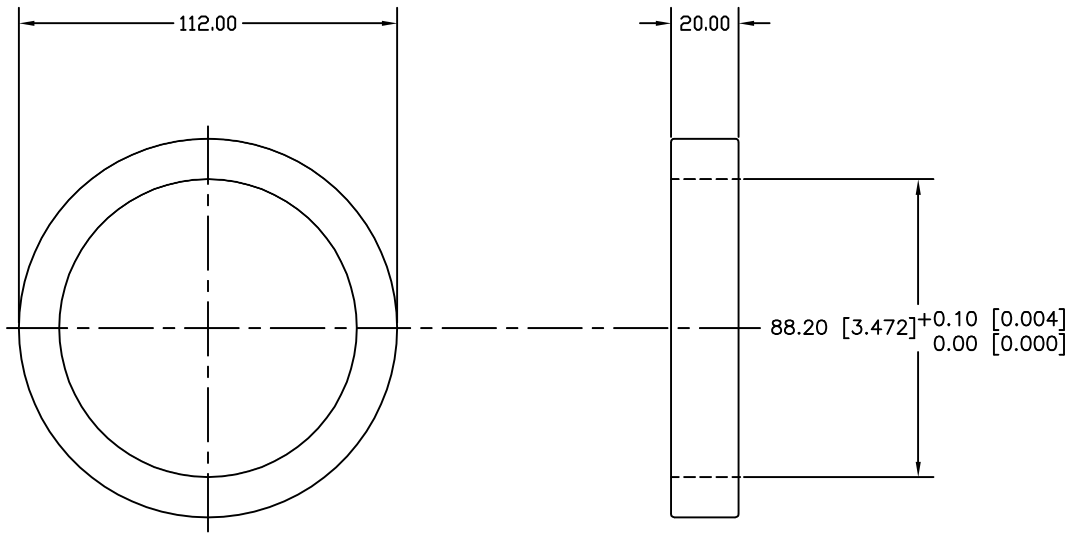
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		11/20/96	G.DOUGLAS



TWO POLE SPACER RINGS 20MM THICK INSTALLED ON 5403 MAGNET GIVE POLE GAP OF 38MM

NOTE:
1. MATERIAL CARBON STEEL
2. FINISH E.N PLATE 0.01 THICK
3. QUANTITY OF 2 RINGS PER MAGNET NEEDED.
4. DRAWING SHOWS DIAMENSIONS BEFORE PLATING

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN: G.DOUGLAS — DATE: 11/20/96
CHECK — DATE
ENGINEERING — DATE
NEXT ASSY — SYSTEM
SOFTWARE: AUTOCAD 13

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
P.O. Box 2578, Redwood City, CA 94064
Tel: (415)802-8292 Fax: (415)802-8298.

TITLE: POLE SPACER RING MODEL: 5403

SIZE: A2 — DRAWING NO.: 17900290 — REV: A
SCALE 1:1 — WT kg — SHEET 1 OF 1

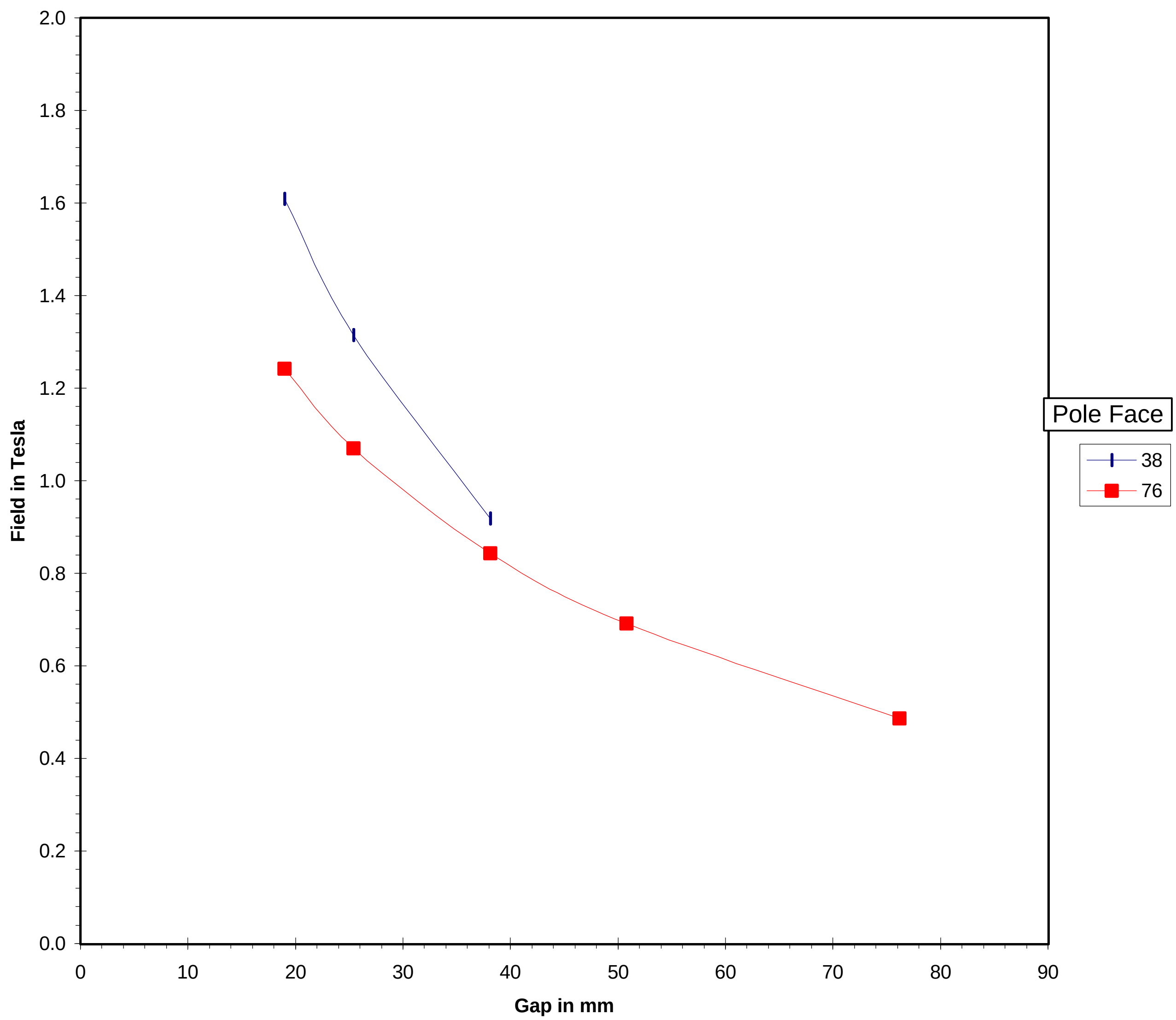
Section 8

EXCITATION CURVES

Field versus Gap Excitation Plot for 38 and 76 Pole Face at 50A.
Field versus Current Excitation Plot at various Gaps for 76 Pole Face.
Field versus Current Excitation Plot at various Gaps for 38 Pole Face.

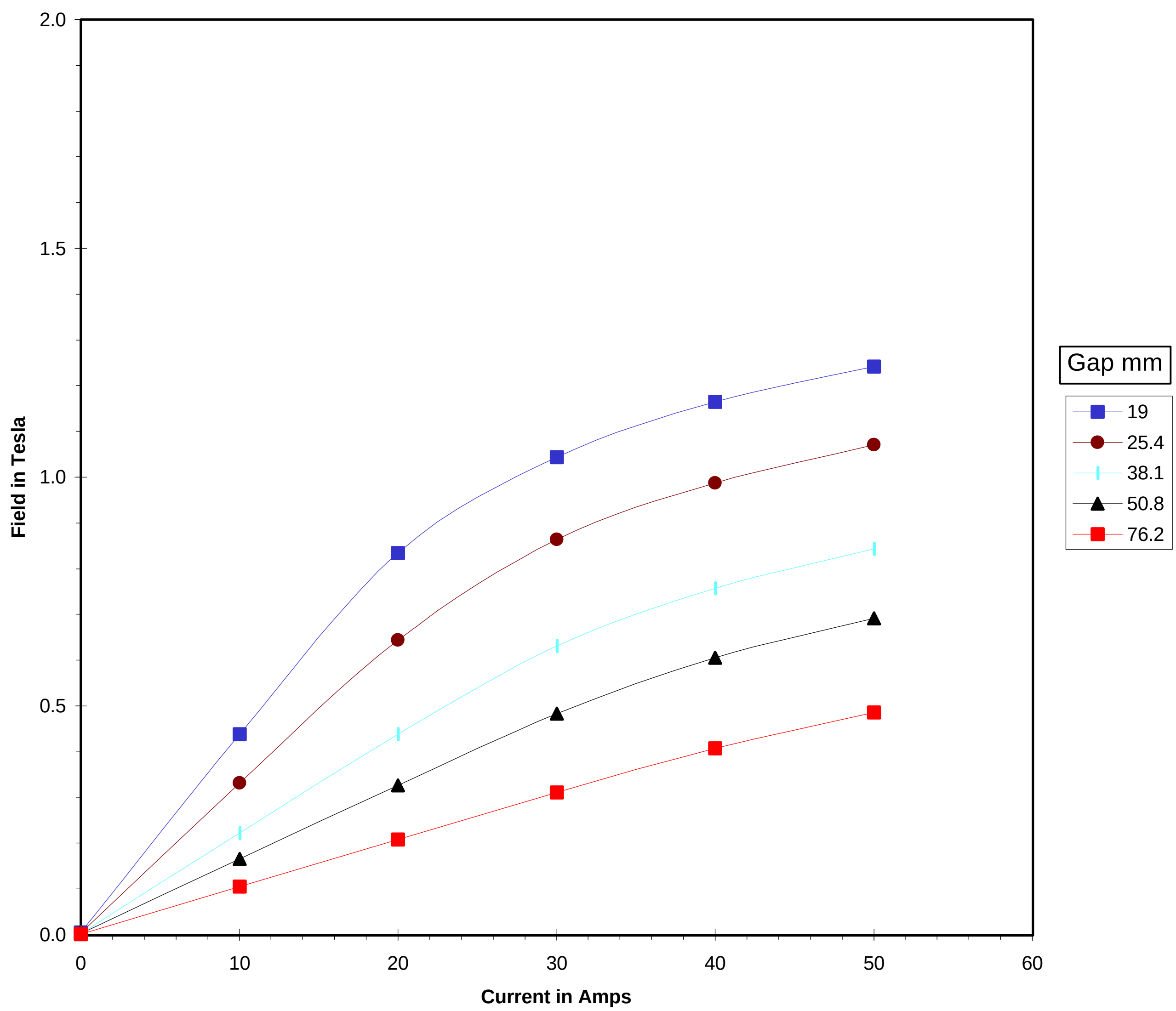
GMW Associates
Electromagnet Excitation Plot
Field Vs Gap

Contract No:		Page:	1 of 1	Date:	May 18, 89
Customer:				Engr:	G.Douglas
Model:	5403	Power Supply:		Set Current:	50 Amps
Serial No:	12	Serial No:		Target Field:	
Pole Face:	As per table below	Position:	X=0, Y=0, Z=0		
Serial No:	None	Notes:			
Pole Gap:	As per table below				
Pole Spacers:	None				



GMW Associates
Electromagnet Excitation Plot
Field Vs Current

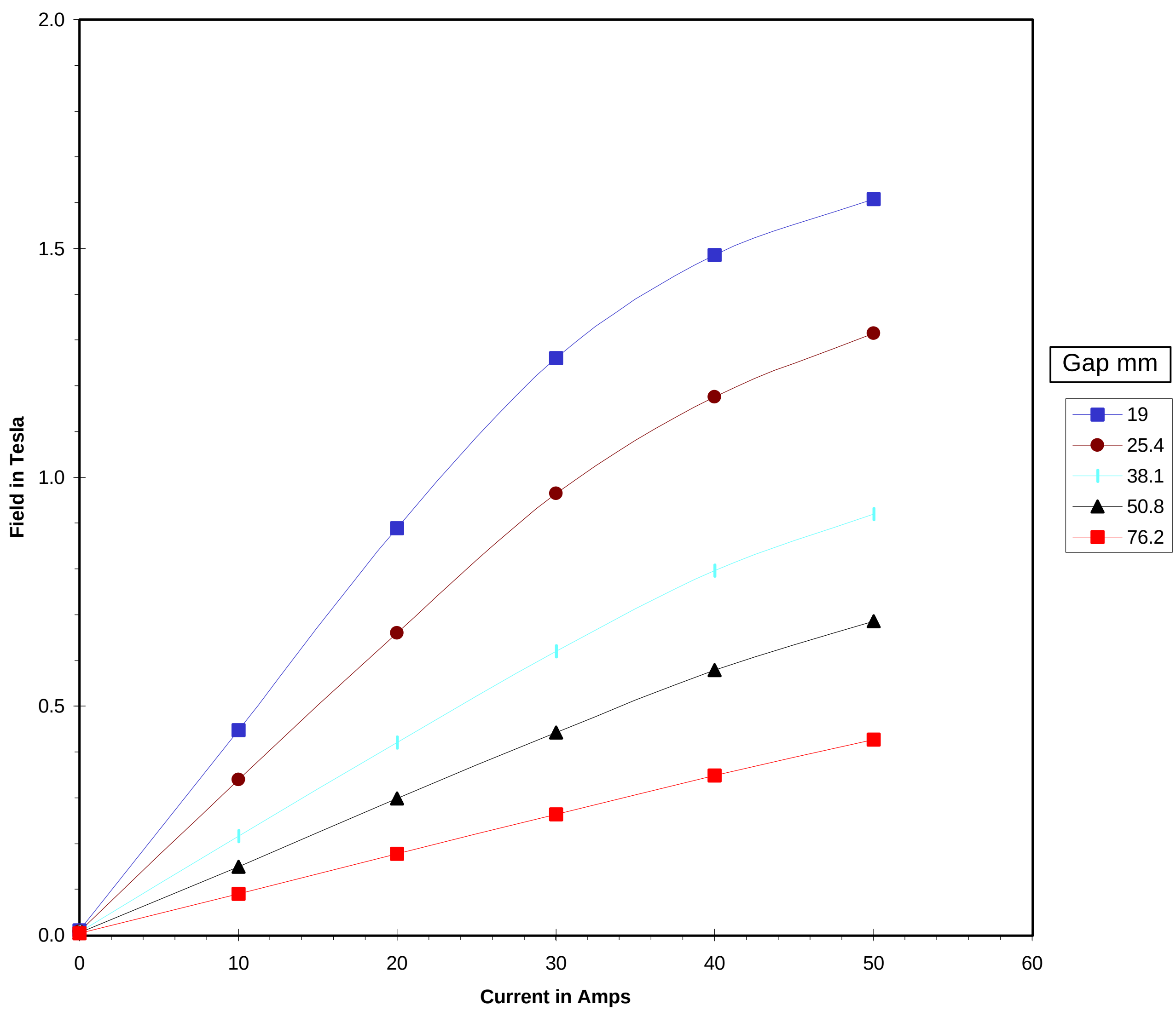
Contract No:		Page:	1 of 2	Date:	May 19, 89
Customer:				Engr:	G.Douglas
Model:	5403	Power Supply:		Set Current:	
Serial No:	12	Serial No:		Target Field:	
Pole Face:	76 mm	Position:	X=0, Y=0, Z=0		
Serial No:	None	Notes:			
Pole Gap:	As per table below				
Pole Spacers:	None				



Filename: 5403 Ex 76-19-76.xls

GMW Associates
Electromagnet Excitation Plot
Field Vs Current

Contract No:		Page:	2 of 2	Date:	May 19, 89
Customer:				Engr:	G.Douglas
Model:	5403	Power Supply:		Set Current:	
Serial No:	12	Serial No:		Target Field:	
Pole Face:	38 mm	Position:	X=0, Y=0, Z=0		
Serial No:	None	Notes:			
Pole Gap:	As per table below				
Pole Spacers:	None				



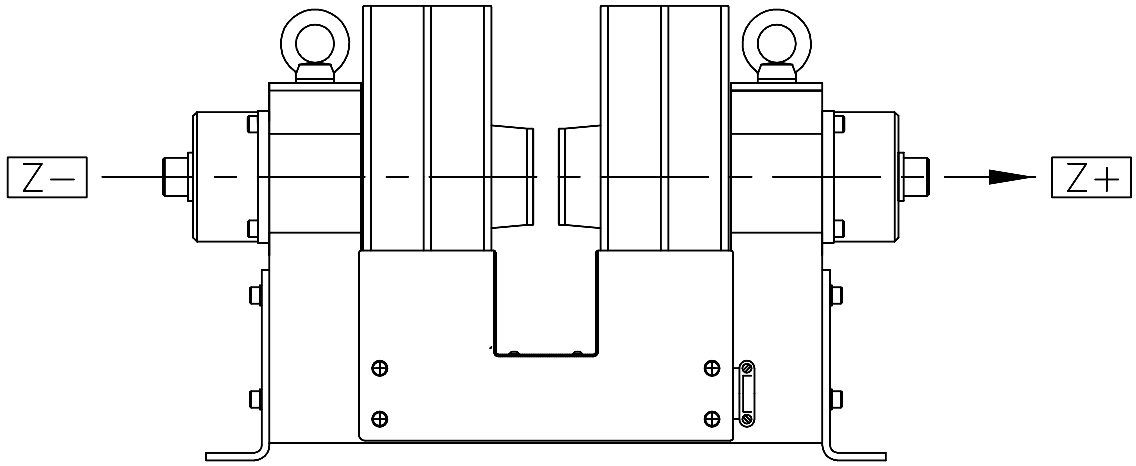
Filename: 5403 Ex 38-19-76.xls

Section 9

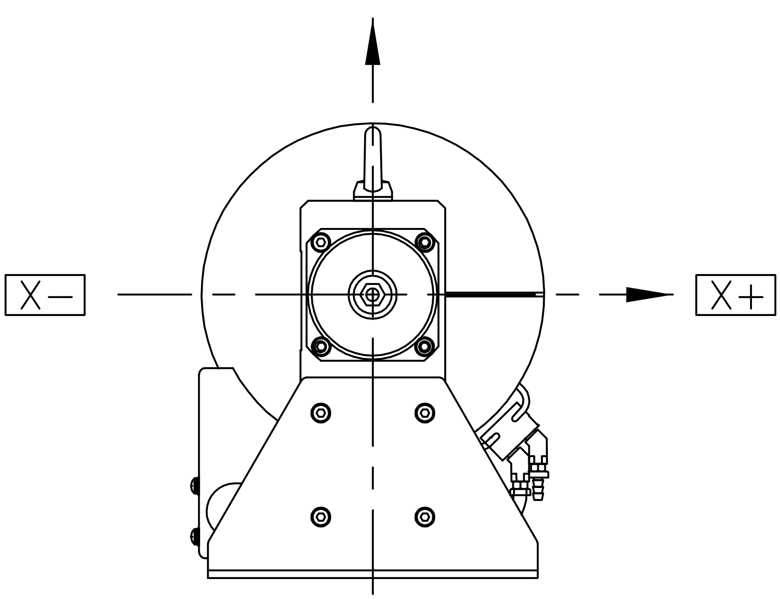
TEST DATA

Magnetic Plotting Axes
Field versus Position Plot with 4mm hole thru 38mm Pole Face
Field versus Position Plot with 11mm hole thru LH Pole Face & 6mm hole thru RH Pole Face

FRONT VIEW



SIDE VIEW



PROPRIETARY This document contains information propritary to GMW Inc. It must not be reproduced or disclosed to others or used in any other way, in whole or part, except as authorized in writing by GMW Inc.	MAGNETIC PLOTTING AXES		
	18900740	A	SHEET 1 OF 1

