USER'S MANUAL

MODEL: 5201
MODEL: 5201-MRD-MPS

PROJECTED FIELD ELECTROMAGNET
MOTORIZED ROTATING DRIVE

Date Sold:_____

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Section 1
SPECIFICATIONS
Model: 5201 Electromagnet Specifications

Field: (at max current)	B_x.= ±0.3T (3000G) **(**X,Y,Z = 0, 0, 4mm)
Projected Field Region (for B_x)	X = ± 2mm Y = ± 5mm Z = 0 to 12mm
Coil:	
coil resistance (20°C)	0.85 Ohm
max resistance (hot)*	1.02 Ohm
max power	20A/20V (400W)
Self Inductance:	
Cooling:	0.5 Litre/min 1.0 bar [14 psid]
Thermal Interlock:	Open circuit above 75° C (167° F)
Dimensions:	Drawing 11901860 70.0 mm W x 60.0 mm D x 120 mm H 2.8 inch W x 2.4 inch D x 4.7 inch H
Weight:	4 kg (9 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.

SPECIFICATIONS

Table 1. Model 5201-MRD Specifications

Rotation Angle: [from zero point]	+/- 200 deg max
Rotation Repeatability:	+/- 0.2 deg max
Rotation Accuracy:	+/- 0.5 deg max
Mechanical Stops:	approx. +/- 210 deg max
Limit Switches:	approx. +/- 200 deg max
Homing Switch:	0.0deg
Drive System:	
Gear type	Worm/Worm Gear
Mechanical reduction	100:1
Stepper Motor:	
Motor type	VS13B-SFRIO
Motor torque	0.5Nm (73 oz.in)
Motor frame size	17
Stepper Motor Controller:	
Model	Compumotor Zeta 6104
AC Power	115V AC only
Rotation Axis Scaling:	approx. 6944 steps/deg
Dimensions:	Drawing 11901960 200 mm W x 200 mm D x 193 mm H 7.9 inch W x 7.9 inch D x 7.6 inch H
Weight:	4 kg (9 lb)

Section 2

WARNINGS

REFER TO WARNINGS BELOW BEFORE OPERATING ELECTROMAGNET SYSTEM

ELECTROMAGNET

1. Safety

In operation the magnet fringing field in the vicinity of the pole gap is in excess of 0.5mT (5G). This can cause malfunctioning of sensitive electronic and magnetic components. We recommend that warning signs are posted indicating that a magnetic field may be present.

2. Ferromagnetic Objects

During operation the magnet exerts magnetic attraction towards ferromagnetic objects in the near vicinity of its pole gap. Keep ferromagnetic items clear!

3. Arcing

This magnet stores 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 arcing and possible damage to electronic circuits.

4. **Coil Hot Resistance**

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

5. Watches, Credit Cards, and Magnetic Disks

Do not move magnetically sensitive items into the close vicinity of the magnet pole. 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 0.5mT (5G) with the magnet power supply off or disconnected.

MOTORIZED ROTATIONAL DRIVE

1. Hand Operation

Do not rotate the Motorized Rotating Drive platen by hand. For hand operation the Motor Drive assembly must be removed. See maintance section for instruction on how to remove the Motor Drive assembly.

2. Obstructions

Keep foreign objects and tools clear of the Motorized Rotation Drive. Ensure the Electromagnet and Motorized Rotation Drive do not contact obstructions during rotation.

Section 3

INSTALLATION
HARDWARE

Mounting Position (Refer to drawing 11902050)
The magnet system can be mounting in any orientation, including being completely inverted. The motorized rotating drive can be adjusted for height and also leveled by following the procedure below.

1. Loosen setscrew [item 19]
2. Screw –in/out foot assembly to adjust height and level as required
3. Retighen setcrew [item 19]

Four M5 mounting holes are provided on the bottom of the Motorized Rotating Drive for inverted mounting or securing to test fixture etc.

Electrical Connections
The magnet system comes with integrated wiring for the magnet, and motorized rotating drive. Never connect or remove cables from the magnet system with the AC power energized otherwise damage to the magnet power supply or MRD stepper motor controller may occur. Follow instruction below for making electrical connections.

Power Supply (Refer to drawing 11901950 & 13900420)
1. Plug in the magnet cable plug into the back of Kepco BOP power supply.
2. Secure the connecting plug with the two securing thumbscrews.
3. Connect the three sleeved wires to the output connector block on the rear of the Kepco BOP power supply as detailed below.