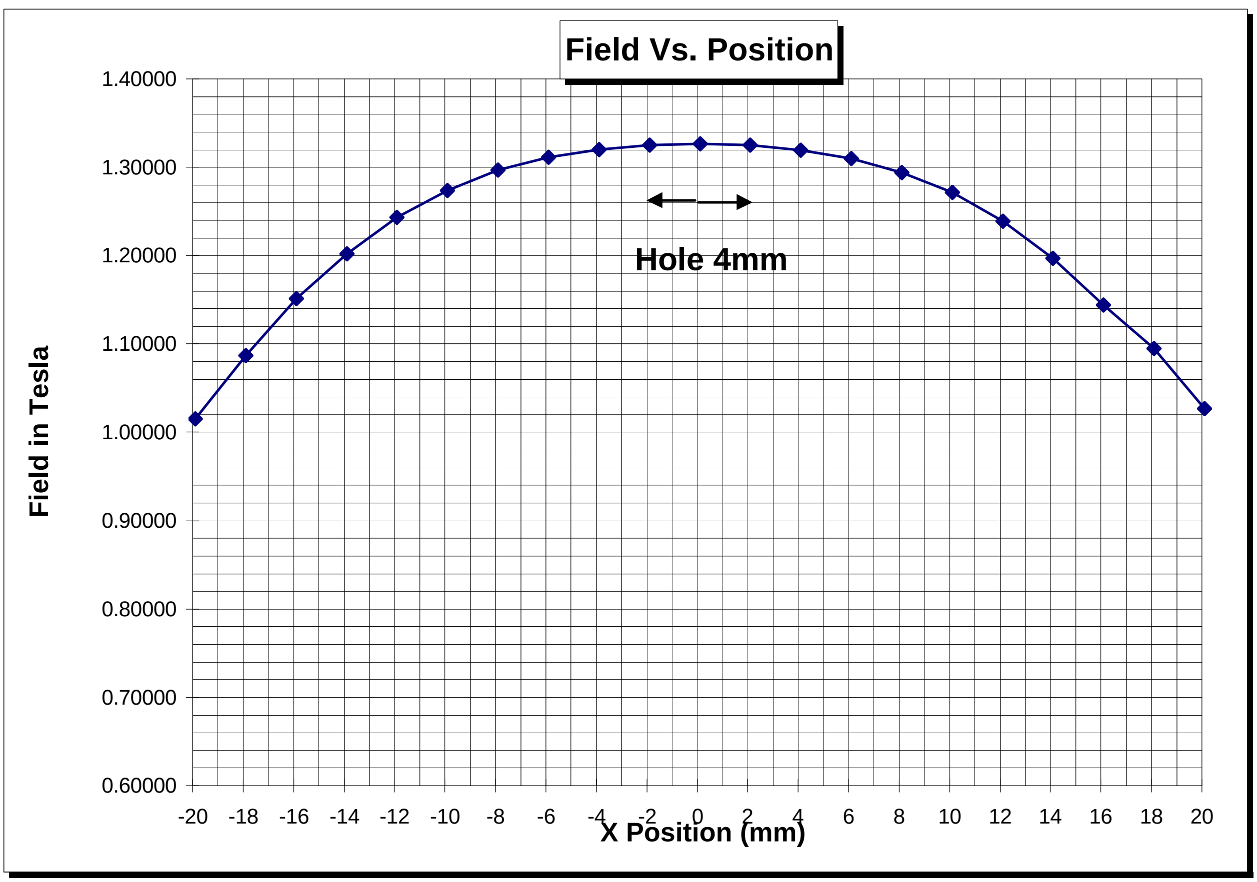
GMW ASSOCIATES

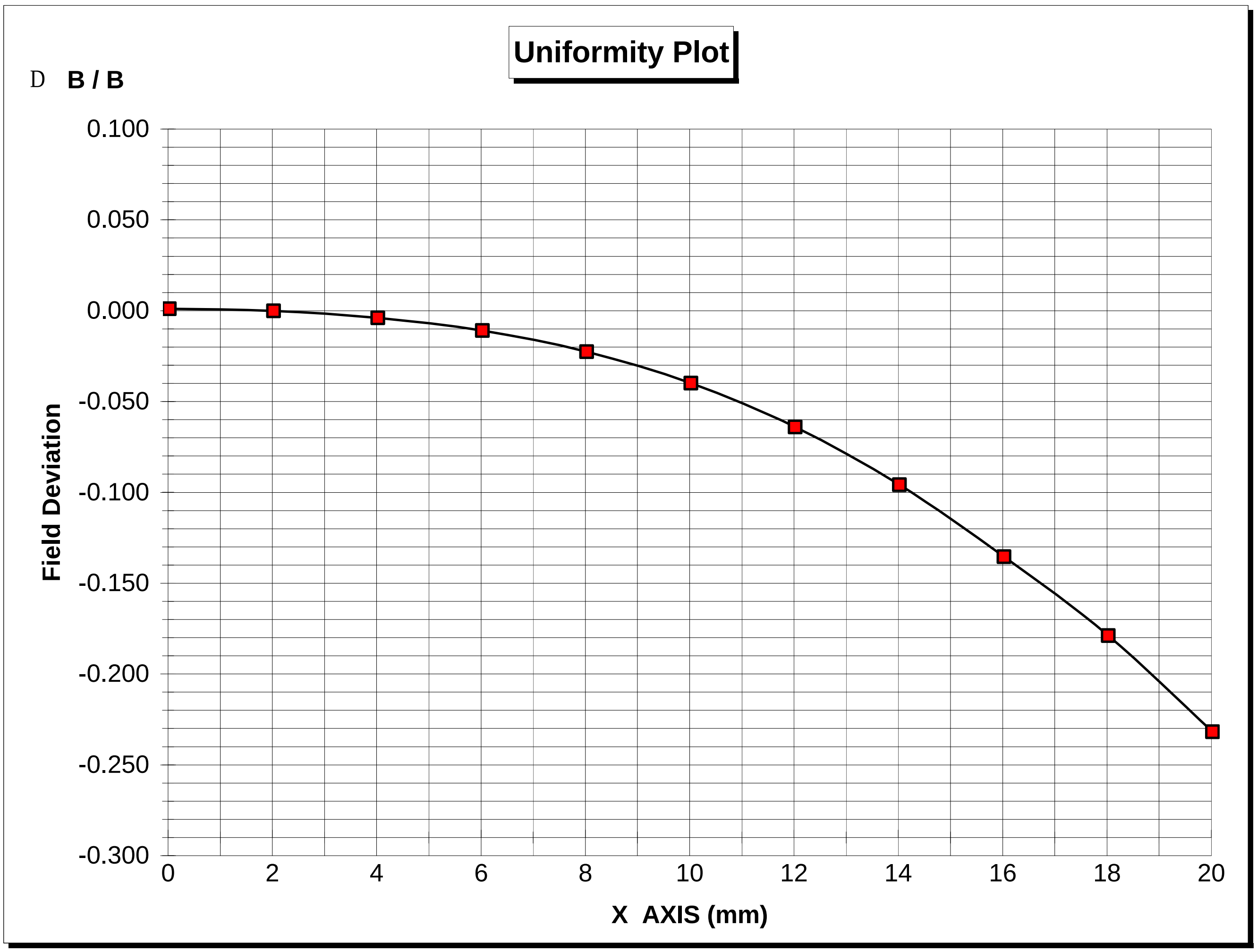
LABORATORY ELECTROMAGNET UNIFORMITY PLOT

Model	5403	Pole Face 38 mm	Engr Toomas Rett
Serial No	42	Pole Gap 25 mm	Date June 27, 1995
		Hole Dia 4mm	
Magnet Current	50 Amps	US Army Redstone Arsenal	C7915

Plot Y = 0.0 mm, Z = 0.0 mm

X - mm	Magnet Field Tesla	X + mm	Magnet Field Tesla	Magnet Field Average Tesla
0	1.31090	0	1.31090	1.31093
-2	1.30950	2	1.30915	1.30933
-4	1.30475	4	1.30395	1.30435
-6	1.29600	6	1.29415	1.29508
-8	1.28145	8	1.27850	1.27998
-10	1.25845	10	1.25585	1.25715
-12	1.22800	12	1.22315	1.22558
-14	1.18620	14	1.18145	1.18383
-16	1.13550	16	1.12820	1.13185
-18	1.07110	18	1.07895	1.07503
-20	0.99980	20	1.01120	1.00550
0	1.31095	0	1.31090	1.31093




Uniformity Plot
D B / B
Field Deviation
0.100
0.050
0.000
-0.050
-0.100
-0.150
-0.200
-0.250
-0.300
0
2
4
6
8
10
12
14
16
18
20
X AXIS (mm)

GMW ASSOCIATES

LABORATORY ELECTROMAGNET UNIFORMITY PLOT

Model 5403
Serial No 42

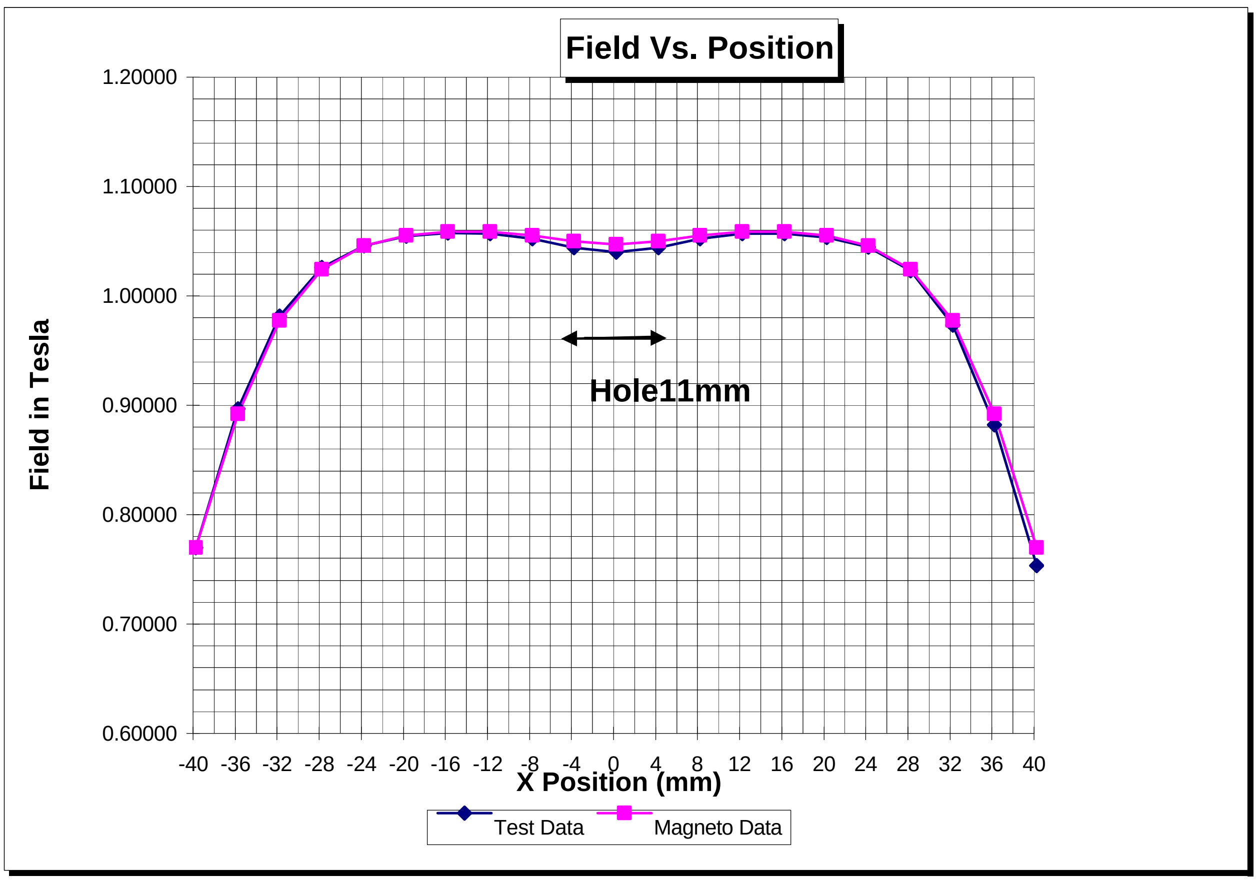
Magnet Curreni 50 Amps

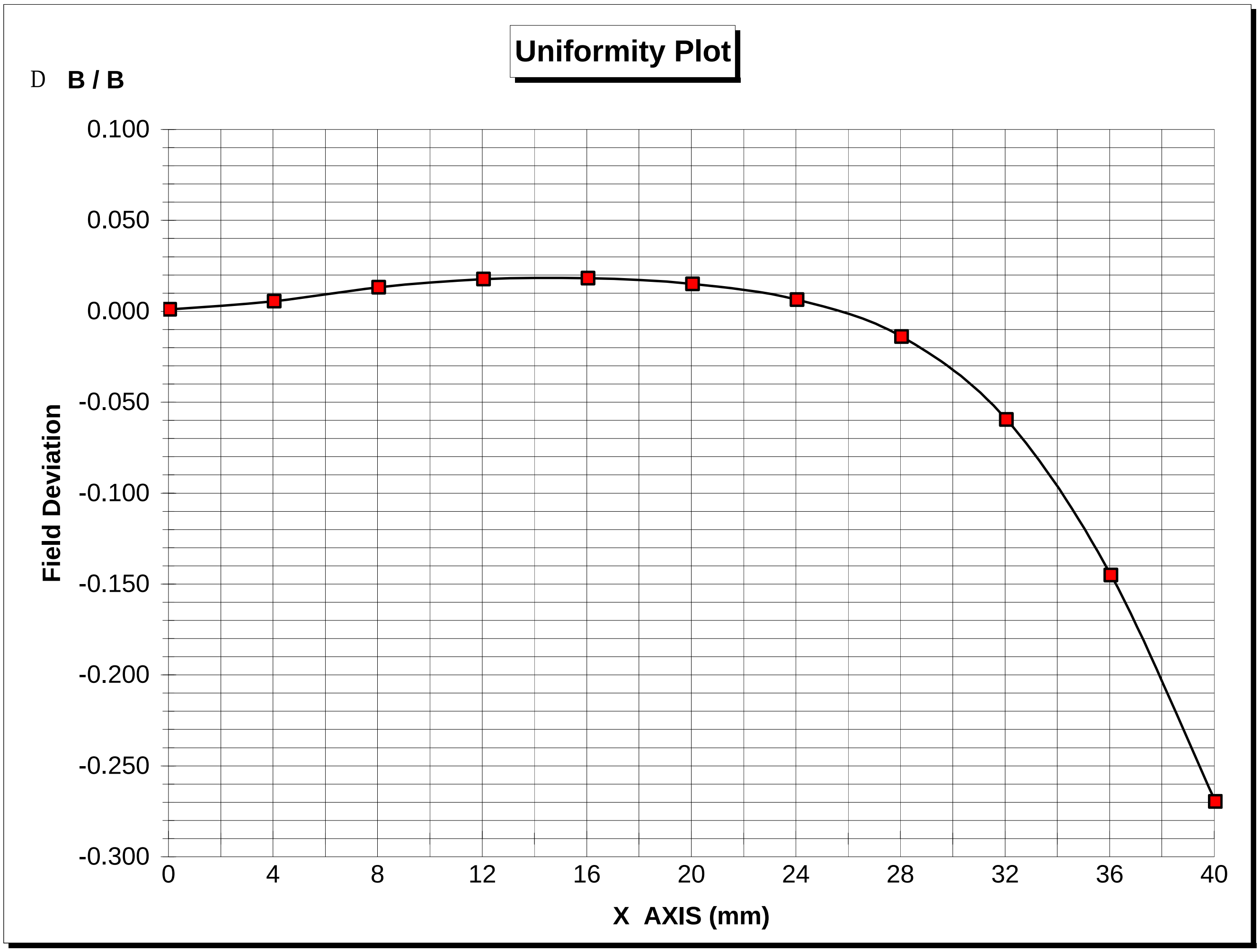
Pole Face 76 mm
Pole Gap 25 mm
Hole Dia 11mm LH Pole & 6mm RH Pole
Un of California, San Dieg

Engr Toomas Rett
Date June 28, 1995

C7909

Plot Y = 0.0 mm, Z = 0.0 mm				
X -	Magnet Field	X +	Magnet Field	Magnet Field Average
mm	Tesla	mm	Tesla	Tesla
0	1.02735	0	1.02710	1.02718
-4	1.03175	4	1.03165	1.03170
-8	1.03965	8	1.03965	1.03965
-12	1.04440	12	1.04420	1.04430
-16	1.04500	16	1.04450	1.04475
-20	1.04200	20	1.04115	1.04158
-24	1.03310	24	1.03200	1.03255
-28	1.01320	28	1.01040	1.01180
-32	0.96910	32	0.96060	0.96485
-36	0.88425	36	0.86975	0.87700
-40	0.75730	40	0.74080	0.74905
0	1.02700	0	1.02695	1.02698





Uniformity Plot
D B / B
Field Deviation
0.100
0.050
0.000
-0.050
-0.100
-0.150
-0.200
-0.250
-0.300
0
4
8
12
16
20
24
28
32
36
40
X AXIS (mm)

Section 10

DRAWINGS

PROPRIETARY
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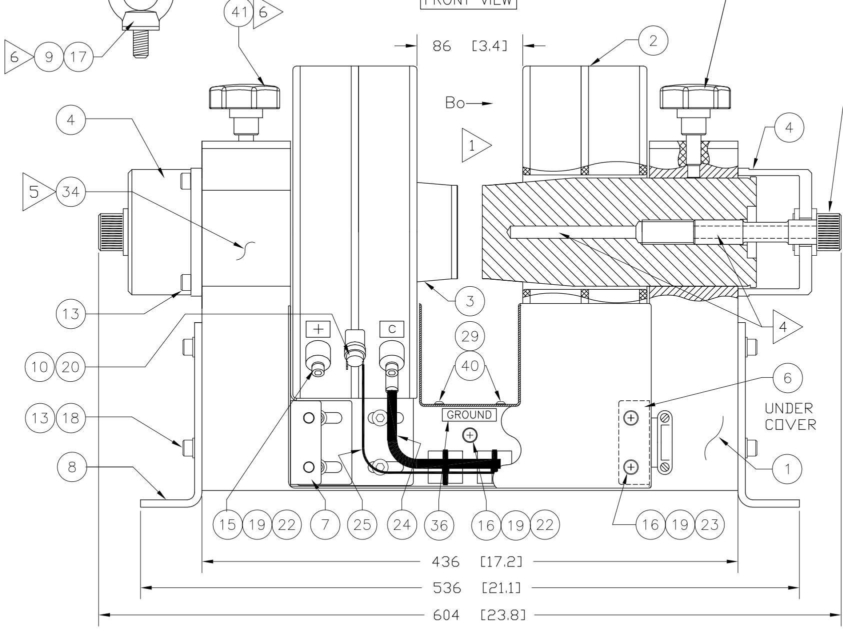
THIS DRAWING SHOWS MAGNET WITH 76mm FACE POLES.
SEE DWG NO: 11901201 FOR MAGNET WITH 38mm POLES.

TO ADJUST POLE GAP.
1. LOOSEN POLE CLAMP ITEM 41 ONE FULL TURN.
2. INSERT 17mm ALLEN HEAD KEY INTO DRIVE SCREW.
3. ROTATE DRIVE SCREW TO ADJUST TO DESIRED POLE GAP, THEN REMOVE KEY.
4. TIGHTEN POLE CLAMP UNTIL RESISTANCE IS FELT, THEN TIGHTEN HALF TURN.

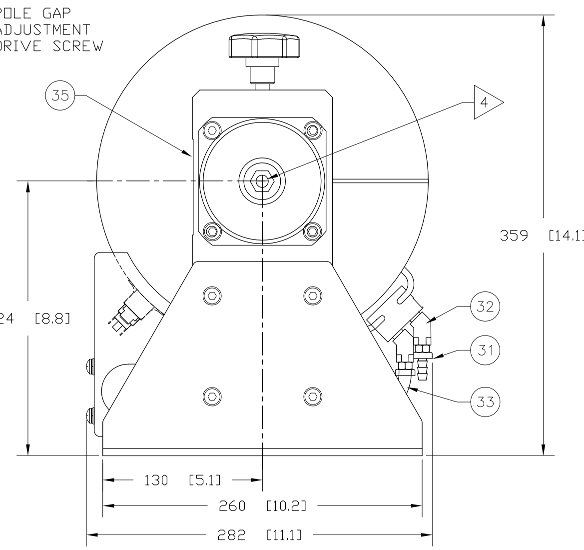
REVISIONS

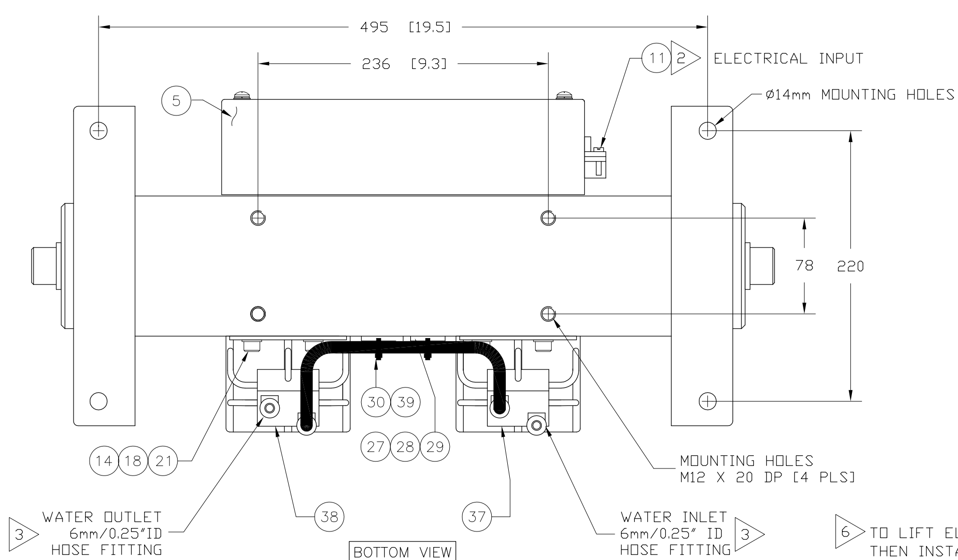
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		06/10/04	G.DOUGLAS
B	ADD INTERMITTENT OPERATING SPECIFICATIONS		07/10/04	G.DOUGLAS
C	CHANGE ITEM 5, 26, 31, 32, & 33		05/23/06	G.DOUGLAS
D	ADD ITEM 41 & NOTE 6		06/26/07	G.DOUGLAS

FRONT VIEW



SIDE VIEW

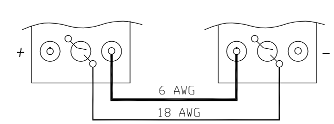




BOTTOM VIEW

MAGNET WIRING SCHEMATIC

FRONT VIEW



MAGNET SPECIFICATIONS

POLE GAP	0 mm TO 86 mm
POLE FACE	CYLINDRICAL Ø76 mm [3"]
	TAPERED Ø38 mm [1.5"]
COILS [series connected]	
MAX RESISTANCE	0.55 Ohm
MAX CONTINUOUS POWER [air]	20A/10V (0.2kW)
MAX CONTINUOUS POWER [water]	50A/25V (1.3kW)
MAX INTERMITTENT POWER [air] [duty cycle 1:3, 4 minute max On]	40A/20V (0.8kW)
MAX INTERMITTENT POWER [water] [duty cycle 1:2, 10 minute max On]	70A/35V (2.5kW)
SELF INDUCTANCE	60 mH
COOLING:	2 l/min [0.6 GPM] @ 0.5 BAR [8 PSID]
THERMAL INTERLOCK	OPEN CIRCUIT ABOVE 50°C [122°F]
MASS	130 kg [286 lbs]

NOTE: DO NOT EXCEED THE MAXIMUM SPECIFIED COIL RESISTANCE OR COIL OVERHEATING AND POSSIBLE DAMAGE MAY OCCUR.

6. TO LIFT ELECTROMAGNET. REMOVE BOTH POLE CLAMPS ITEM 41. THEN INSTALL EYEBOLT ITEM 09, AND WASHER ITEM 17 [2 PLS]. AFTER LIFTING OPERATION IS COMPLETE, REMOVE ITEM 09, AND ITEM 17 AND REINSTALL BOTH POLE CLAMPS ITEM 41.

NOTES

1. POLE GAP ADJUSTABLE FROM 0 TO 86mm FOR MAGNET WITH FIXED POLE GAP SEE DWG NO: 11901100
2. RH SIDE CABLE ENTRY SHOWN. LH ENTRY OPTIONAL
3. AFTER FINAL TEST BLOW OUT WATER LINES, AND FIT PLASTIC SEALING CAP [ITEM 26] ONTO HOSE FITTINGS.
4. POLE AND DRIVE SCREW ARE PROVIDED WITH OPTICAL ACCESS HOLE OF 10.0mm DIAMETER. SMALL OPTICAL ACCESS HOLES THRU THE POLE FACE CAN BE PROVIDED FOR SPECIAL APPLICATIONS. CONSULT GMW FOR DETAILS.
5. THIS DRAWING SHOWS A REVISED DESIGN OF THE 5403 ELECTROMAGNET SERIAL NUMBERS START AT SN 200.

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
41	2	11902450	POLE CLAMP ASSEMBLY	
40	4		M6 X 16 SHCS BUTTON HD S/S	
39	4	3304	CABLE TIE T & B	
38	1	10900880	LABEL, MANIFOLD [LH Side]	
37	1	10900890	LABEL, MANIFOLD [RH Side]	
36	1	10900720	LABEL, GROUND [Fitted under Cover]	
35	1	10900270	LABEL, CAUTION [RH Side]	
34	1	10900900	LABEL, SPECIFICATION [LH side]	
33	A/R	PB-4-BK	HOSE, 1/4" ID, RUBBER SWAGELOK	
32	4	2214P-2-2	ELBOW 45°, 1/8" NPT PARKER	
31	4	30182-2-4B	HOSE COUPLING 6.0/HOSE 1/8 NPT PARKER	
30	4	MB4A	MOUNTING PAD TYTON	
29	8	BN 737	WASHER, M4 X 8 X 0.5 FLAT S/S	
28	8	DIN 6797	WASHER, M4 X 0.7 INT LOCK, S/S	
27	8	DIN 7985A	SCREW, M4 X 8 PAN S/S	
26	2	SC0070	PLASTIC SEALING CAP 7.9 ID, KELVINDALE	3
25	1	16900610	CABLE ASSY, INTERLOCK LINK	
24	1	16900600	CABLE ASSY, CURRENT LINK	
23	4	DIN 6797	WASHER, M6 X 0.7 INT LOCK, S/S	
22	5	DIN 1780	WASHER, M6 X 1.6 SPRING LOCK, S/S	
21	16	DIN 1780	WASHER, M8 X 2.0 SPRING LOCK, S/S	
20	2		WASHER, M5 X 15 X 3, NEOPRENE	
19	9	BN 737	WASHER, M6 X 16 X 1.6 FLAT S/S	
18	24	BN 737	WASHER, M8 X 15 X 1.6 FLAT S/S	
17	2	DIN 433	WASHER, M12 X 13 X 2 FLAT S/S	
16	5	DIN 7985A	SCREW, M6 X 12 PAN S/S	
15	4	DIN 912	SHCS, M6 X 12 S/S	
14	16	DIN 912	SHCS, M8 X 16 S/S	
13	16	DIN 912	SHCS, M8 X 20 S/S	
12			DELETED	
11	1	3304	CABLE CLAMP, T & B	
10	2	3450G611-1	TEMP SENSOR, 50°C 10-32UNF ELMWOOD	
9	2	9-0503	EYEBOLT, M12	
8	2	17901450	ANGLE BRACKET	
7	1	17901422	TERMINAL COVER BRACKET [WITHOUT HOLE]	
6	1	17901421	TERMINAL COVER BRACKET, [WITH HOLE]	
5	1	11902440	TERMINAL COVER ASSEMBLY [cover + label]	
4	2	11902370	VARIABLE GAP MECHANISM ASSEMBLY	
3	2	17901510	POLE, 76mm FACE	
2	2	11901110	COIL ASSEMBLY	
1	1	17901500	YOKE	

DRAWN G.DOUGLAS	DATE 06/03/03	DO NOT SCALE FROM DRAWING DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)	GMW 955 Industrial Rd, San Carlos, CA 94070 Tel: (650)802-8292. Fax: (650)802-8298.
CHECK	DATE	LINEAR: X.XXX ±.005 / ±0.03; X.XX ±.01 / ±0.1; X.X ±.03 / ±0.3; X ±.06 / ±1; DEG. ±.5 / ±0.5; FINISH 63 / 1.6	TITLE MAGNET ASSEMBLY MODEL: 5403
ENGINEERING	DATE	THIRD ANGLE PROJECTION	SIZE A1 DRAWING NO. 11901200 REV D
NEXT ASSY	SYSTEM	SOFTWARE AUTOCAD 2000	SCALE 1:2 WT kg SHEET 1 OF 1

PROPRIETARY
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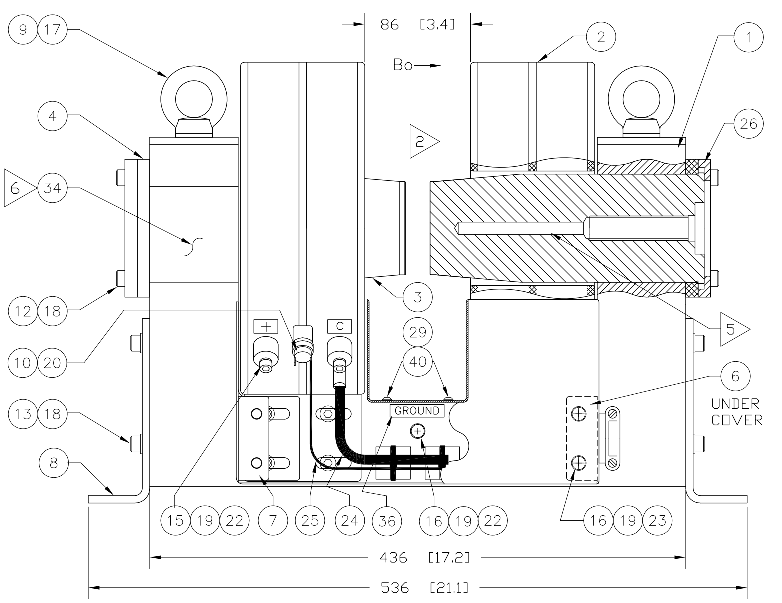
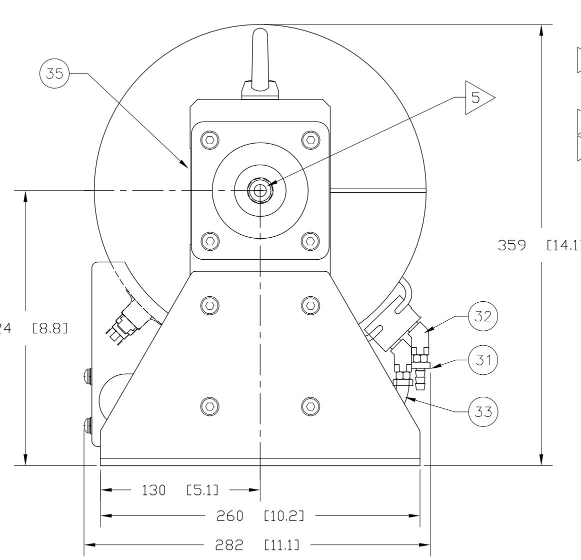
REVISIONS

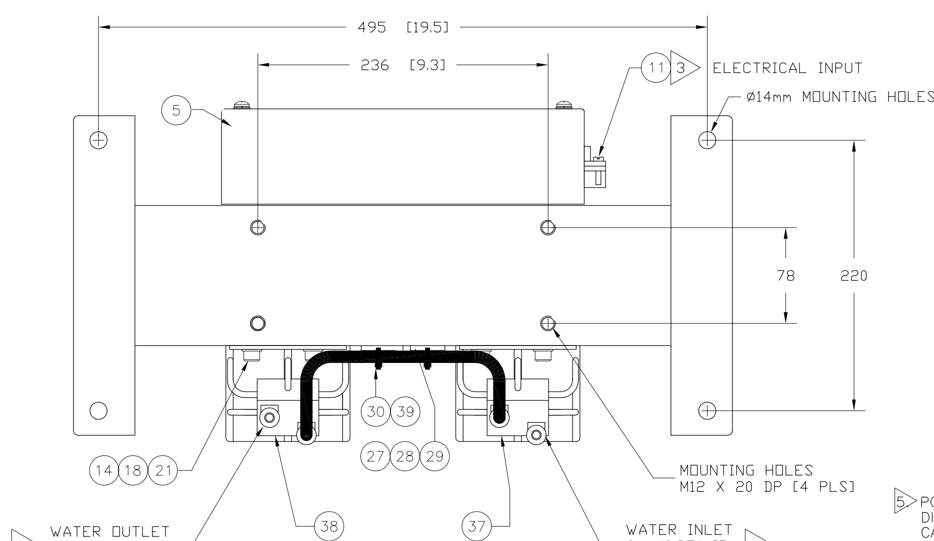
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		06/10/04	G.DOUGLAS
B	ADD INTERMITTENT OPERATING SPECIFICATIONS		07/10/04	G.DOUGLAS
C	CHANGE ITEM 5, 31, 32, 33 & 41		05/23/06	G.DOUGLAS

FRONT VIEW



SIDE VIEW

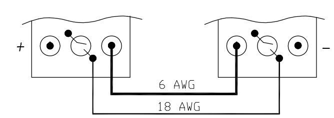




BOTTOM VIEW

MAGNET WIRING SCHEMATIC

FRONT VIEW



MAGNET SPECIFICATIONS

POLE GAP	0 mm TO 86 mm
POLE FACE	CYLINDRICAL Ø76 mm [3"] TAPERED Ø38 mm [1.5"]
COILS [series connected]	
MAX RESISTANCE	0.55 Ohm
MAX CONTINUOUS POWER [air]	20A/10V (0.2kW)
MAX CONTINUOUS POWER [water]	50A/25V (1.3kW)
MAX INTERMITTENT POWER [air] [duty cycle 1:3, 4 minute max On]	40A/20V (0.8kW)
MAX INTERMITTENT POWER [water] [duty cycle 1:2, 10 minute max On]	70A/35V (2.5kW)
SELF INDUCTANCE	60 mH
COOLING:	2 l/min [0.6 GPM] @ 0.5 BAR [8 PSID]
THERMAL INTERLOCK	OPEN CIRCUIT ABOVE 50°C [122°F]
MASS	130 kg [286 lbs]

NOTE: DO NOT EXCEED THE MAXIMUM SPECIFIED COIL RESISTANCE OR COIL OVERHEATING AND POSSIBLE DAMAGE MAY OCCUR.

5. POLE IS PROVIDED WITH OPTICAL ACCESS HOLE OF 10.0mm DIAMETER. SMALL OPTICAL ACCESS HOLES THRU THE POLE FACE CAN BE PROVIDED FOR SPECIAL APPLICATIONS. CONSULT GMW FOR DETAILS.

6. THIS DRAWING SHOWS A REVISED DESIGN OF THE 5403 ELECTROMAGNET SERIAL NUMBERS START AT SN 200.

NOTE

1. POLE MOUNTING SCREWS SHOULD BE 20mm LONGER THAN SPACER THICKNESS. FOR 40mm THICK SPACER MOUNTING SCREW SHOULD BE 60mm LONG FOR MAGNET WITH VARIABLE POLE GAP SEE DWG NO: 11901200.

2. POLE GAP FIXED BY POLE SPACERS [ITEM 4] MIN GAP 0.0 mm MAGNET SHOWN WITH 10 mm POLE SPACERS FOR 20 mm GAP.

3. RH SIDE CABLE ENTRY SHOWN. LH ENTRY OPTIONAL.

4. AFTER FINAL TEST BLOW OUT WATER LINES, AND FIT PLASTIC SEALING CAP [ITEM 41] ONTO HOSE FITTINGS.

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
41	2	SC0070	PLASTIC SEALING CAP 7.9 ID, KELVINDALE	4
40	4	ISO 7380 10.9	M6 X 16 SHCS BUTTON HD S/S	
39	4	T50S9C2	CABLE TIE, WHITE TYTON	
38	1	10900880	LABEL, MANIFOLD [LH Side]	
37	1	10900890	LABEL, MANIFOLD [RH Side]	
36	1	10900720	LABEL, GROUND [Fitted under Cover]	
35	1	10900270	LABEL, CAUTION [RH Side]	
34	1	10900900	LABEL, SPECIFICATION [LH side]	
33	A/R	PB-4-BK	HOSE, 1/4" ID, RUBBER SWAGELOK	
32	4	2214P-2-2	ELBOW 45°, 1/8" NPT PARKER	
31	4	30182-2-4B	HOSE COUPLING 6.0/HOSE 1/8 NPT PARKER	
30	4	MB4A	MOUNTING PAD, WHITE, TYTON	
29	8	BN 737	WASHER, M4 X 8 X 0.5 FLAT S/S	
28	8	DIN 6797	WASHER, M4 X 0.7 INT LOCK, S/S	
27	8	DIN 7985A	SCREW, M4 X 8 PAN S/S	
26	2	17901470	POLE RETAINER	
25	1	16900610	CABLE ASSY, INTERLOCK LINK	
24	1	16900600	CABLE ASSY, DC CURRENT LINK	
23	5	DIN 6797	WASHER, M6 X 0.7 INT LOCK, S/S	
22	4	DIN 1780	WASHER, M6 X 1.6 SPRING LOCK, S/S	
21	16	DIN 1780	WASHER, M8 X 2.0 SPRING LOCK, S/S	
20	2		WASHER, M5 X 15 X 3, NEOPRENE	
19	9	BN 737	WASHER, M6 X 16 X 1.6 FLAT S/S	
18	32	BN 737	WASHER, M8 X 15 X 1.6 FLAT S/S	
17	2	DIN 433	WASHER, M12 X 13 X 2 FLAT S/S	
16	5	DIN 7985A	SCREW, M6 X 12 PAN S/S	
15	4	DIN 912	SHCS, M6 X 12 S/S	
14	16	DIN 912	SHCS, M8 X 16 S/S	
13	8	DIN 912	SHCS, M8 X 20 S/S	
12	8	DIN 912	SHCS, M8 X 30 S/S [See note 1 & 2]	
11	1	3304	CABLE CLAMP, T & B	
10	2	3450G611-1	TEMP SENSOR, 50°C 10-32UNF ELMWOOD	
9	2	9-0503	EYEBOLT, M12	
8	2	17901450	ANGLE BRACKET	
7	1	17901422	TERMINAL COVER BRACKET [WITHOUT HOLE]	
6	1	17901421	TERMINAL COVER BRACKET, [WITH HOLE]	
5	1	11902440	TERMINAL COVER ASSEMBLY [cover + label]	
4	2	17901400	POLE SPACER, 10MM THICK	
3	2	17901510	POLE, 76MM FACE	
2	2	11901110	COIL ASSEMBLY	
1	1	17901500	YOKE	

PARTS LIST

DRAWN G.DOUGLAS	DATE 06/03/03	DO NOT SCALE FROM DRAWING DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)	GMW 955 Industrial Rd, San Carlos, CA 94070 Tel: (650)802-8292. Fax: (650)802-8298.
CHECK	DATE	LINEAR: INCHES / mm; X.XXX ±.005 / ±0.03; X.XX ±.01 / ±0.1; X.X ±.03 / ±0.3; X ±.06 / ±1; DEG. ±.5 / ±0.5; FINISH 63 / 1.6	TITLE MAGNET ASSEMBLY MODEL: 5403FG
ENGINEERING	DATE	THIRD ANGLE PROJECTION	SIZE A1 DRAWING NO. 11901100 REV C
NEXT ASSY	SYSTEM SOFTWARE AUTOCAD 2000		SCALE 1:2 WT kg SHEET 1 OF 1

PROPRIETARY
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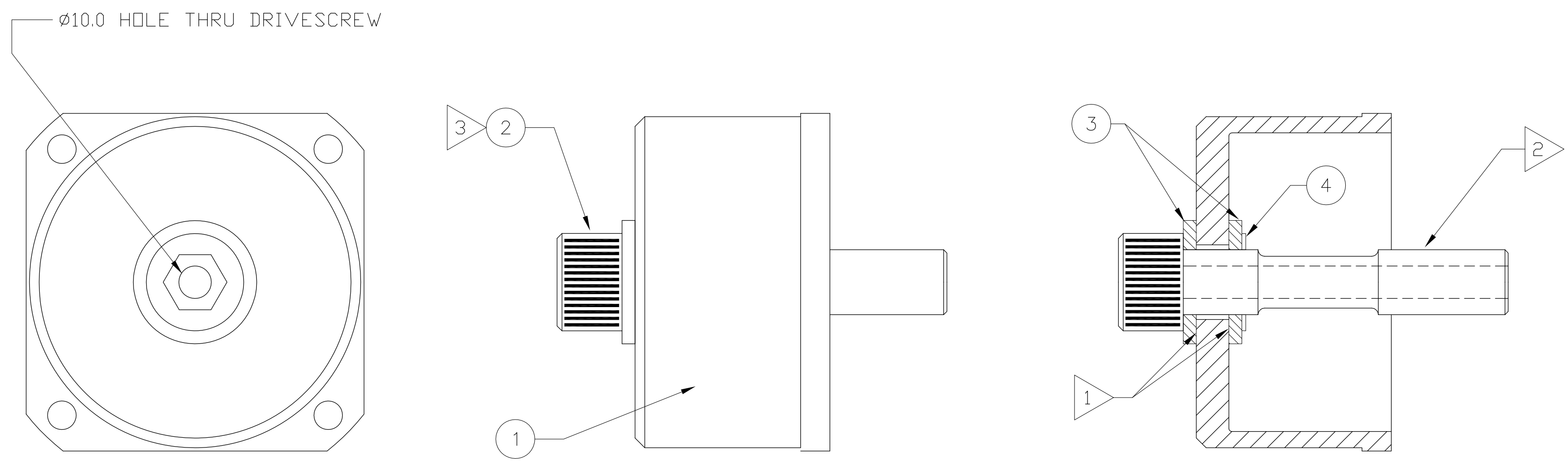
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		06/08/04	G.DOUGLAS



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
4	1	5101-78	BOWED RETAINING RING, WALDES	
3	2	17901650	WASHER	
2	1	17901640	DRIVE SCREW	
1	1	17901630	CAP	

PARTS LIST

DRAWN G.DOUGLAS	DATE 04/31/04	DO NOT SCALE FROM DRAWING		
CHECK	DATE	DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)		
ENGINEERING	DATE	LINEAR	INCHES	mm
		X.XXX	±.005	±0.03
		X.XX	±.01	±0.1
		X.X	±.03	±0.3
		X	±.06	±1
		DEG.	±.5	±0.5
11901200	5403	FINISH	63	1.6
NEXT ASSY	SYSTEM	THIRD ANGLE PROJECTION		
SOFTWARE AUTOCAD 2000				

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
VARIABLE GAP KIT
MODEL: 5403

SIZE	DRAWING NO.	REV
A2	11902370	A

SCALE 1:1 | WT kg | SHEET 1 OF 1

NOTES

1. APPLY ANTISEIZE GREASE TO AREAS SHOWN BEFORE ASSEMBLY.
2. BEFORE ASSEMBLY ONTO MAGNET APPLY ANTISEIZE GREASE TO AREA SHOWN.
3. TAKE CARE NOTE NOT DAMAGE SPINES

PROPRIETARY
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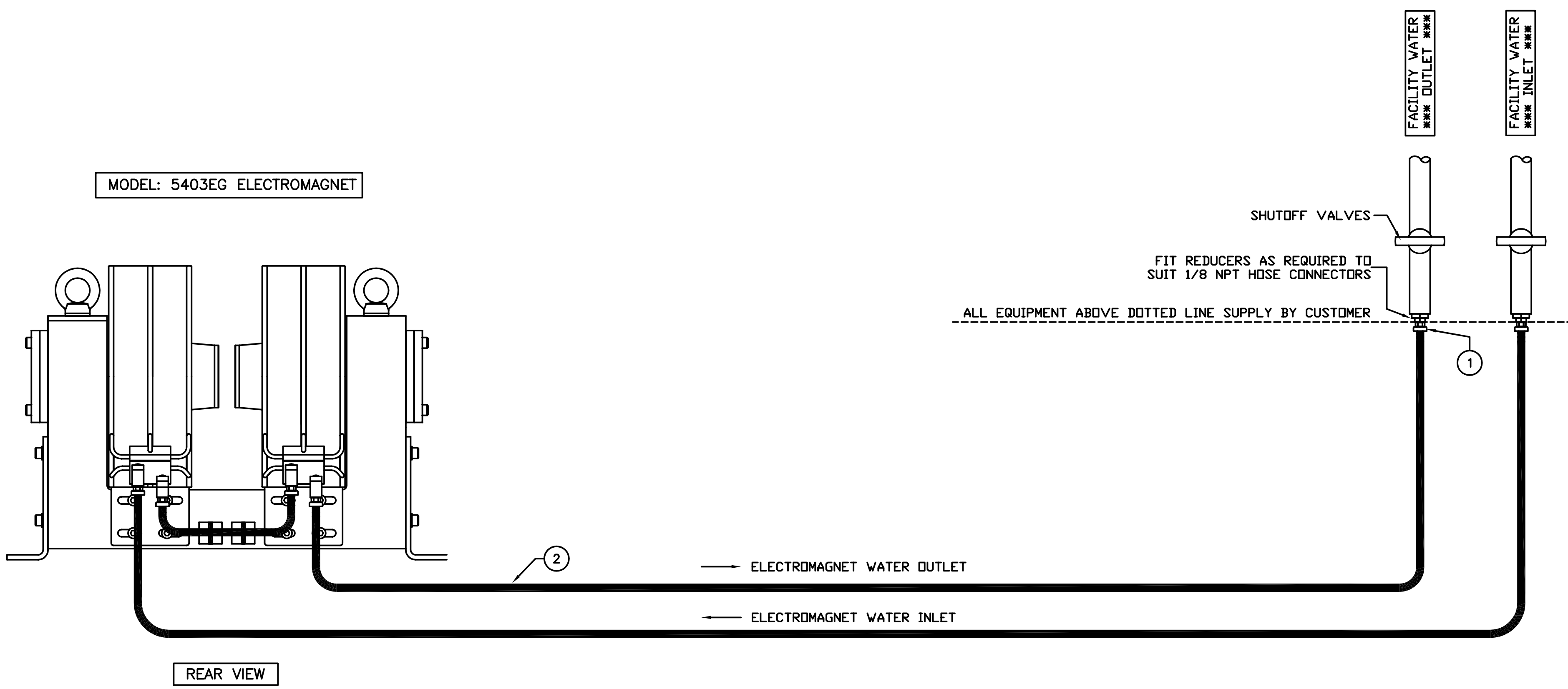
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		06/06/03	G.DOUGLAS