- Black Wire with RED sleeve to Output
- Black Wire with BLUE sleeve to Common
- Green wire to Ground

4. Connect GPIB ribbon cable to edge connector on GPIB board.
5. Connect GPIB adaptor into the back of Kepco BOP power supply.
6. Secure GPIB adaptor with the two adaptor securing thumbscrews.
7. Connect GPIB cable to adaptor and secure with GPIB connector thumbscrews.
8. Connect the other end of the GPIB cable to the host computer.
9. Secure GPIB cable with the two GPIB connector securing thumbscrews.
10. Connect Kepco power supply to AC power source with cord set provided.

Motorized Rotating Drive (Refer to drawing 13900350)
1. Plug in the black 9 way plug on the MRD cable into the Motor connector on the Zeta 6104 controller.
2. Plug in the black 4 way plug on the MRD cable into the Limits connector on the Zeta 6104 controller.
3. Plug in the black 4 way plug on the serial communication cable into the Com 1 connector on the Zeta 6104 controller. Connect other end to host computer.
4. Connect Zeta 6104 controller to 115V AC power source with cord set provided.

Section 3

INSTALLATION
HARDWARE

Electrical Interlocks

The Model 5201 has two temperature switches, Selco part no 802L-075. They are located on the pole/coil assembly heatsinks and wired in series. The temperature switches are normally closed, opening when the coil heatsink temperature exceeds 75° C +/5° C.

Water Cooling (Refer to drawing 11901960)

The Model 5201 can be operated to an average coil temperature of 70° C. Assuming an ambient laboratory temperature of 20°C and a temperature coefficient of resistively 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 pole/coil heatsink temperature exceeds approximately 75° C. If either temperature switch opens then the Magnet power supply circuit breaker will trip to the off position. Clean, cool (16°C - 20°C) water at 0.5 *l*/min at 1.0 bar (14 psid) should be used to cool the 5201 magnet.

The cooling copper tubes are electrically isolated from the coils to avoid electrochemical corrosion. A 50 micron filter should be placed before the input to the magnet to trap particulates and avoid blockage of the cooling circuits.

Water Cooling Connections

The magnet system has two water cooling connections provided on the rear of the motorized rotating drive. Two barbed “push on” hose couplings are provided to suit 6 mm (1/4”) ID rubber hose.

- Water Inlet: Connect to a clean water source fitted with a suitable metering valve (to control water flow).
- Water Outlet: Connect to drain.

Inlet Water Metering Valve Kit.

Metering Valve (brass)	SWAGELOCK Cat No: B-4MG2 (1 required)
Hex Coupling (brass) 1/4” NPT female	SWAGELOCK Cat No: B-4-HGC (2 required)
Hose Connectors (brass) 1/4” NPT to1/4”Hose	SWAGELOCK Cat No: SB-PB4-PM4 (2 required)
Hose Push On (black) 1/4” ID	SWAGELOCK: Cat No: PB-4-BK (as required)

Section 3

INSTALLATION
SOFTWARE

Software Requirements

- An IBM PC 486/Pentium or compatible.
- 8Mb RAM memory.
- SVGA monitor running 1024 x 768 pixels. [Note1]
- CD Rom Drive.
- GPIB Board [National Instruments compatible].
- Windows 95/98/ME/XP Operating System software.
- LabVIEW for Windows 95/98/ME/XP.Ver 6.0 or higher.

Motorized Rotating Drive software can also be supplied as an executable file and run directly from the Windows Operating System. In this case LabVIEW for Windows V6.0 is not required. [Note 2]

Software Installation

The Motorized Rotating Drive LabVIEW driver and support files are all located in a directory called 5201 Magnet Control.

To install the driver follow the directions given below.

1. Insert CD rom into computer CD ROM drive
2. Copy the complete 5201 Magnet Control directory to the host computers hard drive.
3. Locate the Default.dat file in the Data directory.
4. Right mouse click on the file properties
5. Uncheck the Read Only attribute.

Before running the 5201 Magnet Control software set the Com Port control to match the Com Port being used on the control computer. [Com 1 is the default.] The 5201 Magnet power supply is set to GPIB address 2 and is not changeable from the Setup Panel.

Note:

1. Using screen resolutions other than 1024 x 768 means all items on the LabVIEW front panels will have to be resized by the end user.
2. **The executable program file cannot be altered by the end user**. Consult GMW if the 5201 Magnet Control software is required as a executable file.

Section 4

OPERATION
SOFTWARE DESCRIPTION

MAIN CONTROL PANEL

Panel Control:. Makes either Setup or Automatic control panels visible.

Control Mode:. Selects either Manual or Automatic control mode of operation.

Key Focus Control:. When Key Focus is turned on the selected control is controlled by the Up an Down arrows on the computer keyboard. A set value can also be directly entered from the numeral keypad. By default the lowest significant digit is controlled and rolls over to the next highest digit. Roll over occurs between the lowest to the most significant digit.

System Shutdown: Sets zero current on the magnet power supply, and stop rotation on the Motorized Rotating Drive. Finally this LabVIEW application stops running, and a System Shutdown message is displayed.

MAGNET FIELD CONTROL

Setpoint Control: Selects either a current setpoint in Amps or field input in Tesla.

Setpoint Mode Control: Selects either current control or field control of the magnet system..

Excitation File Control: Makes sub panel visible for the creating and loading of open loop characterization files.

Magnet Voltage Indicator: Display voltage from the magnet power supply.

Magnet Current Indicator: Display current from the magnet power supply.

Loaded Excitation File: Displays the current loaded excitation file.

MAGNET ROTATION CONTROL PANEL

Home CW Control: Makes the motorized rotating Drive rotate in a clockwise direction until it finds the homing position at 0.0 deg and resets the current position counter to 0.0 deg.

Home CCW Control: Makes the motorized rotating Drive rotate in a counterclockwise direction until it finds the homing position at 0.0 deg and resets the current position counter to 0.0 deg.

Counter Reset Control: Resets the current position counter to 0.0 deg.

Velocity Control: Sets the velocity of the stepper motor.

Set Position Control: Sets the MRD platen to the desired position.

Immediate Control: Starts the MRD in motion as soon as set position input value is entered.

Go Control: If immediate control is turned off, no motion occurs on the MRD until the Go button is pressed.

Start Motion CCW Control: Starts the motorized rotating drive rotating in a counterclockwise direction until a soft limit is reached, or the **Stop Motion** button in pushed.

Start Motion CW Control: Starts the motorized rotating drive rotating in a clockwise direction until a soft limit is reached, or the **Stop Motion** button in pushed.

Stop Motion Control: Stops the motorized rotating drive rotating at any time.

Emergency Stop Control: Stops the motorized rotating drive rotating INSTANTLY.

<u>FOR EMERGENCY USE ONLY</u>.

MAGNET ROTATION CONTROL PANEL (Continued)

CCW Limit Control: Stops the motorized rotation drive from rotating in thecounterclockwise direction when the current position counter equals the CCW limit setting.[A red indicator shows when limit is reached.]

CW Limit Control: Stops the motorized rotation drive from rotating in theclockwise direction when the current position counter equals the CW limit setting. [A red indicator shows when limit is reached.]

Current Position Indicator: Shows the motorized rotation drive current position on a digital display. Units are in degrees from the initialized zero position, [normally 0.0 deg.]

Ramp Indicator: Shows velocity ramp up and down as set position is approached.

SETUP PANEL (Visible only when selected with the Panel Control)

Com Port Control: Selects the computer serial port to use to communicate with the stepper motor controller. [Set to Com 1 as default.]

Motor Controls: Sets the acceleration, start of speed ramp down, ramp rate and axis scaling of the stepper motor. Ramp feature can be turn On or Off by the Ramp control switch

Home Motion Controls: Sets the acceleration, deceleration and velocity of the stepper motor when homing to the 0.0 deg position.

Soft Limits Range: Sets the maximum, minimum and increment on the soft limits scale. Soft Limit feature can be turned On or Off by the Soft Limits control switch.

Velocity Chart Indicator: Shows the current acceleration, deceleration and velocity of the stepper motor.

Reset Controller on Start Up: Sends a Reset command to the stepper motor controller. This command is only sent once when the program starts.

AUTOMATIC CONTROL/LOGGING PANEL (Visible only when selected with the Panel Control).

Date Indicator: Shows the data from the computers clock.

Time Indicator: Shows time from the computers clock.

Step in Progress: Shows the current row of data being used for automatic control.

Automatic Control: Turns On and Off the automatic operation from the table setting control.

Logging Control: Turns On and Off logging of system data to log file.

Table Settings Control: The table setting control has five columns of data. Step is the row of Data in use. Current or Field settings are sent to the magnet power supply. Rotation settings are sent to the Motorized Rotating Drive. Time in seconds is the interval between steps.

Step Control: Single steps the table control through steps 1,2,3,4 etc.

Zero Control: Returns the table control to step 1.