COOLING SYSTEM SPECIFICATIONS

SUBSYSTEM NAME	FLOW RATE (liter/min)	PRESSURE (bar)	TEMPERATURE (deg C)
ELECTROMAGNET	2	0.5	18–25

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
2	10m	B704	HOSE, RUBBER ø6mm [0.25"] I.E	
1	2	KA-04-02-MB	HOSE COUPLING, 1/4 HOSE 1/8 NPT I.E	

DRAWN G.DOUGLAS DATE 06/06/03
CHECK DATE
ENGINEERING DATE

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

NEXT ASSY: | SYSTEM: 5403

SOFTWARE AUTOCAD 2000

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE COOLING SYSTEM 5403/5403EG

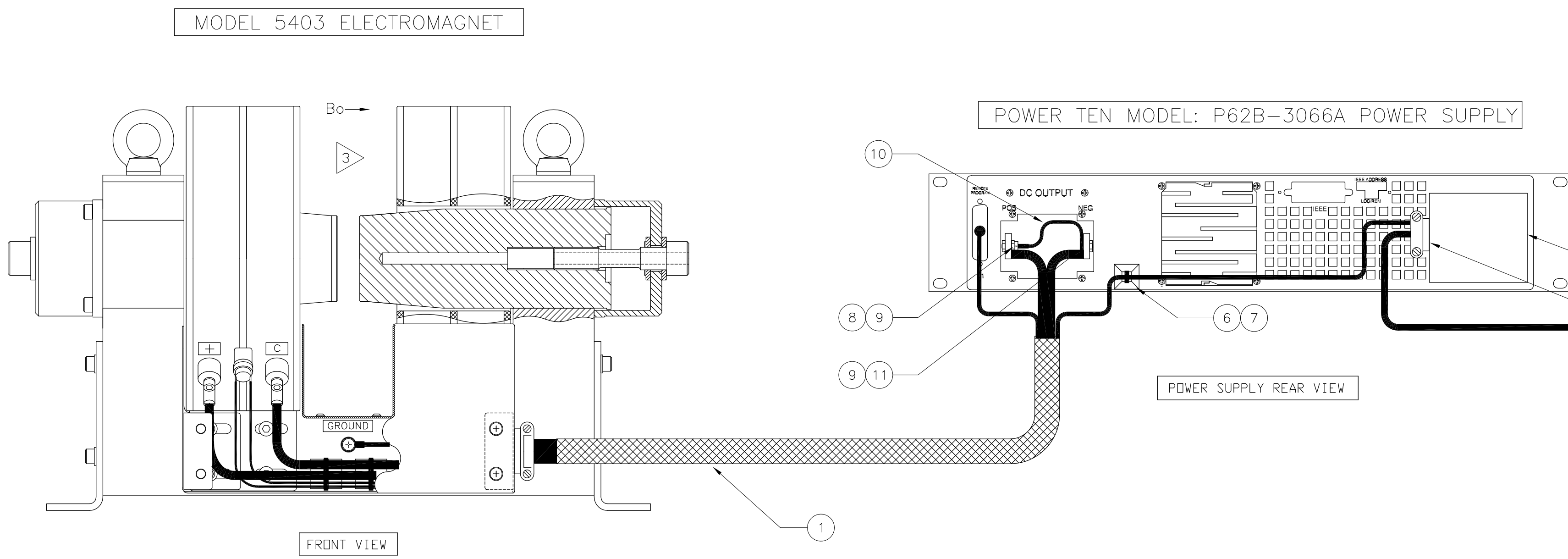
SIZE A1 | DRAWING NO. 11901140 | REV A

SCALE NTS | WT kg | SHEET 1 OF 1

PROPRIETARY
THIS DRAWING CONTAINS CONFIDENTIAL INFORMATION PROPRIETARY TO GMW INC. IT MUST NOT BE REPRODUCED OR DISCLOSED TO OTHERS OR USED IN ANY OTHER WAY, IN WHOLE OR IN PART EXCEPT AS AUTHORIZED IN WRITING BY GMW INC.

REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		06/10/04	G.DOUGLAS



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
11	1		CRIMPLUG	
10	A/R		WIRE, 16 AWG PVC BLACK	
9	1		HEATSHRINK 12mm 1/2" SLEEVING, BLACK	
8	1	NTE6076	RECTIFIER DIODE [Protection Diode] NTE	
7	1	08461	CABLE TIE ADHESIVE MTG, NYL BAR-LOK	
6	1	08432	CABLE TIE, NYLON 2.5mm WIDE. BAR-LOK	
5	1	4A-1203	POWER CORD, TYPE SO 3 CORE 12AWG	N/S
4	1	L15-20P	PLUG 3PHASE/20A, NYLON. BRYANT	N/S
3	1	3303	CABLE CLAMP, THOMAS & BETTS	
2	1	12900010	AC TERMINAL BOX	
1	1	16900150	CURRENT & INTERLOCK CABLE 60A	

PARTS LIST

NOTE

1. POWER SUPPLY SHOWN WITH 2 PHASE 208V AC INPUT
2. REFER TO TABLE ON DWG 13900240 FOR AC INPUT RATINGS OTHER THAN 2 PHASE 208V
3. MODEL 5403 ELECTROMAGNET SHOWN. ELECTRICAL CONNECTIONS AND WIRING IDENTICAL FOR MODEL 5403FG, 5403EG-20 & 5403EG-50.

N/S = NOT SUPPLIED

*** WARNING ***

CHECK AC POWER VOLTAGE AND FREQUENCY MATCH POWER SUPPLY SPECIFIED REQUIREMENTS BEFORE APPLYING AC INPUT POWER

DRAWN G.DOUGLAS DATE 04/20/04
CHECK DATE
ENGINEERING DATE

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

NEXT ASSY | SYSTEM
SOFTWARE AUTOCAD 2000

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE ELECTRICAL ASSEM 5403/P62B-3066A

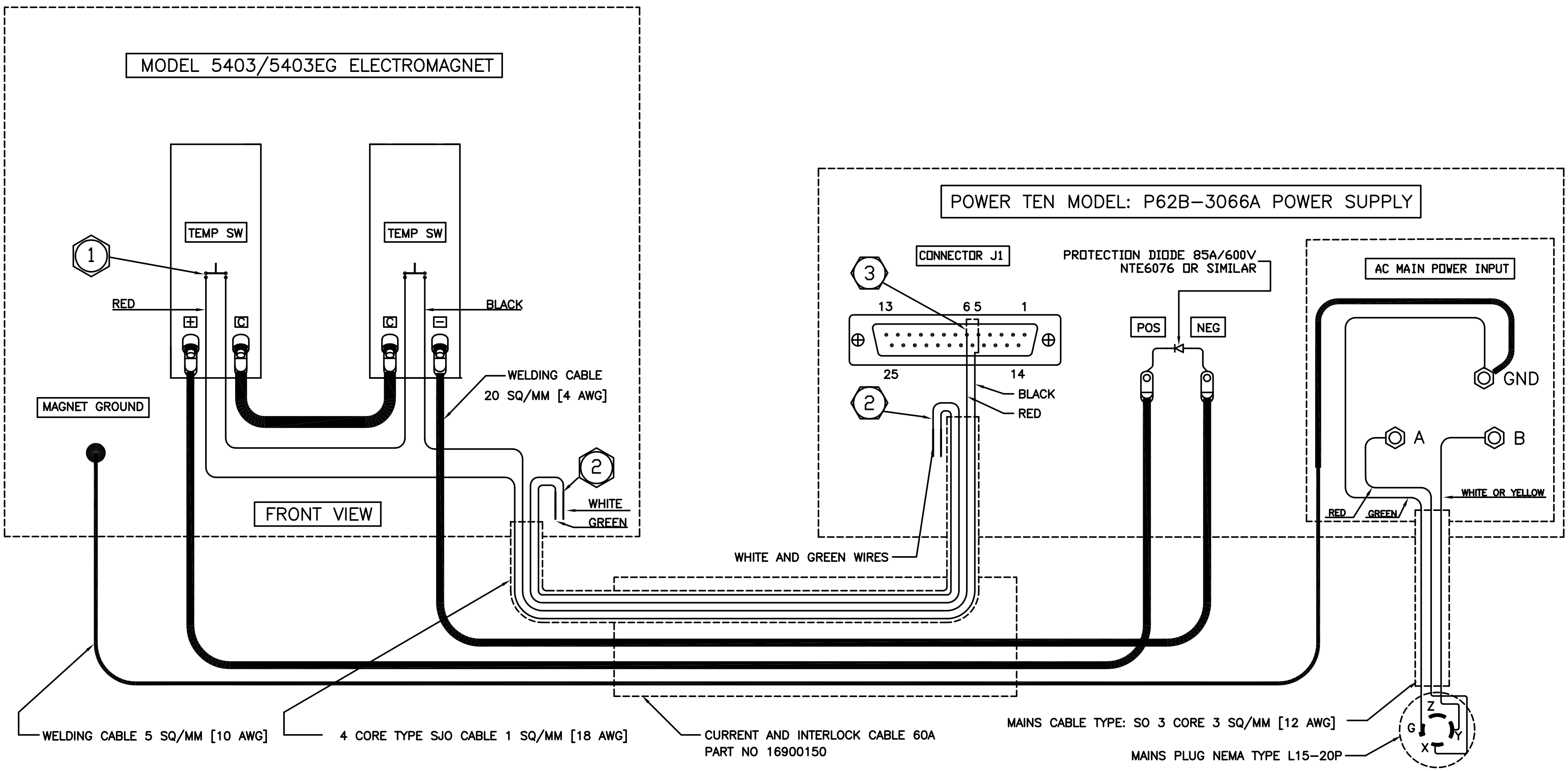
SIZE A1 DRAWING NO. 11902420 REV A

SCALE NTS WT kg SHEET 1 OF 1

PROPRIETARY
THIS DRAWING CONTAINS CONFIDENTIAL INFORMATION PROPRIETARY TO GMW INC. IT MUST NOT BE REPRODUCED OR DISCLOSED TO OTHERS OR USED IN ANY OTHER WAY, IN WHOLE OR IN PART EXCEPT AS AUTHORIZED IN WRITING BY GMW INC.

REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		03/19/97	G.DOUGLAS
B	ADD PROTECTION DIODE		06/12/03	G.DOUGLAS



NOTE:

1. CONNECT MAGNET TEMPERATURE INTERLOCK WIRING DIRECTLY ONTO QC TABS ON TEMP SWITCHES
2. LEAVE WHITE AND GREEN WIRES FULL LENGTH AND INSULATE WITH HEAT SHRINK SLEEVING. CAN BE USED FOR WATER FLOW SWITCH INTERLOCK [OPTIONAL]
3. REMOVE LINK BETWEEN PIN 5 AND PIN 6 ON POWER SUPPLY AT J1. CONNECT INTERLOCK WIRES AS SHOWN.

ELECTROMAGNET SYSTEM ELECTRICAL REQUIREMENTS			
AC INPUT POWER 2 PHASE, 47 to 63HZ	208V	-	-
AC INPUT FULL LOAD CURRENT	10	-	-
RECOMMENDED MAIN AC BREAKER	20	-	-
RECOMMENDED AC POWER OUTLET	L15-20R	-	-
RECOMMENDED AC CABLE SIZE	3 SQ/MM	-	-
NOTE: DRAWING SHOWS POWER SUPPLY FOR US 208V AC POWER			

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN G.DOUGLAS	DATE 03/19/97	DO NOT SCALE FROM DRAWING
CHECK	DATE	DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)
ENGINEERING	DATE	
	5403EG-50	
	5403EG-20	
	5403	
NEXT ASSY	SYSTEM	THIRD ANGLE PROJECTION
SOFTWARE AUTOCAD 2000		

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

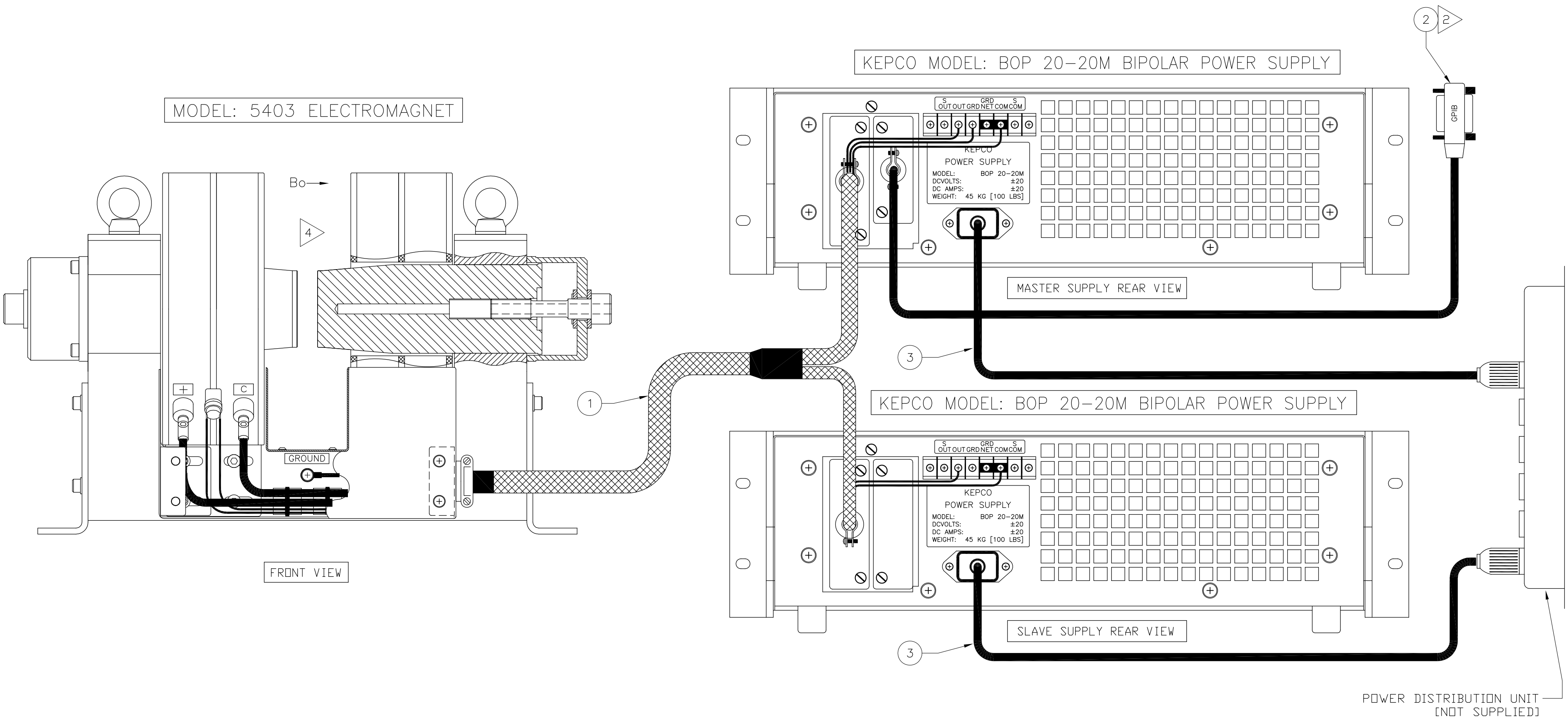
TITLE: ELECTRICAL WIRING 5403/P62B-3066A

SIZE: A1 | DRAWING NO.: 13900240 | REV: B
SCALE: NTS | WT kg | SHEET 1 OF 1

PROPRIETARY
THIS DRAWING CONTAINS CONFIDENTIAL INFORMATION PROPRIETARY TO GMW INC. IT MUST NOT BE REPRODUCED OR DISCLOSED TO OTHERS OR USED IN ANY OTHER WAY, IN WHOLE OR IN PART EXCEPT AS AUTHORIZED IN WRITING BY GMW INC.

REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		06/10/04	G.DOUGLAS
B	CHG NOTE 2, ADD NOTE 5		01/23/08	G.DOUGLAS



NOTE

1. POWER SUPPLY SHOWN WITH 115V AC INPUT
2. GPIB INTERFACE & CABLE ARE OPTIONAL EQUIPMENT
3. REFER TO TABLE ON DWG 13900110 FOR AC INPUT RATINGS OTHER THAN 115V AC INPUT
4. MODEL 5403 ELECTROMAGNET SHOWN. ELECTRICAL CONNECTIONS AND WIRING IDENTICAL FOR MODEL: 5403FG, 5403EG-20 & 5403EG-50
5. SEE DWG NO 13900110 & 13900090 FOR DETAILED WIRING CONNECTIONS

*** WARNING ***

CHECK AC POWER VOLTAGE AND FREQUENCY MATCH POWER SUPPLY SPECIFIED REQUIREMENTS BEFORE APPLYING AC INPUT POWER

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
3	2	KEPCO	AC POWER CORD [115V US TYPE]	
2	1	SNQ 488-2	GPIB CABLE [2M LONG]	
1	1	16900070	CURRENT & INTERLOCK CABLE 40A	

PARTS LIST

DRAWN G.DOUGLAS DATE 04/20/04
CHECK DATE
ENGINEERING DATE
NEXT ASSY SYSTEM
SOFTWARE AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

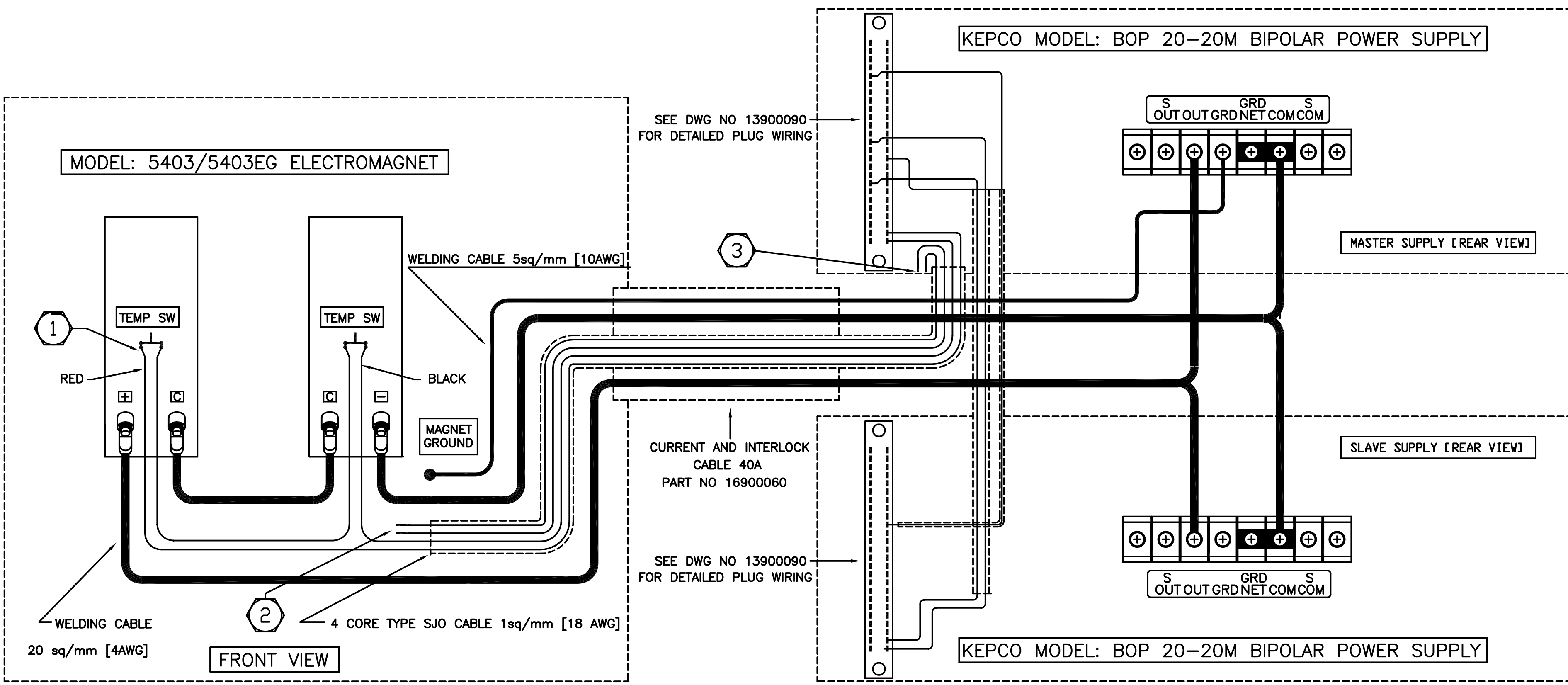
LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE ELECTRICAL ASSEM 5403/BOP20-40

SIZE A1 DRAWING NO. 11902430 REV B
SCALE NTS WT kg SHEET 1 OF 1



PROPRIETARY
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REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		04/20/95	G.DOUGLAS

NOTE:
1. CONNECT MAGNET TEMPERATURE INTERLOCK WIRING DIRECTLY ONTO QC TABS ON TEMP THERMOSTATS
2. LEAVE WHITE AND GREEN WIRES FULL LENGTH AND INSULATE WITH HEAT SHRINK SLEEVING CAN BE USED FOR WATER FLOW SWITCH INTERLOCK [OPTION]
3. INSULATE WHITE AND GREEN WIRES WITH HEAT SHRINK SLEEVING [not used]