OPERATION
SOFTWARE DESCRIPTION

Auto Log Indicator: Flash's yellow when data is being written to log file.
Data to File Indicator: Shows data that will be written to log file.
Log File Indicator: Reads the data from the current log file.
Log File Name Indicator: Shows the current log file name.
New Data File Control: This control makes the Log File Setup Panel visible.
Open File Control: Reads data from the current log file and displays data in the log file indicator.
Press to Log Control: Logs one line of data to the current log file. Auto log indicator will flash yellow.

CREATE DATA FILE PANEL (Visible only when the new data file control is pressed).
Data File Header Control: Provides inputs for test engineer, magnet model, magnet serial no andtest notes. The computer date is automatically inserted into the data file.
Data File Name Control: Provides input for new file name.
Create New Data File Control: Creates a new data file and writes all the data file header information to the file. Note: If a file with the same name exists a warning will be given. Options are replace the existing file data or cancel the operation. Clicking the replace control will make a new data file with new header information.
Close Panel Control: Closes the create data file panel.

Section 4

OPERATION

To Start the Magnet System Software
Click the LabVIEW **Run** button.

To Stop the Magnet System Software
Click the red System Shutdown button located at the lower LH corner of the screen.

Magnet System Software Default Settings
The Magnet Control System software will open with all parameters set to the default settings. To change the default of a control follow the instructions listed below.

1. First stop the software by clicking on the SYSTEM SHUTDOWN button.
2. Then set the control to the desired default value.
3. Right mouse click on the control and select Data Operation.
4. Click on the selection Make Current Value Default.
5. Restart the Motorized Rotating Drive Software by clicking on the LabVIEW run arrow at the top left screen.

Magnet System Software Help
On screen help is available. To use the on line help use a CTRL + H from the keyboard to open the help window, and then move the cursor over the control or indicator on the front panel. A description of the control or indicator function will appear in the help window.

ELECTROMAGNET OPERATION (Current Control)

1. Select current control mode (default).
2. Select Setpoint on the key focus control.
3. Enter desired current from the keyboard and press the enter key.

The setpoint control pointer should move to the desired current and the correct current will be displayed in the magnet current indicator.

ELECTROMAGNET OPERATION (Field Control)

1. Select field control mode.
2. Press the create/load excitation file button.

(The open loop file charactization sub panel will appear).

3. Press the load button.
4. Select the directory where the open charactization files as located.
5. Select the desired file for the correct height above the magnet.
6. (Note for operation 4.0 mm above the magnet the correct file will be 5201-Z04.olc.)
7. Click the done button (The open loop file charactization sub panel will close).
8. The loaded file name will appear in the loaded excitation file indicator.
9. Select Setpoint on the key focus control.
10. Enter desired current from the keyboard and press the enter key.

Section 4

OPERATION

MOTORIZED ROTATING DRIVE

Setup Operation:

1. Firstly power up the Zeta 6104 stepper motor controller.
2. Start the 5201 magnet contol software.
3. Click either the CW or CCW home button.
4. After the platen stops at the approximate zero point reduce the velocity setting to 0.1.
5. Use the CW or CCW motion to approach the zero mark.
6. Use the stop motion button when the zero mark is reached.
7. Press the counter reset button to set the position counter to zero.
8. Return the velocity control to the desired setting 0.5 to 2.0.

Note: Do the above operation on power up only. Do not use the home control to go accurately to 0.0 deg, use the set position control as detailed below.

Set Position Operation:

Type in the desired position into the set position control and press the enter key on the keyboard.

Note: If immediate control is turned on, the MRD will start to rotate as soon as new input value has entered and enter key pressed. If immediate control is turned off then press the GO button to start the MRD rotating to the new position.

Soft Limits Operation

1. Set the soft limits control to **enable**.
2. Set the CCW limit by clicking on the blue pointer with the mouse and dragging to the desired location on the status indicator.
3. Set the CW limit by clicking on the blue pointer with the mouse and dragging to the desired location on the status indicator.
4. Click on either the CCW or CW Start Motion button.

The motorized rotating drive will rotate in the desired direction until the soft limit is reached. The soft limit digital control will flash red when the soft limit is reached. Further rotation in the same direction will not occur. Clicking on the opposite direction **Start Motion** button will rotate the motorized rotation drive in the opposite direction until its soft limit is reached.

Hardware Limits

The hardware CCW and CW limit switches operate at approximately -200deg and +200deg respectively. After the limit switch has operated the rotation of the motorized rotating drive will decelerate at the same rate as set by the software acceleration control setting and then stop. A 5 deg overrun has been allowed for before the mechanical stops operate.