ELECTROMAGNET SYSTEM ELECTRICAL REQUIREMENTS			
AC INPUT POWER 1 PHASE, 50 to 65HZ	115V	208V	230V
AC INPUT FULL LOAD CURRENT	11.0*	6.5*	6.0*
RECOMMENDED MAIN AC BREAKER	25	15	15
RECOMMENDED AC POWER OUTLET	5-20S	–	–
RECOMMENDED AC CABLE SIZE	1.5 SQ/MM	1.0 SQ/MM	1.0 SQ/MM

NOTE: DRAWING SHOWS POWER SUPPLY SETUP FOR 1 PHASE 115V AC POWER
* RATING GIVEN FOR EACH POWER SUPPLY, TOTAL SYSTEM CURRENT DOUBLE VALUES SHOWN]

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN G.DOUGLAS DATE 04/20/95
CHECK DATE
ENGINEERING DATE

NEXT ASSY: 5403EG-50, 5403EG-20, 5403 — SYSTEM

SOFTWARE AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE: ELECTRICAL WIRING 5403/BOP20-40

SIZE A1 DRAWING NO. 13900110 REV A

SCALE NTS WT kg SHEET 1 OF 1

PROPRIETARY
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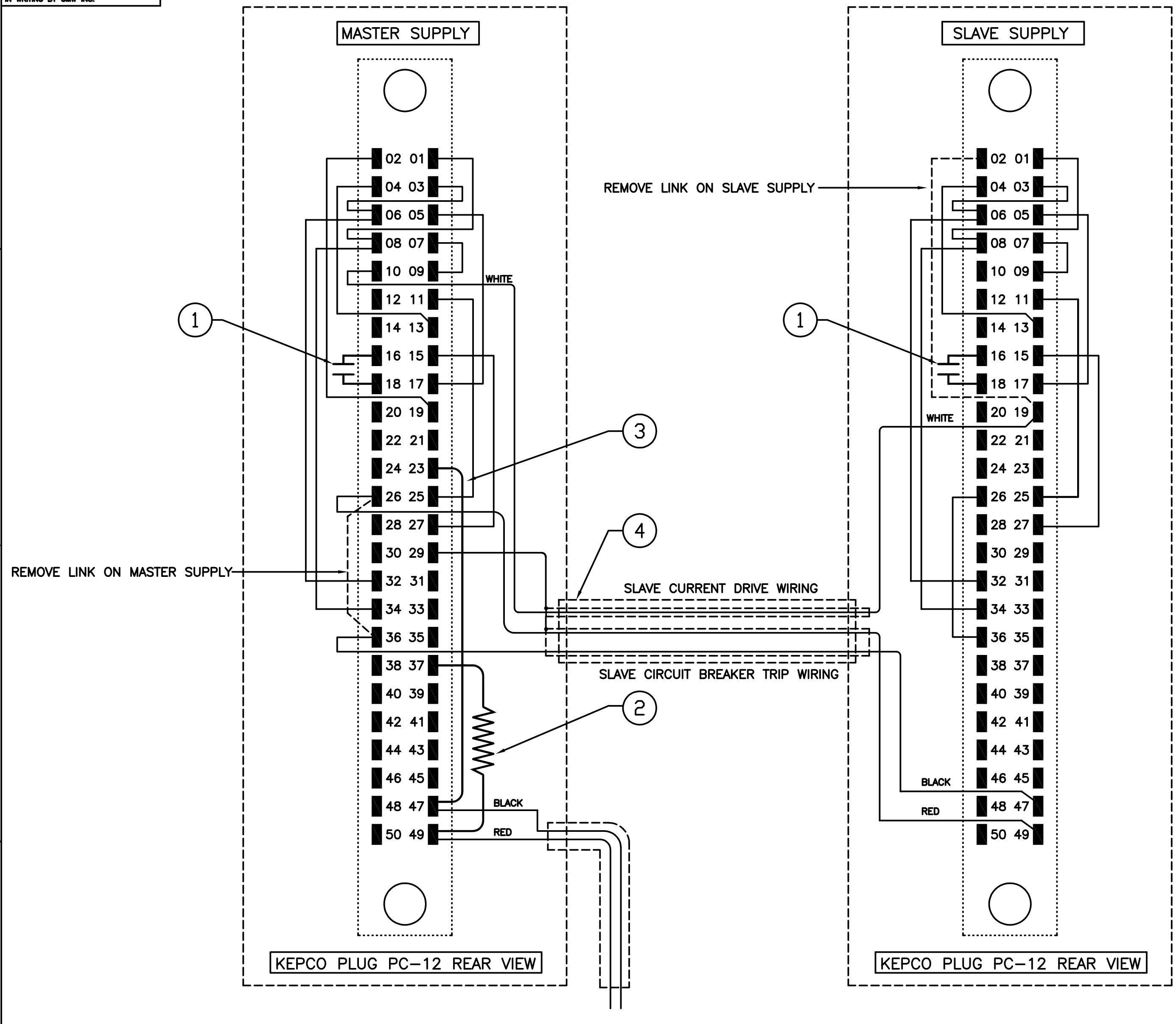
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		05/12/95	G.DOUGLAS



NOTE:
1. CUT OUT GREEN WIRE, USE WHITE, RED, BLACK ONLY.

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
4	A/R	8723	CABLE, 4 CORE SHIELDED PAIRS, BELDEN	1
3	1		WIRE LINK, HOOK UP WIRE 0.5 SQ/MM	
2	1		RESISTOR, 680 OHM/0.25 W	
1	2		CAPACITOR, MYLAR 0.33uF	

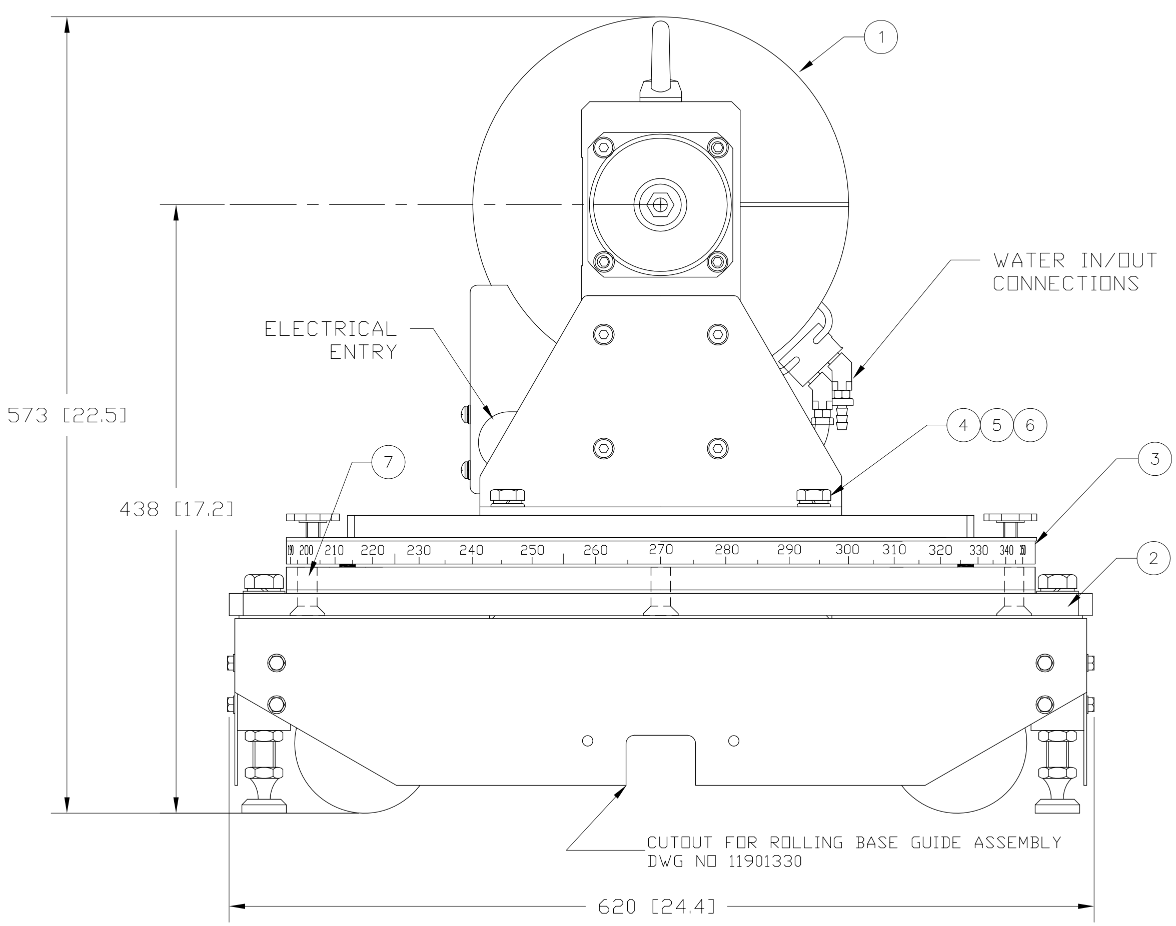
PARTS LIST

DRAWN G.DOUGLAS	DATE 03/30/95	DO NOT SCALE FROM DRAWING	GMW P.O. Box 2578, Redwood City, CA 94064 Tel: (415)802-8292. Fax: (415)802-8298.
CHECK	DATE	DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)	
ENGINEERING	DATE	LINEAR INCHES/ mm	TITLE ELECTRICAL WIRING BOP 2020/2020
		X.XXX ±.005 ±0.03	
		X.XX ±.01 ±0.1	
		X.X ±.03 ±0.3	
		X ±.06 ±1	
		DEG. ±.5 ±0.5	
		FINISH 63 1.6	SIZE A1 DRAWING NO. 13900090 REV A
NEXT ASSY	SYSTEM	THIRD ANGLE PROJECTION	SCALE NTS WT kg SHEET 1 OF 1
SOFTWARE: AUTOCAD 12			

PROPRIETARY
THIS DRAWING CONTAINS CONFIDENTIAL INFORMATION PROPRIETARY TO GMW INC. IT MUST NOT BE REPRODUCED OR DISCLOSED TO OTHERS OR USED IN ANY OTHER WAY, IN WHOLE OR IN PART EXCEPT AS AUTHORIZED IN WRITING BY GMW INC.

REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		06/10/04	G.DOUGLAS



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
7	4	DIN 7991	SHCS, M12 X 35 FLAT HD S/S	
6	4	DIN 127 B	WASHER, M12 SPRING LOCK, S/S	
5	4	DIN 125 A	WASHER, M12 FLAT, S/S	
4	4	DIN 933	SCREW, HEX HD M12 X 25 S/S	
3	1	11802090	ROTATING BASE ASSEMBLY	
2	1	11803170	ROLLING BASE ASSEMBLY	
1	1	5403	ELECTROMAGNET, 76MM	

PARTS LIST

DRAWN G.DOUGLAS	DATE 04/13/04	
CHECK	DATE	
ENGINEERING	DATE	
NEXT ASSY	SYSTEM	
SOFTWARE AUTOCAD 2000		

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
ROL/ROT BASE ASSY
MODEL: 5403

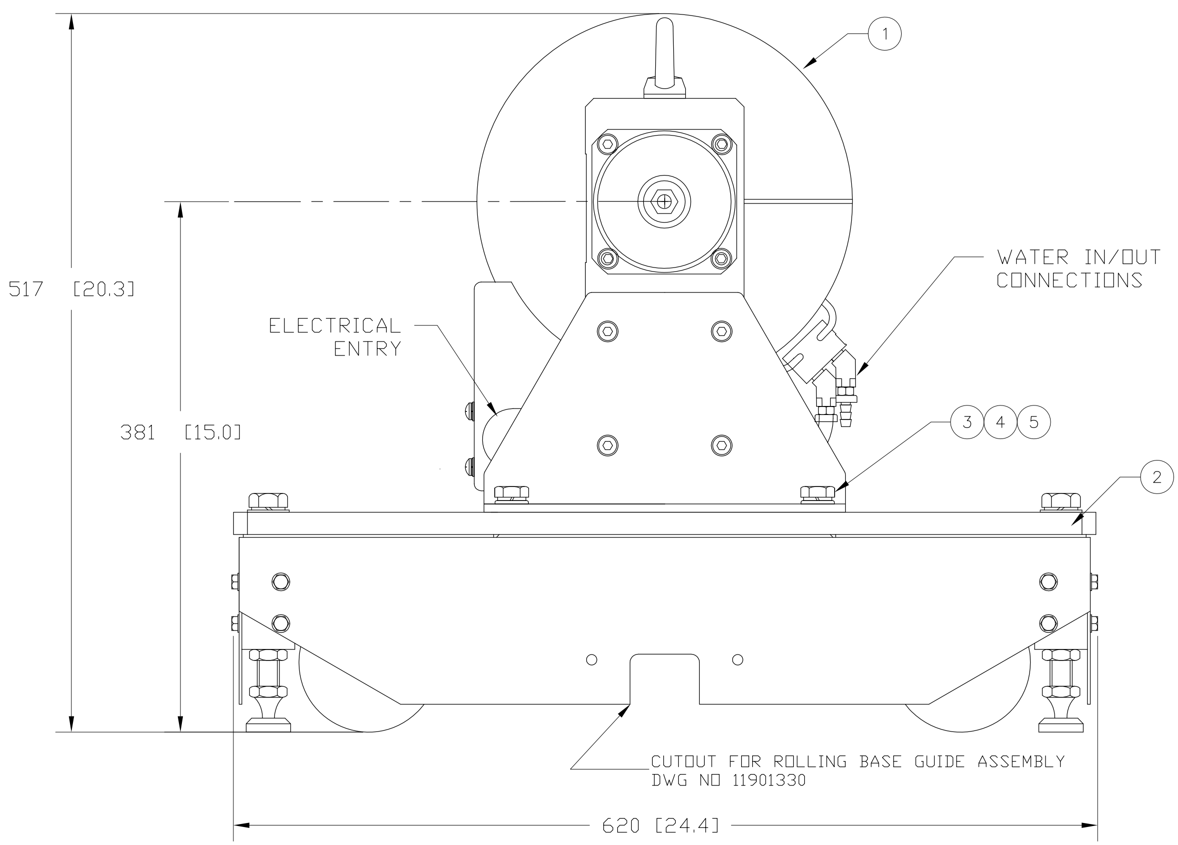
SIZE	DRAWING NO.	REV
A2	11902380	A

SCALE 1:2.5 WT kg SHEET 1 OF 1

PROPRIETARY
THIS DRAWING CONTAINS CONFIDENTIAL INFORMATION PROPRIETARY TO GMW INC. IT MUST NOT BE REPRODUCED OR DISCLOSED TO OTHERS OR USED IN ANY OTHER WAY, IN WHOLE OR IN PART EXCEPT AS AUTHORIZED IN WRITING BY GMW INC.

REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		06/10/04	G.DOUGLAS



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
5	4	DIN 127 B	WASHER, M12 SPRING LOCK, S/S	
4	4	DIN 125 A	WASHER, M12 FLAT, S/S	
3	4	DIN 933	SCREW, HEX HD M12 X 25 S/S	
2	1	11803170	ROLLING BASE ASSEMBLY	
1	1	5403	ELECTROMAGNET, 76MM	

PARTS LIST

DRAWN G.DOUGLAS — DATE 04/14/04
CHECK — DATE
ENGINEERING — DATE
NEXT ASSY — SYSTEM
SOFTWARE AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63 ✓	1.6 ✓

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
ROLLING BASE ASSY MODEL: 5403

SIZE A2 — DRAWING NO. 11902390 — REV A
SCALE 1:2.5 — WT kg — SHEET 1 OF 1

PROPRIETARY
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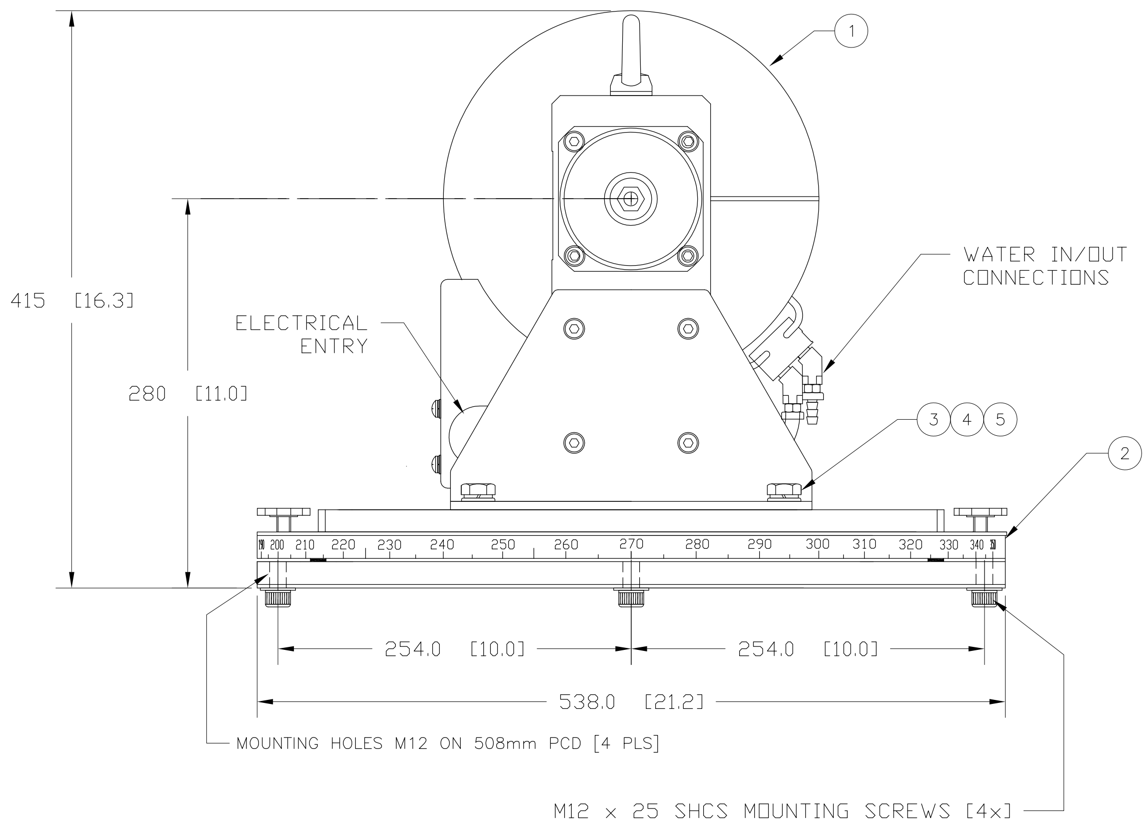
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		06/10/04	G.DOUGLAS



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
5	4	DIN 127 B	WASHER, M12 SPRING LOCK, S/S	
4	4	DIN 125 A	WASHER, M12 FLAT, S/S	
3	4	DIN 933	SCREW, HEX HD M12 X 25 S/S	
2	1	11802090	ROTATING BASE ASSEMBLY	
1	1	5403	ELECTROMAGNET, 76MM	

PARTS LIST

DRAWN	G.DOUGLAS
DATE	04/14/04
CHECK	
DATE	
ENGINEERING	
DATE	
NEXT ASSY	
SYSTEM	
SOFTWARE	AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
ROTATING BASE ASSY
MODEL: 5403

SIZE	DRAWING NO.	REV
A2	11902400	A

SCALE 1:2.5 WT kg SHEET 1 OF 1

PROPRIETARY
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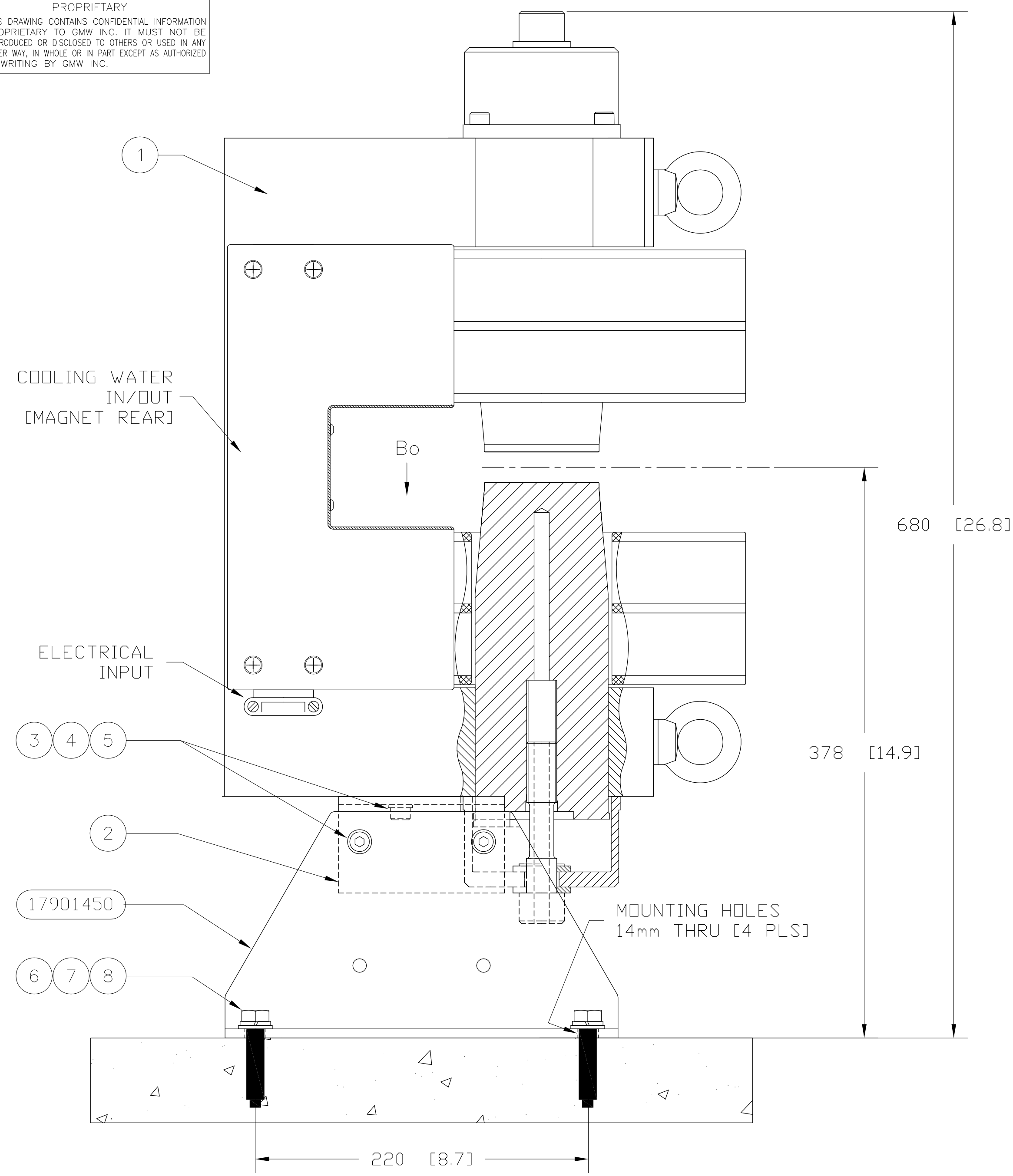
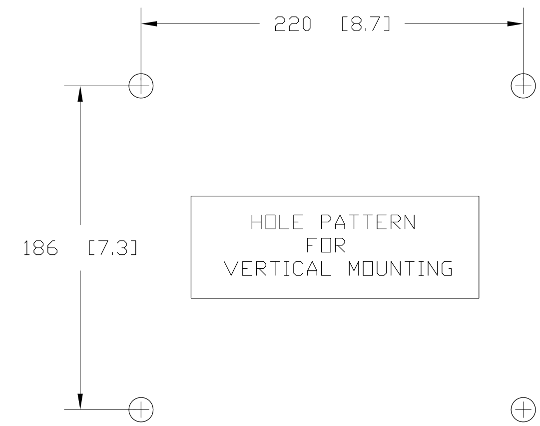
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		06/08/04	G.DOUGLAS