Mechanical Stops

The mechanical stops operate at -200 deg and +200 deg stopping any rotation beyond these positions.

Section 5

MAINTANCE

Electromagnet

Electrical Connections on the magnet terminal block should be checked annually. The electrical connections should be clean and tight. Discoloration is a sign that the connection is overheating and must be rectified before further use of the magnet.

Water Hoses should be checked regularly for water leaks. Any leaks should be rectified before further use of the magnet.

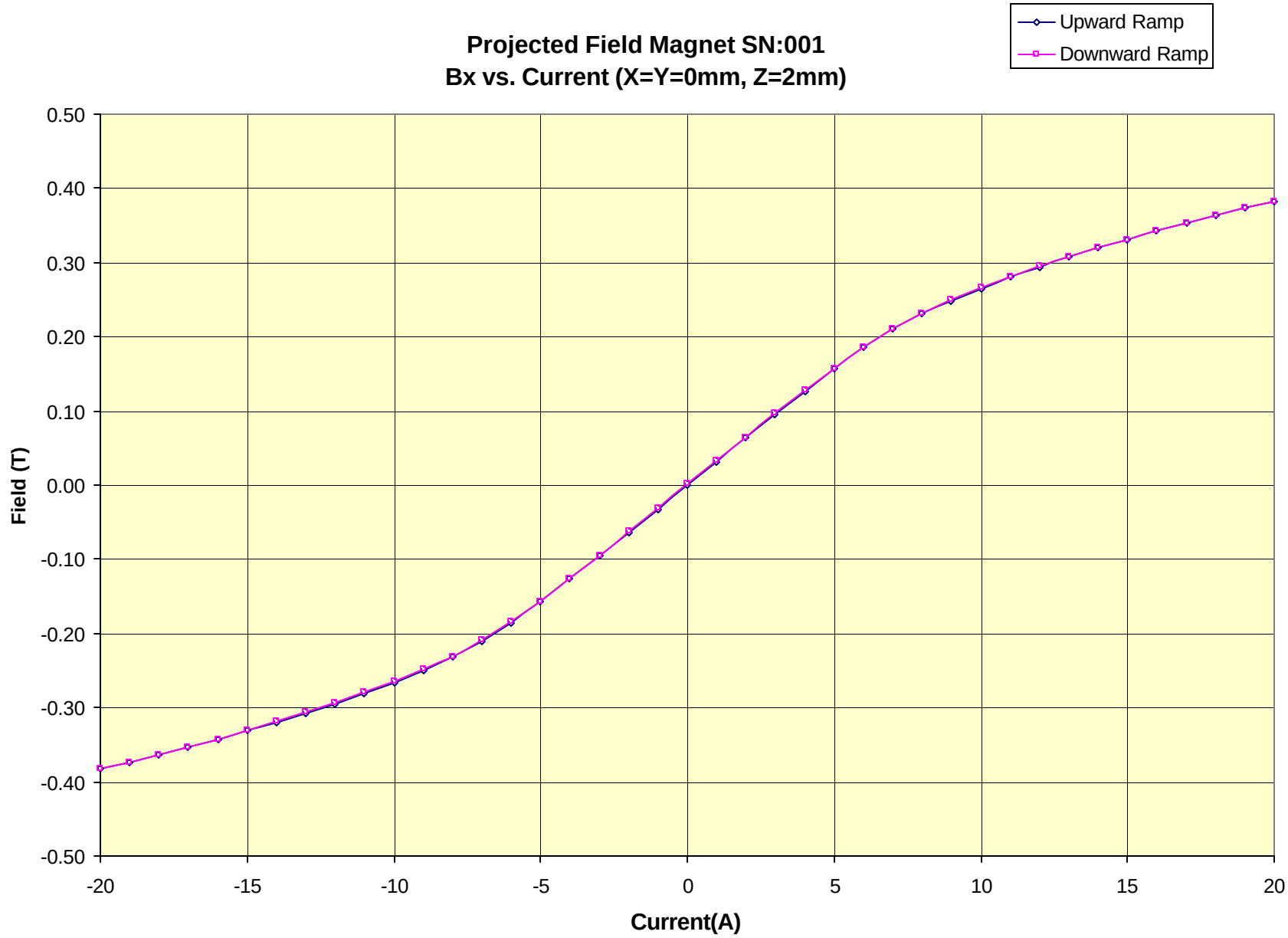
Motorized Rotating Drive

Rotating Platen contains nylon ball bearings and does not require periodic lubrication.