*** WARNING ***
WHEN THE 5403 ELECTROMAGNET IS VERTICALLY MOUNTED IT MUST BE BOLTED TO THE FLOOR SECURELY AS SHOWN.

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
8	4		BOLT, MI2 or 1/2" EXPANSION	
7	4	DIN 127 B	WASHER, M12 SPRING LOCK, S/S	
6	4	DIN 125 A	WASHER, M12 FLAT, S/S	
5	6	DIN 912	SHCS, M8 X 16 S/S	
4	6	DIN 127 B	WASHER, M8 SPRING LOCK, S/S	
3	6	DIN 125 A	WASHER, M8 FLAT, S/S	
2	1	17901610	VERTICAL MOUNTING BRACKET	
1	1	5403	ELECTROMAGNET, 76MM	

PARTS LIST

DRAWN	G.DOUGLAS
DATE	04/14/04
CHECK	
DATE	
ENGINEERING	
DATE	
NEXT ASSY	
SYSTEM	

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

SOFTWARE AUTOCAD 2000

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
VERT MOUNT ASSEM
MODEL: 5403

SIZE	DRAWING NO.	REV
A2	11902410	A

SCALE 1:2 | WT kg | SHEET 1 OF 1

PROPRIETARY
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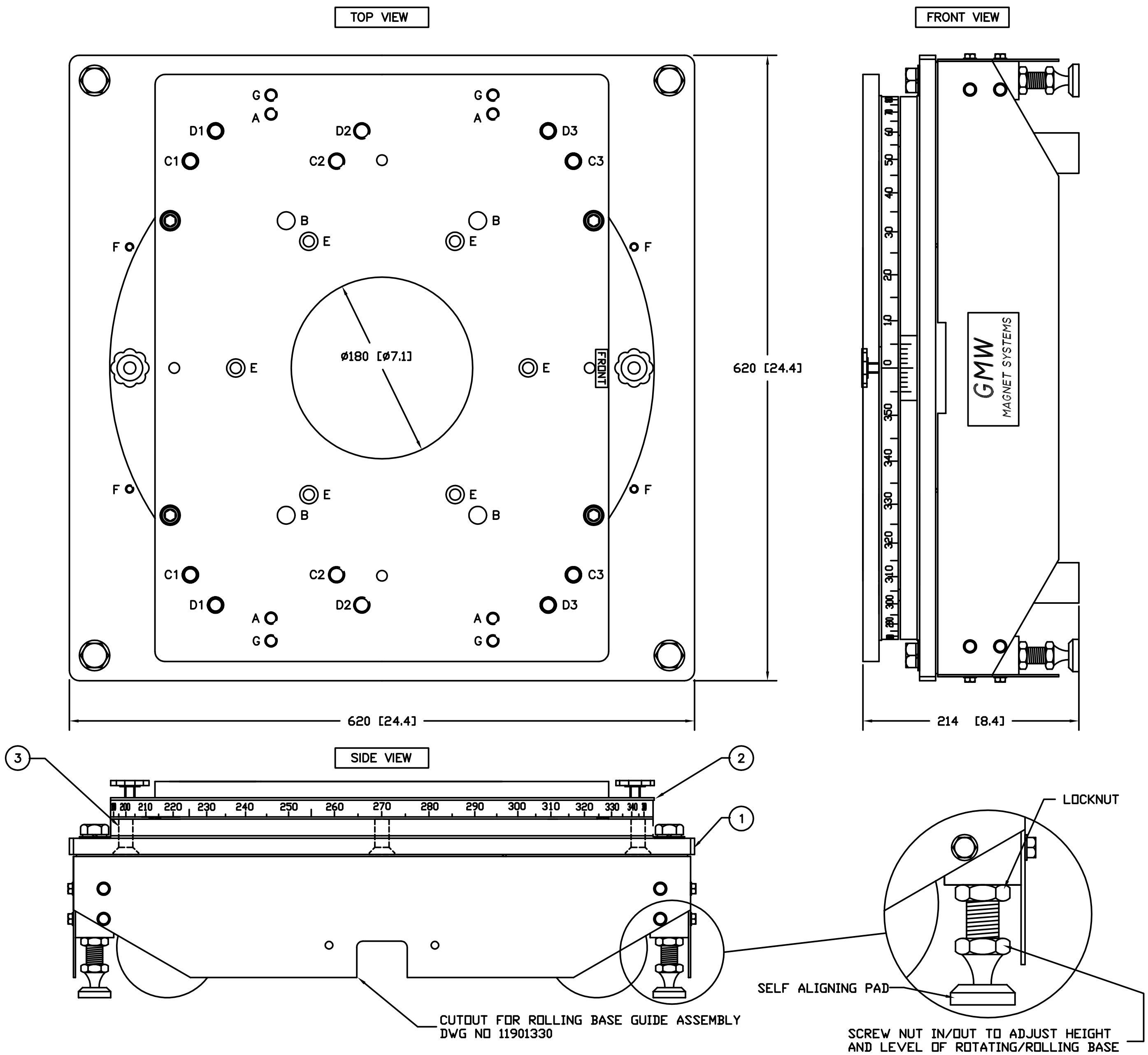
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		04/27/94	G.DOUGLAS
B	ADD 5403 MTG HOLES		05/13/95	G.DOUGLAS
C	ADD MOTORIZED ROTATING BASE HOLES		07/05/97	G.DOUGLAS
D	ADD "G" HOLES, INCR TRANSISTION PLATE SIZE		06/27/03	G.DOUGLAS
E	CORRECT TRANSISTION PLATE HOLE CALLOUT, ADD FOOT VIEW		04/14/04	G.DOUGLAS



MOUNTING HOLES

A=5403 DIRECT MOUNTING
B=3473/3472 DIRECT MOUNTING
C1/C2=3472 45° MOUNTING
D1/D2=3473 45° MOUNTING
C1/C3=3472 HORZ MOUNTING
D1/D3=3473 HORZ MOUNTING
E=MRD SPOOL MOUNTING
F=MRD MOTOR DRIVE MOUNTING
G=5403EG DIRECT MOUNTING

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
3	4	DIN 7991	SHCS, M12 X 35 FLAT HD S/S	
2	1	11802090	ROTATING BASE ASSEMBLY	
1	1	11803170	ROLLING BASE ASSEMBLY	

DRAWN G.DOUGLAS	DATE 04/27/94	DO NOT SCALE FROM DRAWING	GMW 955 Industrial Rd, San Carlos, CA 94070 Tel: (650)802-8292. Fax: (650)802-8298.
CHECK	DATE	DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)	TITLE ROT/ROLLING BASE 3473/3472/5403
ENGINEERING	DATE		
NEXT ASSY	SYSTEM	THIRD ANGLE PROJECTION	SIZE A1 · DRAWING NO. 11803430 · REV E
SOFTWARE AUTOCAD 2000			SCALE 1:2 · WT kg · SHEET 1 OF 1

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

PROPRIETARY
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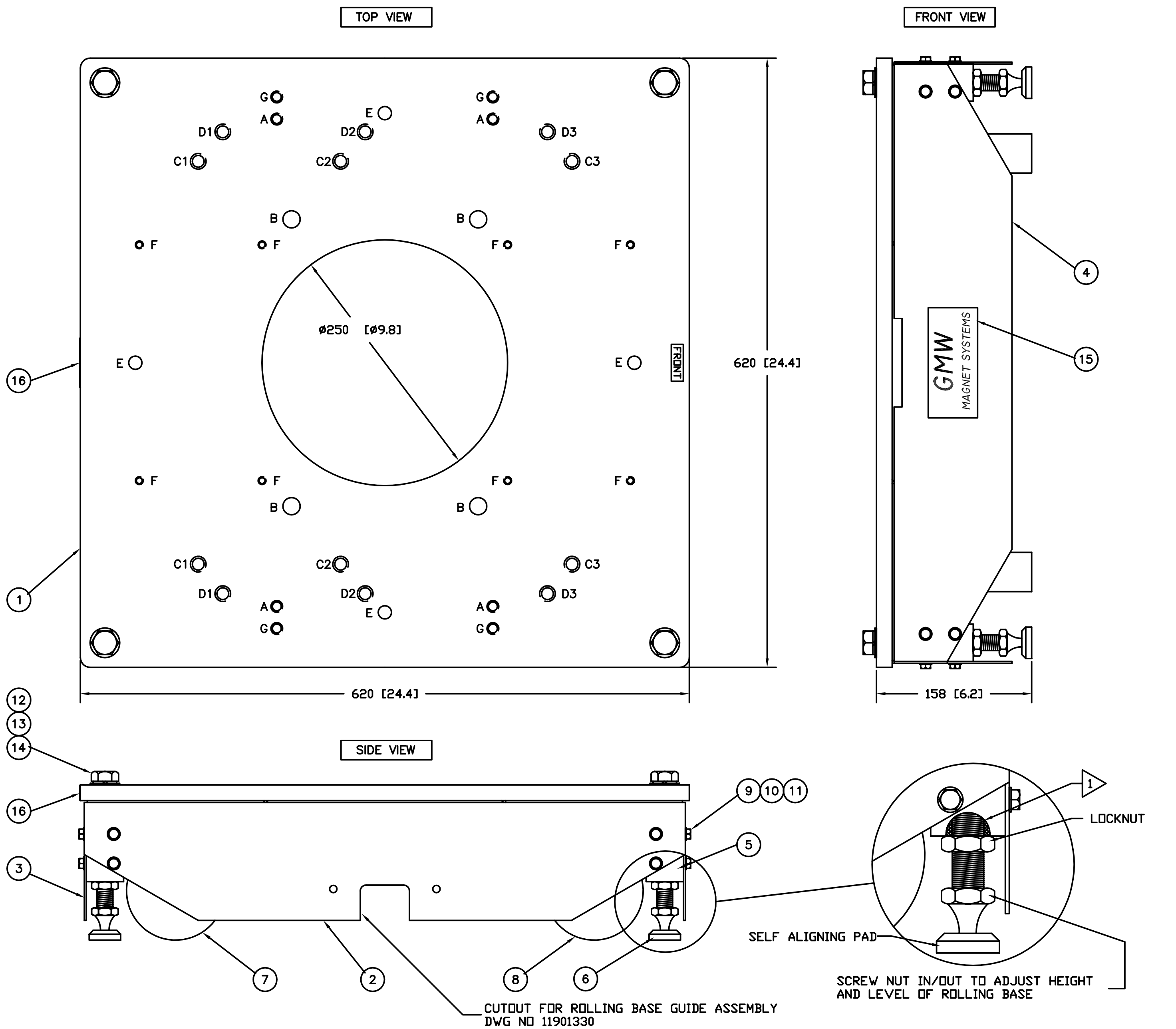
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		08/04/93	A.MARTIN
B	NEW T/B, ADD ITEM 13, MOVE 2,3, SHIFT "A" HOLES		04/29/94	G.DOUGLAS
C	ADD MAGNET HORIZONTAL MOUNTING HOLES		05/08/94	G.DOUGLAS
D	ADD 5403 MTG HOLES		05/13/95	G.DOUGLAS
E	ADD MRD MOTOR DRIVE MOUNTING HOLES		10/21/98	G.DOUGLAS
F	ADD ITEM 16, AND "G" 5403EG MOUNTING HOLES		06/28/03	G.DOUGLAS
G	ADD ENLARGED FOOT VIEW, NOTE 1		04/14/04	G.DOUGLAS



MOUNTING HOLES

A=5403 DIRECT MOUNTING
B=3473/3472 DIRECT MOUNTING
C1/C2=3472 45° MOUNTING
D1/D2=3473 45° MOUNTING
C1/C3=3472 HORZ MOUNTING
D1/D3=3473 HORZ MOUNTING
E=ROTATING BASE MOUNTING
F=MRD MOTOR DRIVE MOUNTING
G=5403EG DIRECT MOUNTING

NOTE:
1. APPLY GENERAL PURPOSE GREASE TO INTERNAL THREAD IN AREA SHOWN DURING ASSEMBLY [4 PLS]

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
16	1	10901110	LABEL, IDENTIFICATION	
15	1	10901120	LABEL, GMW MAGNET SYSTEMS	
14	4	DIN 125 A	M16 X 3 THICK WASHER, FLAT S/S	
13	4	DIN 127 B	M16 WASHER, SPRING S/S	
12	4	DIN 933	M16 X 40 HEX HD BOLT, S/S	
11	16	DIN 127 B	M6 WASHER, SPRING S/S	
10	16	DIN 433	M6 WASHER, FLAT S/S	
9	16	DIN 933	M6 x 8 HEX HD BOLT S/S	
8	2	REX CHDS 4RT	CASTER, SWIVEL	
7	2	REX CHDF 4RT	CASTER, FIXED	
6	4	17802180	LEVELING FOOT	
5	4	17802160	SUPPORT LEG	
4	1	17802123	SKIRT PANEL, FRONT	
3	1	17802122	SKIRT PANEL, REAR	
2	2	17802121	SKIRT PANEL, SIDE	
1	1	17802110	BASE PLATE	

PARTS LIST

DRAWN A.MARTIN — DATE 08/04/93
CHECK — DATE
ENGINEERING — DATE
NEXT ASSY — SYSTEM
SOFTWARE AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

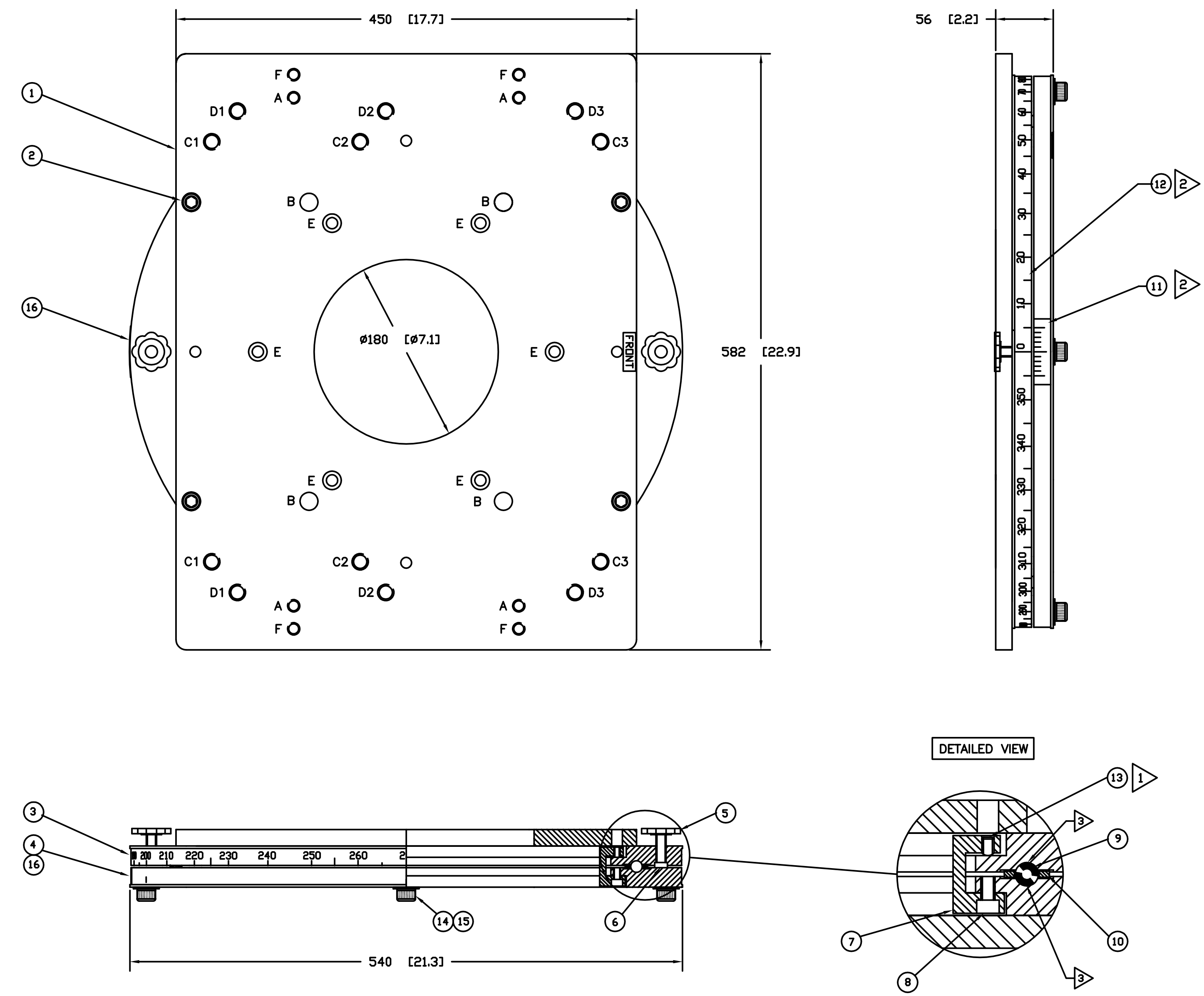
TITLE: ROLLING BASE ASSY 3473/3472/5403

SIZE A1 — DRAWING NO. 11803170 — REV G
SCALE 1:2 — WT kg — SHEET 1 OF 1

PROPRIETARY
THIS DRAWING CONTAINS CONFIDENTIAL INFORMATION PROPRIETARY TO GMW INC. IT MUST NOT BE REPRODUCED OR DISCLOSED TO OTHERS OR USED IN ANY OTHER WAY, IN WHOLE OR IN PART EXCEPT AS AUTHORIZED IN WRITING BY GMW INC.

REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		04/27/94	A.MARTIN
B	NEW T/B, SHIFT ITEM 11 & 12 TO FRONT OF BASE.		04/29/94	G.DOUGLAS
C	ADD HORIZONTAL MTG HOLES @ B6/D6		05/10/94	G.DOUGLAS
D	ADD 5403 MTG HOLES, DELETE BASE PLATE		04/28/95	G.DOUGLAS
E	ADD MOTORISED ROT BASE SPOOL HOLES @ C7		09/30/97	G.DOUGLAS
F	CHG ITEM 9 AND ITEM 13		07/29/98	G.DOUGLAS
G	ADD ITEM 16, "F" HOLES, INCR TRANSISTION PLATE SIZE		06/27/03	G.DOUGLAS
H	CHG ITEM 14 TO SHCS		04/15/04	G.DOUGLAS



MOUNTING HOLES

A=5403 DIRECT MOUNTING
B=3473/3472 DIRECT MOUNTING
C1/C2=3472 45° MOUNTING
D1/D2=3473 45° MOUNTING
C1/C3=3472 HORZ MOUNTING
D1/D3=3473 HORZ MOUNTING
E=MOTORISED ROT BASE SPOOL
F=5403EG DIRECT MOUNTING

NOTES

1. ADJUST SET SCREW FOR MINIMUM CLEARANCE ALLOWING FOR FULL FREE ROTATION; AND LOCTITE
2. FORM DECAL TO PLATE DIA TO PREVENT ENDS FROM SPRINGING LOOSE
3. GREASE BEARING SURFACES BEFORE ASSEMBLY
4. ITEM 14 AND ITEM 15 ONLY USED IF ROTATING BASE SOLD SEPARATELY. SEE DWG NO 11803430 FOR DETAILS ON MOUNTING ROTATING BASE TO ROLLING BASE

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
16	1	10901140	LABEL, IDENTIFICATION	
15	4	DIN 7980	WASHER, M12 SPRING, S/S	4
14	4	DIN 912	SCREW, M12 x 25 SK HD CAP S/S	4
13	4	DIN 913	SCREW, M6 x 8 SHSS , OVAL PT S/S	
12	1	10901150	LABEL, ANGLE GRADUATIONS 0-360°	
11	1	10901160	LABEL, VERNIER INDEX	
10	1	17802140	SPACER, BEARING	
9	32	RB-11.906	BALL BEARING 11.91mm [15/32"] DIA SKF	
8	4	DIN 912	SCREW, M6 x 10 SK HD CAP, S/S	
7	4	17802150	CLAMP, RETAINING	
6	2	17901340	CLAMP PAD	
5	2	17802170	HANDWHEEL, M10	
4	1	17802132	LOWER THRUST BEARING PLATE	
3	1	17802131	UPPER THRUST BEARING PLATE	
2	4	DIN 912	SCREW, M12 x 20 SK HD CAP S/S	
1	1	17802100	TRANSITION PLATE	

DRAWN A.MARTIN 04/27/94
CHECK DATE
ENGINEERING DATE

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

NEXT ASSY | SYSTEM

SOFTWARE AUTOCAD 2000

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE ROTATING BASE 3473/3472/5403

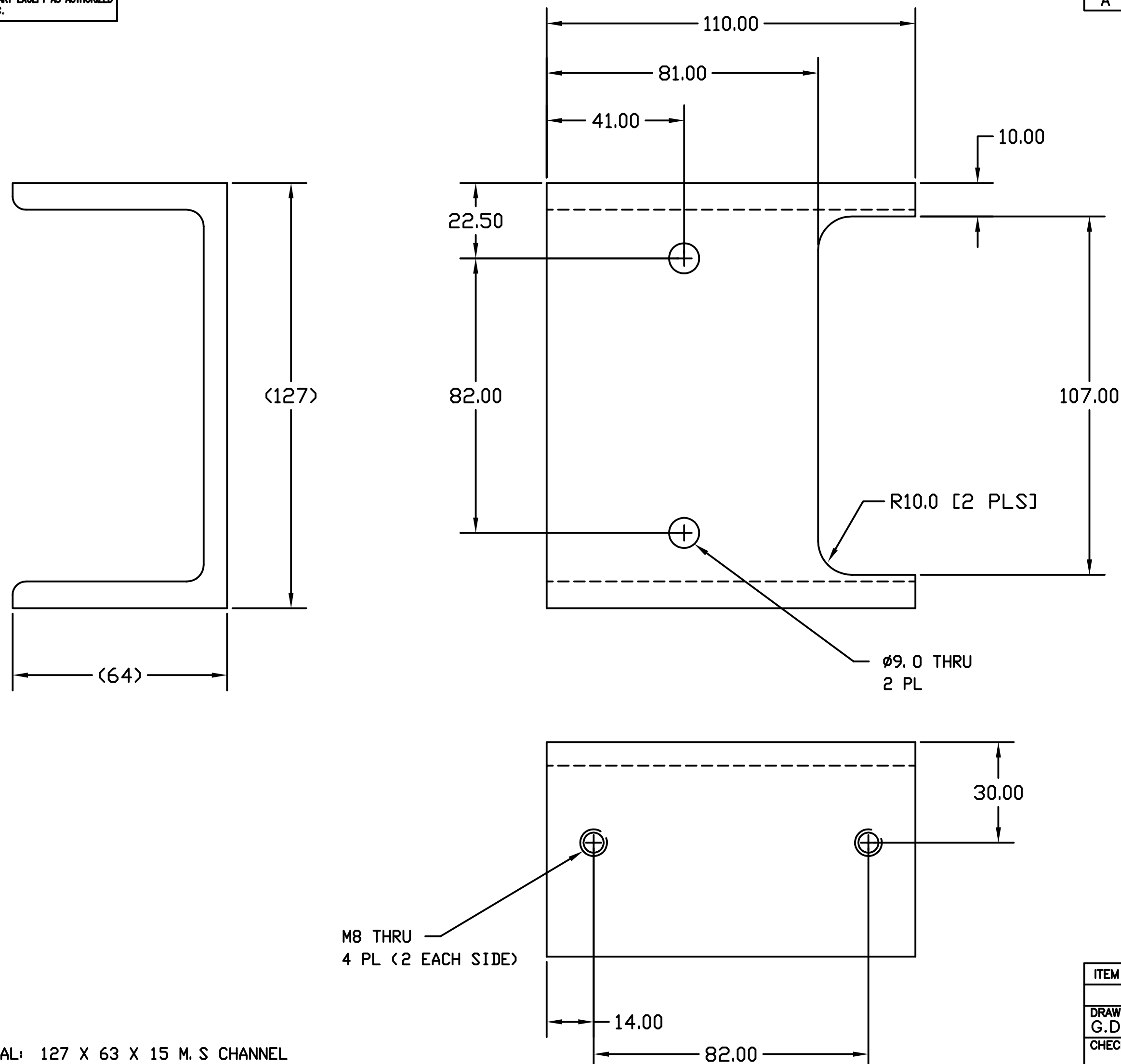
SIZE A1 DRAWING NO. 11802090 REV H

SCALE 1:2 WT kg SHEET 1 OF 1

PROPRIETARY
THIS DRAWING CONTAINS CONFIDENTIAL INFORMATION PROPRIETARY TO GMW INC. IT MUST NOT BE REPRODUCED OR DISCLOSED TO OTHERS OR USED IN ANY OTHER WAY, IN WHOLE OR IN PART EXCEPT AS AUTHORIZED IN WRITING BY GMW INC.

REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE, REDRAWN FROM DWG NO 17612640		07/01/03	G.DOUGLAS



NOTES

1. MATERIAL: 127 X 63 X 15 M.S CHANNEL
2. DE BURR & BREAK SHARP EDGES
3. FINISH: PAINT PRECISION TAN TO BSL: TP85800010

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN	DATE
G.DOUGLAS	07/01/03
CHECK	DATE
ENGINEERING	DATE

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63 ✓	1.6 ✓

THIRD ANGLE PROJECTION

NEXT ASSY	SYSTEM
11901050	5403EG-20
11901080	5403EG-50
11901100	5403

SOFTWARE
AUTOCAD 2000

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
VERT MTG BRK
MODEL:5403/5403EG

SIZE	DRAWING NO.	REV
A2	17901610	A

SCALE 1:1 | WT kg | SHEET 1 OF 1

PROPRIETARY
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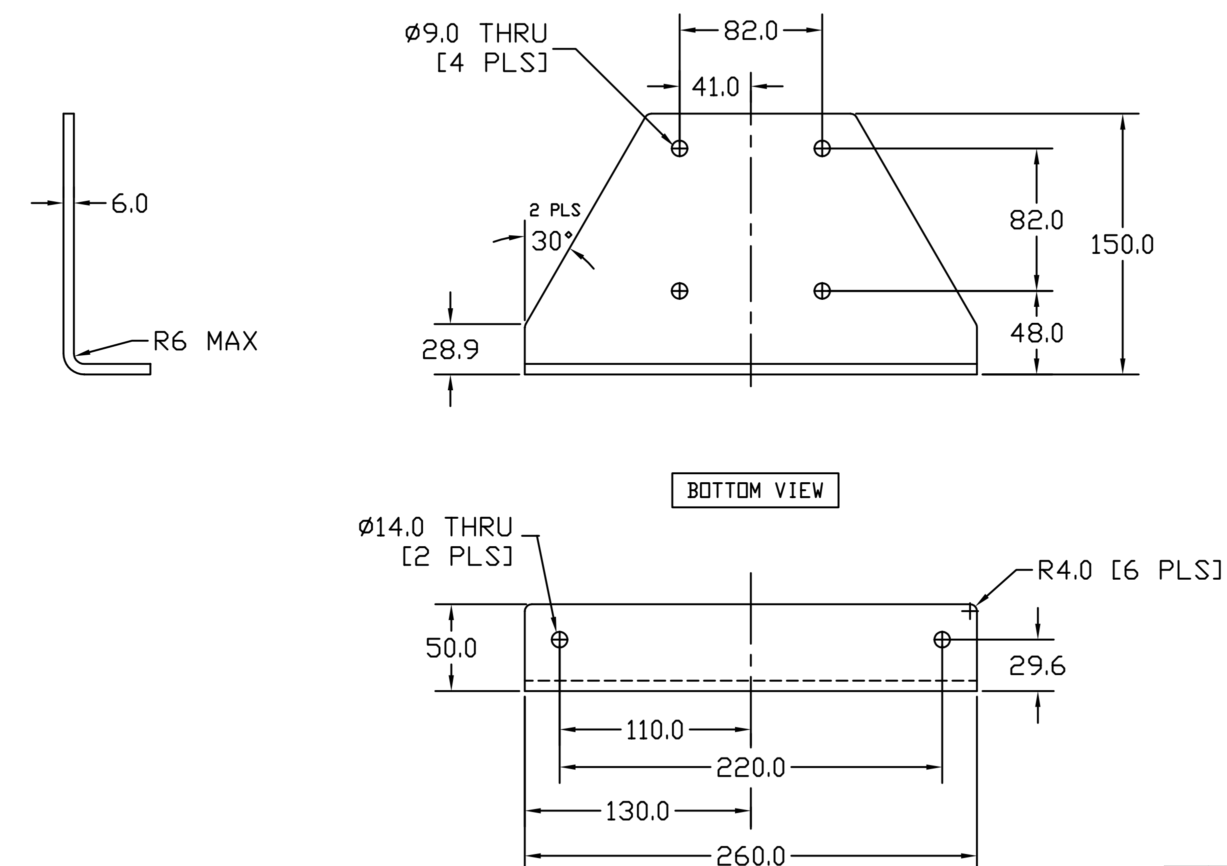
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE, REDRAWN FROM DWG NO 1761250		11/25/97	G.DOUGLAS



NOTES

1. MATERIAL: M/S PLATE 6MM THICK
2. DE BURR & BREAK SHARP EDGES 0.2MM
3. FINISH: PAINT PRECISION TAN TO BSL: TP85800010
4. NO REQD: 2 PER MAGNET.

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN G.DOUGLAS	DATE 11/25/97	
CHECK	DATE	
ENGINEERING	DATE	
11901050	5403EG-20	
11901080	5403EG-50	
11901100	5403	
NEXT ASSY	SYSTEM	

SOFTWARE AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63 ✓	1.6 ✓

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
ANGLE BRACKET
MODEL:5403/5403EG

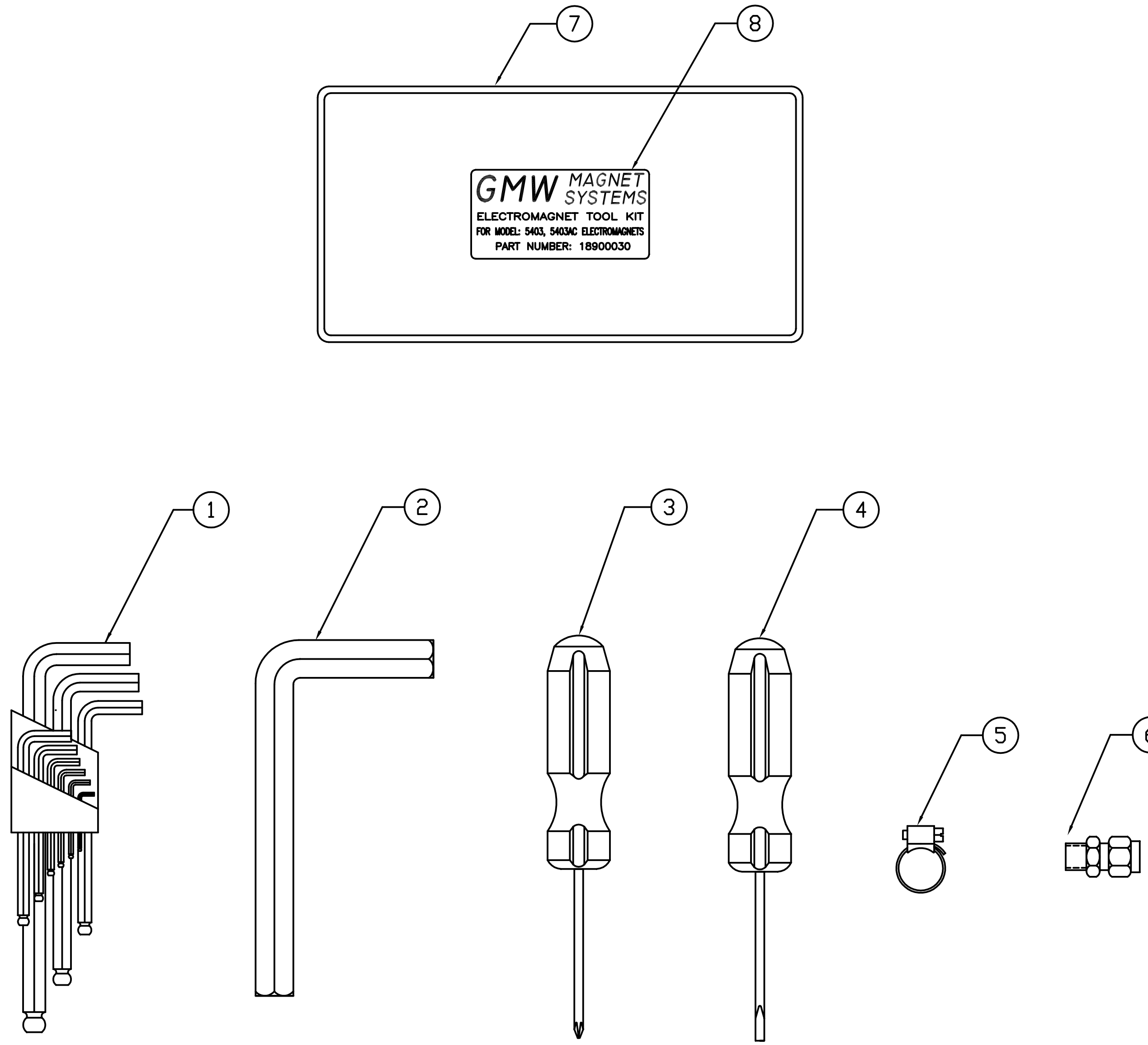
SIZE	DRAWING NO.	REV
A2	17901450	A

SCALE 1:2 | WT kg | SHEET 1 OF 1

PROPRIETARY
THIS DRAWING CONTAINS CONFIDENTIAL INFORMATION PROPRIETARY TO GMW INC. IT MUST NOT BE REPRODUCED OR DISCLOSED TO OTHERS OR USED IN ANY OTHER WAY, IN WHOLE OR IN PART EXCEPT AS AUTHORIZED IN WRITING BY GMW INC.

REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		05/13/95	G.DOUGLAS



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
8	1		LABEL, TOOL KIT	
7	1	V401	STORAGE BOX, PLASTIC. FLAMBEAU	
6	2	NY-400-1-2	TUBE COUPLING, NYLON 1/4" 1/8NPT	
5	2	350-006	HOSE CLIP, TRIDON	
4	1	62-133	SCREWDRIVER, SLOTTED. STANLEY	
3	1	62-021	SCREWDRIVER, PHILLIPS. STANLEY	
2	1		HEX KEY WRENCH, 17mm	
1	1	BLX 9mm	HEX KEY WRENCH SET, BONDHUS	

PARTS LIST

DRAWN G.DOUGLAS DATE 04/24/95
CHECK DATE
ENGINEERING DATE
NEXT ASSY: 5403 SYSTEM
SOFTWARE: AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
P.O. Box 2578, Redwood City, CA 94064
Tel: (415)802-8292. Fax: (415)802-8298.

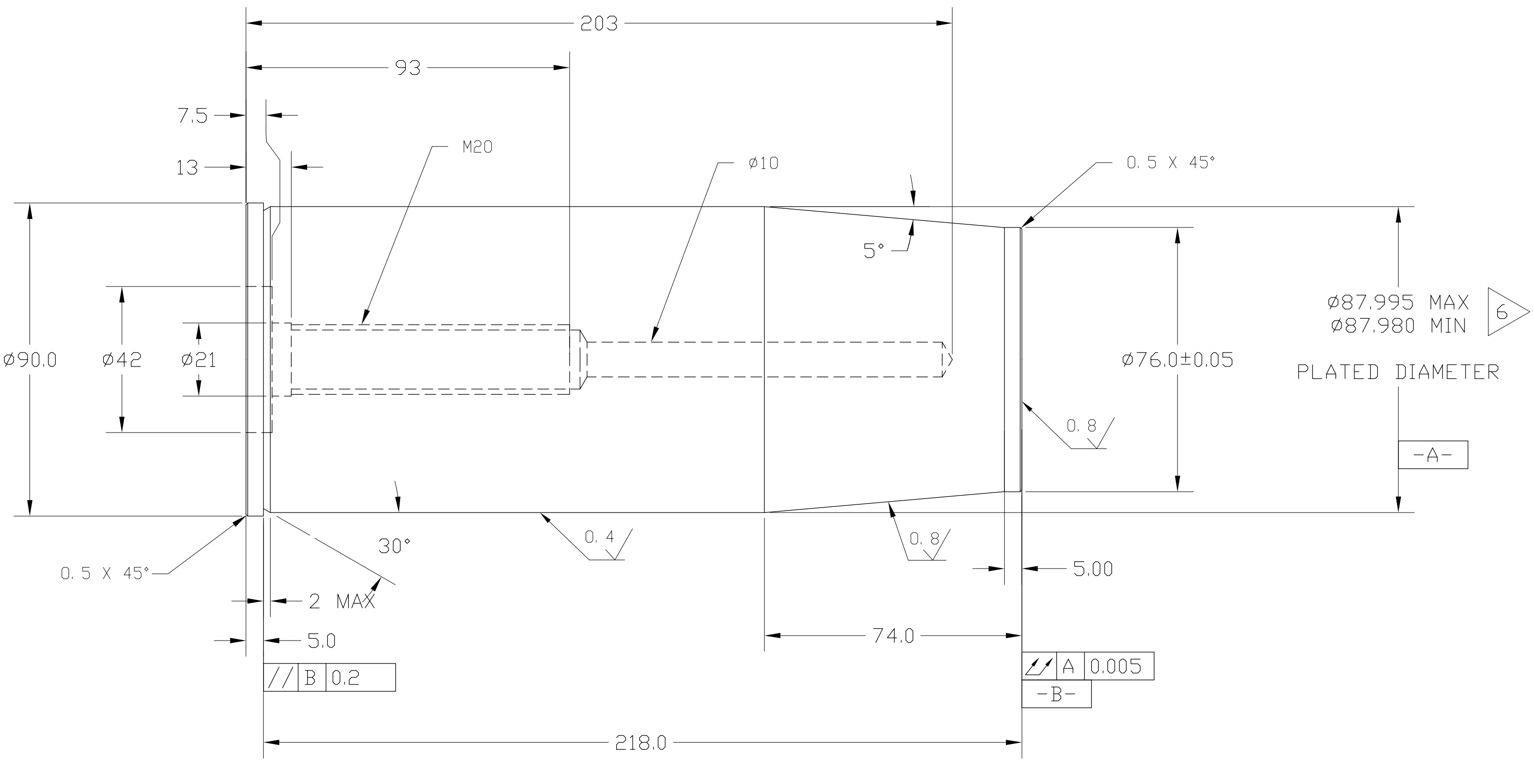
TITLE: MAGNET TOOL KIT MODEL:5403,5403AC

SIZE: A1 | DRAWING NO.: 18900030 | REV: A
SCALE: 1:1 | WT kg | SHEET 1 OF 1

PROPRIETARY
THIS DRAWING CONTAINS CONFIDENTIAL INFORMATION PROPRIETARY TO GMW INC. IT MUST NOT BE REPRODUCED OR DISCLOSED TO OTHERS OR USED IN ANY OTHER WAY, IN WHOLE OR IN PART EXCEPT AS AUTHORIZED IN WRITING BY GMW INC.

REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		06/08/04	G.DOUGLAS
B	CHANGE POLE DIAMETER TOLERANCE		06/25/07	G.DOUGLAS



NOTES

1. MATERIAL: 1006 LOW CARBON STEEL
2. MATERIAL MUST BE CUT WITH THE AXIS OF THE POLE RUNNING IN THE SAME DIRECTION AS THE RAW PLATE GRAIN
3. ROUGH MACHINE THEN ANNEAL TO BSL: TP85800040
4. ELECTROCLEAN ONLY, DO NOT ORBITAL SAND
5. FINISH: E.N PLATE 0.01 THICK TO BSL: TP85800120
6. CRITICAL DIAMENSION [MEASUREMENT DONE AFTER PLATING] DO NOT EXCEED MAX PLATED DIAMETER.
7. 2 REQD PER MAGNET

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN G.DOUGLAS	DATE 04/31/04	
CHECK	DATE	
ENGINEERING	DATE	
11901200	5403	
11901100	5403	
NEXT ASSY	SYSTEM	

SOFTWARE AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
POLE 76MM
MODEL: 5403

SIZE A2 | DRAWING NO. 17901510 | REV B

SCALE 1:1 | WT kg | SHEET 1 OF 1

PROPRIETARY
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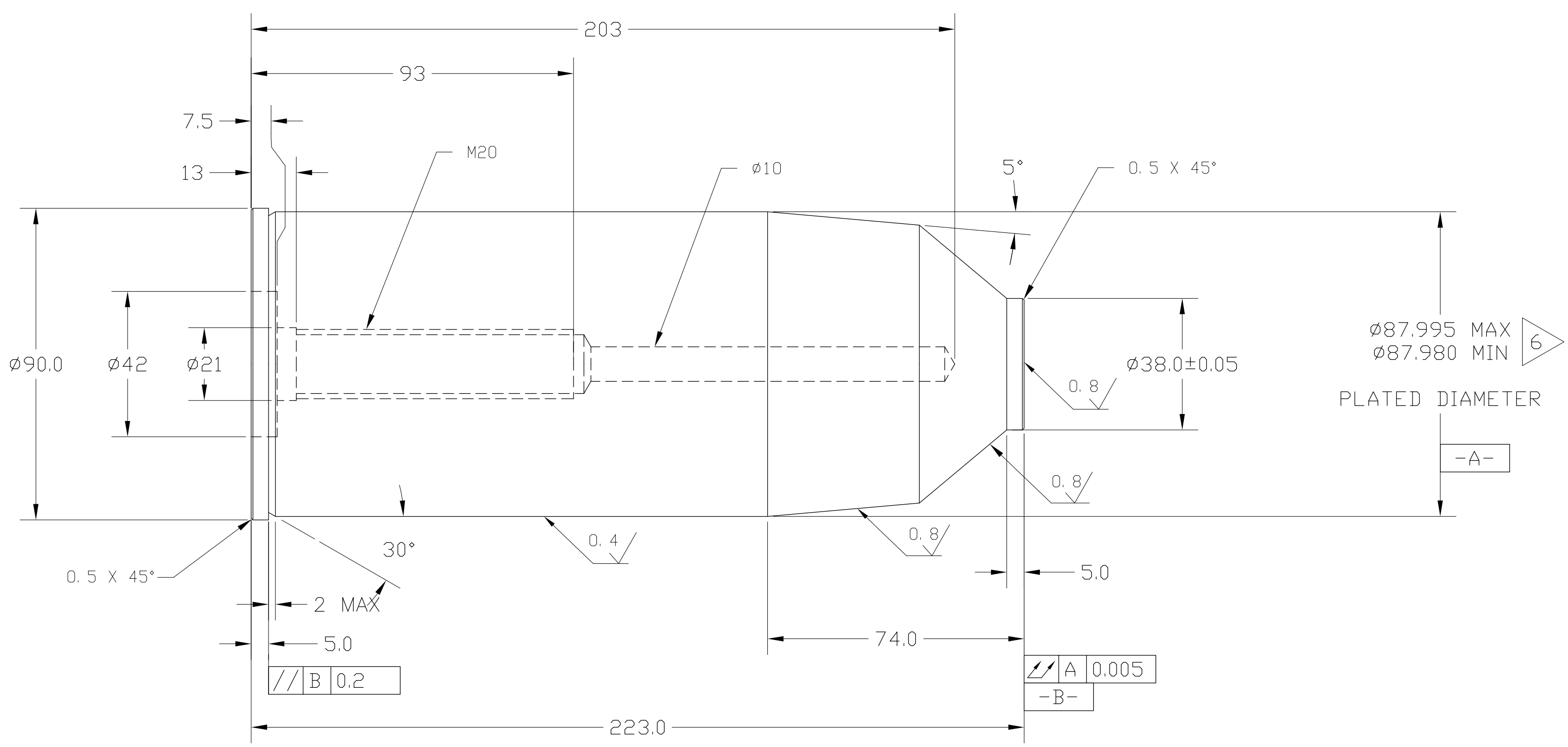
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		06/08/04	G.DOUGLAS
B	CHANGE POLE DIAMETER TOLERANCE		06/25/07	G.DOUGLAS



NOTES

1. MATERIAL: 1006 LOW CARBON STEEL
2. MATERIAL MUST BE CUT WITH THE AXIS OF THE POLE RUNNING IN THE SAME DIRECTION AS THE RAW PLATE GRAIN
3. ROUGH MACHINE THEN ANNEAL TO BSL: TP85800040
4. ELECTROCLEAN ONLY, DO NOT ORBITAL SAND
5. FINISH: E.N PLATE 0.01 THICK TO BSL: TP85800120
6. CRITICAL DIAMENSION [MEASUREMENT DONE AFTER PLATING] DO NOT EXCEED MAX PLATED DIAMETER.
7. 2 REQD PER MAGNET

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN	DATE
G.DOUGLAS	04/06/04
CHECK	DATE
ENGINEERING	DATE
11901200	5403
11901100	5403
NEXT ASSY	SYSTEM

SOFTWARE
AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63 ✓	1.6 ✓

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
POLE 38MM
MODEL: 5403

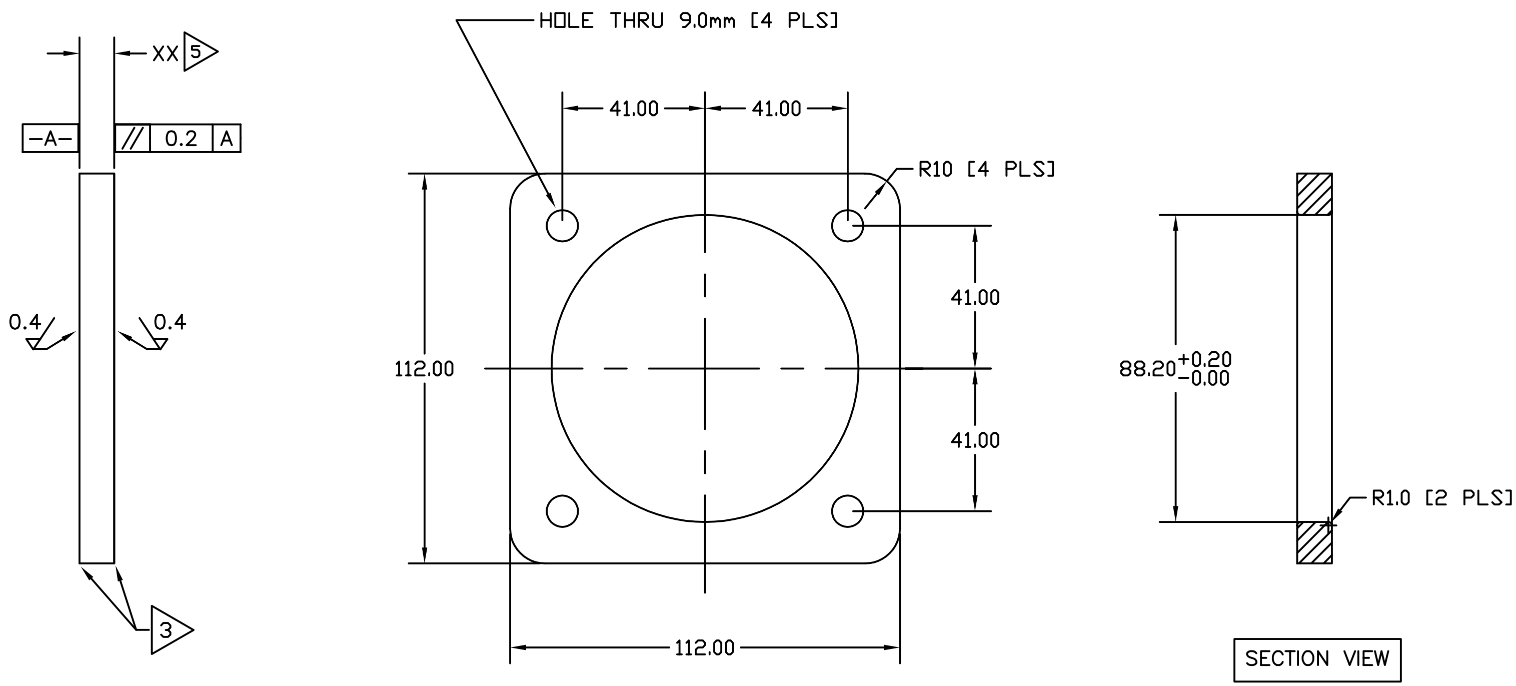
SIZE	DRAWING NO.	REV
A2	17901520	B

SCALE 1:1 | WT kg | SHEET 1 OF 1

PROPRIETARY
THIS DRAWING CONTAINS CONFIDENTIAL INFORMATION PROPRIETARY TO GMW INC. IT MUST NOT BE REPRODUCED OR DISCLOSED TO OTHERS OR USED IN ANY OTHER WAY, IN WHOLE OR IN PART EXCEPT AS AUTHORIZED IN WRITING BY GMW INC.

REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		11/24/97	G.DOUGLAS
B	CHANGE HOLE SIZE & TOL		05/01/02	G.DOUGLAS
C	ADD NOTE: 5		06/09/03	G.DOUGLAS
D	INCREASE BORE ID & CHANGE TOLERANCE		04/16/04	G.DOUGLAS



NOTES:

1. MATERIAL: 1018 MILD STEEL
2. FINISH: E.N PLATE 0.01MM THICK TO BSL TP85800120
3. BREAK ALL SHARP EDGES 0.2MM.
4. NO REQD: 2 PER MAGNET
5. SPACER THICKNESS SPECIFIED BY PART NO SUFFIX.
   10mm THICK SPACER = PART NO 17901400-10
   12.5mm THICK SPACER = PART NO 17901400-12.5

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

NEXT ASSY	SYSTEM
11901080	5403EG-50
11901050	5403EG-20
11901100	5403

DRAWN G.DOUGLAS DATE 11/24/97
CHECK DATE
ENGINEERING DATE

SOFTWARE AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63 ✓	1.6 ✓

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE: POLE SPACER MODEL: 5403

SIZE A2 | DRAWING NO. 17901400 | REV D

SCALE 1:1 | WT kg | SHEET 1 OF 1

PROPRIETARY
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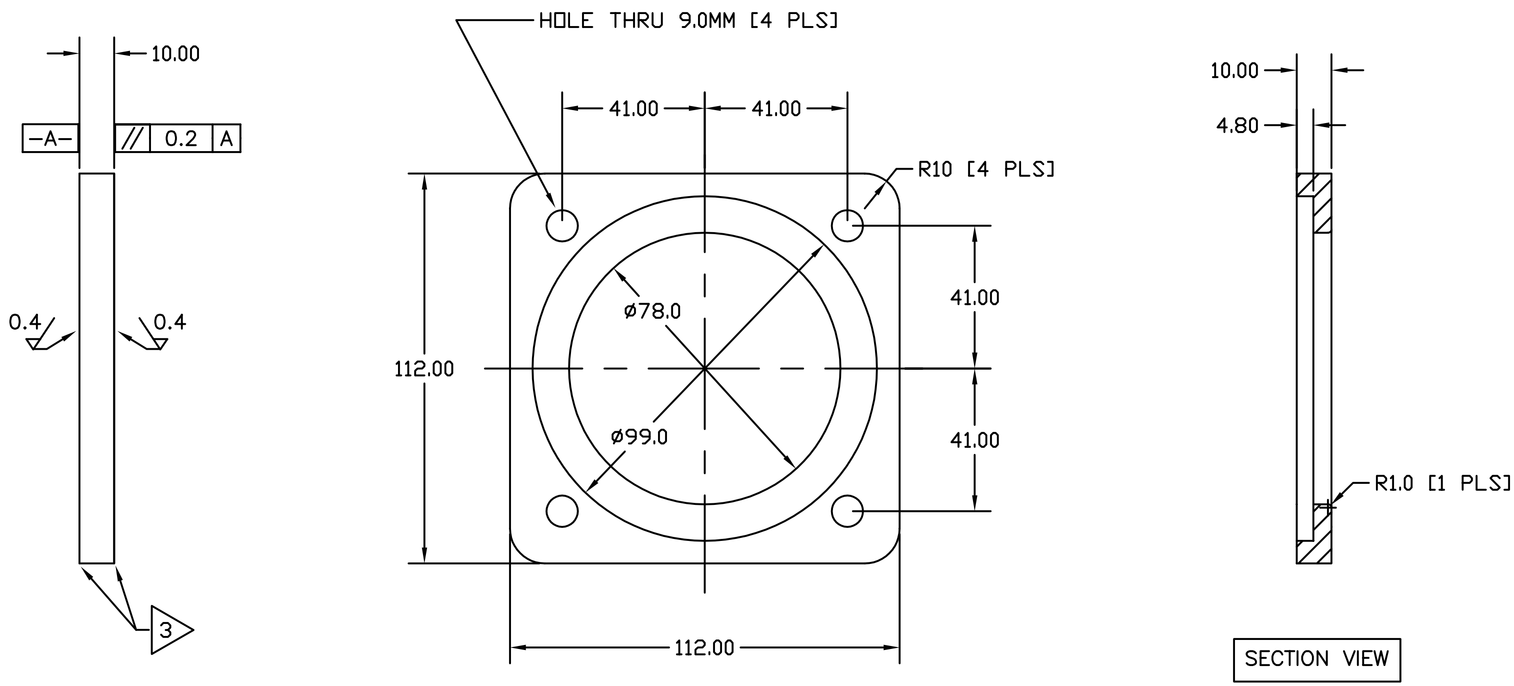
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		12/12/97	G.DOUGLAS
B	CORRECT MATERIAL CALLOUT		04/16/04	G.DOUGLAS



NOTES:

1. MATERIAL: 1018 MILD STEEL
2. FINISH: E.N PLATE 0.01MM THICK TO BSL TP85800120
3. BREAK ALL SHARP EDGES 0.2MM.
4. NO REQD: 2 PER MAGNET

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN G.DOUGLAS — DATE 12/12/97
CHECK — DATE
ENGINEERING — DATE

NEXT ASSY	SYSTEM
11901080	5403EG-50
11901050	5403EG-20
11901100	5403

SOFTWARE AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63 ✓	1.6 ✓

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

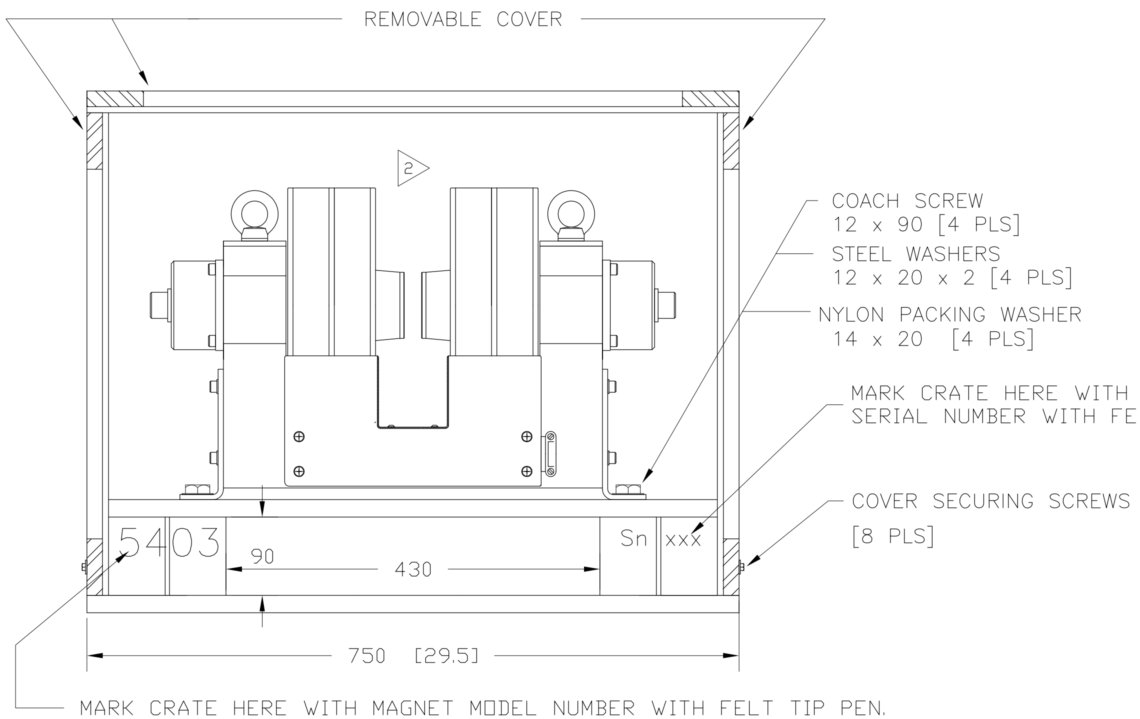
TITLE
POLE RETAINER MODEL: 5403

SIZE A2 | DRAWING NO. 17901470 | REV B
SCALE 1:1 | WT kg | SHEET 1 OF 1

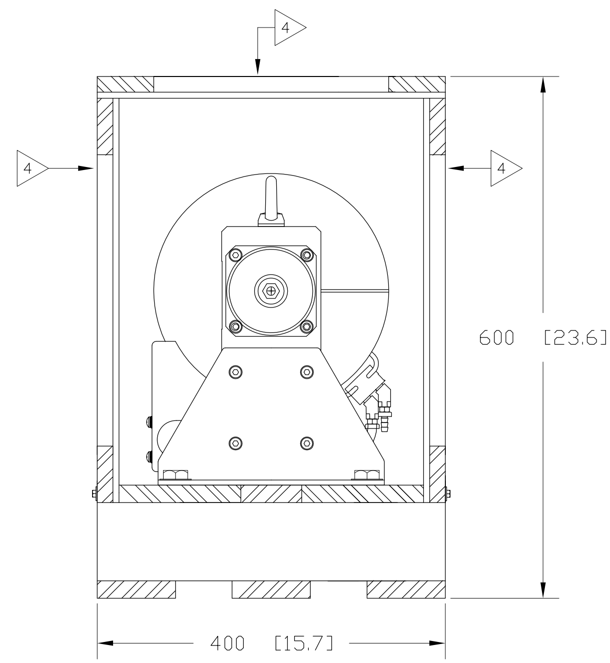
PROPRIETARY
THIS DRAWING CONTAINS CONFIDENTIAL INFORMATION PROPRIETARY TO GMW INC. IT MUST NOT BE REPRODUCED OR DISCLOSED TO OTHERS OR USED IN ANY OTHER WAY, IN WHOLE OR IN PART EXCEPT AS AUTHORIZED IN WRITING BY GMW INC.

REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	REDRAWN FROM DWG NO: 18800281		06/08/04	G.DOUGLAS
B	ADD NOTE 3		04/13/05	G.DOUGLAS
C	INCREASE CRATE HEIGHT, 5403AC ADDED TO NOTE: 2		08/26/05	G.DOUGLAS



NOTE: DO NOT GLUE or STAPLE TOP COVER TO PALLET



SHIPPING WEIGHT: 150 Kg [330 lbs]

NOTE:
1. THE 5403 SHIPPING CRATE HAS A ONE PIECE COVER
2. THIS DRAWING SHOWS MODEL 5403 ELECTROMAGNET SAME SHIPPING CRATE CAN BE USED FOR MODEL: 5403AC, 5403FG, 5403EG-20 & 5403EG-50
3. SEE DRAWING NO: 18900771 FOR CRATE CONSTRUCTION DETAILS
4. CRATE PLYWOOD TO BE MARKED ON SIDES AND TOP STATING TIMBER IS HEAT TREATED.

COVER REMOVAL:

1. REMOVE THE COVER SECURING SCREWS
2. GRIP THE COVER AT THE TOP LH AND RH CORNERS
3. LIFT THE COVER VERTICALLY HIGH ENOUGH TO CLEAR THE MAGNET
4. MOVE THE COVER SIDEWAYS AND PLACE ON FLOOR

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN: G.DOUGLAS — DATE: 04/21/04
CHECK — DATE
ENGINEERING — DATE

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

NEXT ASSY — SYSTEM
SOFTWARE AUTOCAD 2000
THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE: SHIP CRATE ASSY MODEL: 5403

SIZE: A2 — DRAWING NO.: 18900770 — REV: C
SCALE: 1:4 — WT kg — SHEET 1 OF 1

PROPRIETARY
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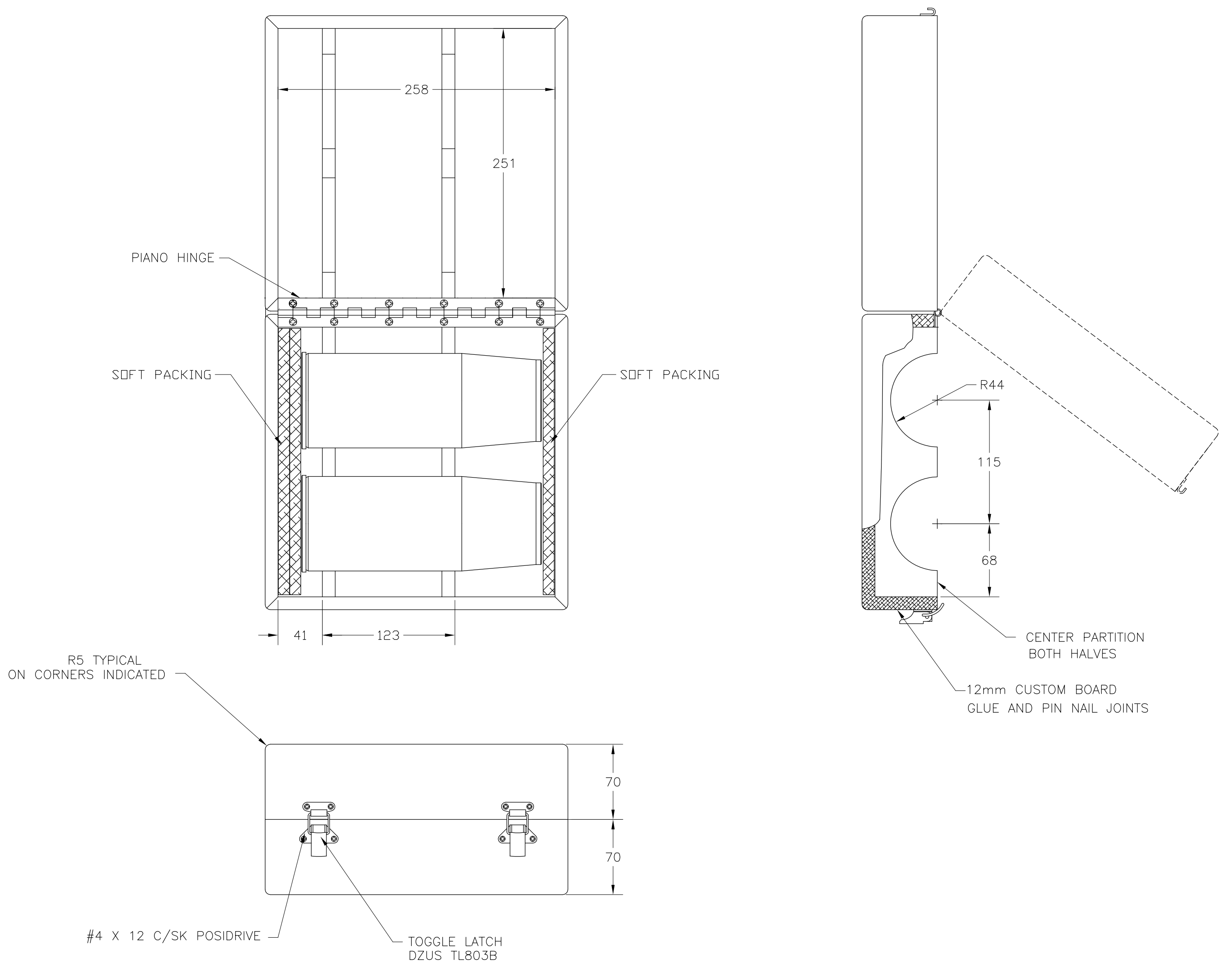
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	REDRAWN FROM DWG NO: 17803500		06/08/04	G.DOUGLAS



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN G.DOUGLAS DATE 04/08/04
CHECK DATE
ENGINEERING DATE

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63 ✓	1.6 ✓

THIRD ANGLE PROJECTION

NEXT ASSY | SYSTEM

SOFTWARE AUTOCAD 2000

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
POLE PACKING BOX
MODEL: 5403

SIZE A1 | DRAWING NO. 18900750 | REV A

SCALE 1:2 | WT kg | SHEET 1 OF 1