Worm Gear should be lubricated annually by smearing the worm gear with a coating of a graphite based grease.

Section 6

EXCITATION CURVES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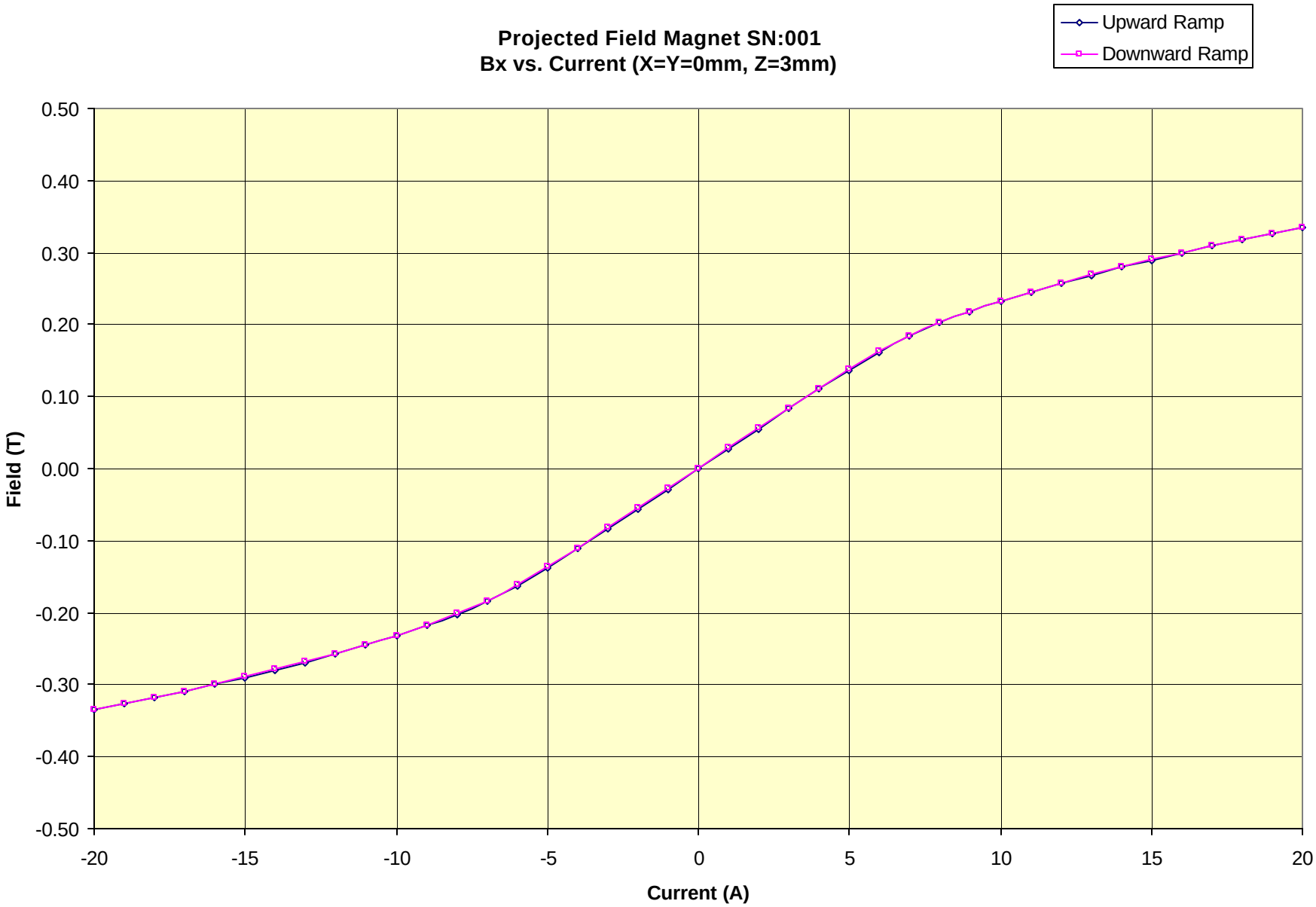
Bx vs. Current (X=Y=0mm, Z=2mm)
Upward Ramp
Downward Ramp
Field (T)
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-20
-15
-10
-5
0
5
10
15
20
Current(A)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Bx vs. Current (X=Y=0mm, Z=3mm)
Upward Ramp
Downward Ramp
Field (T)
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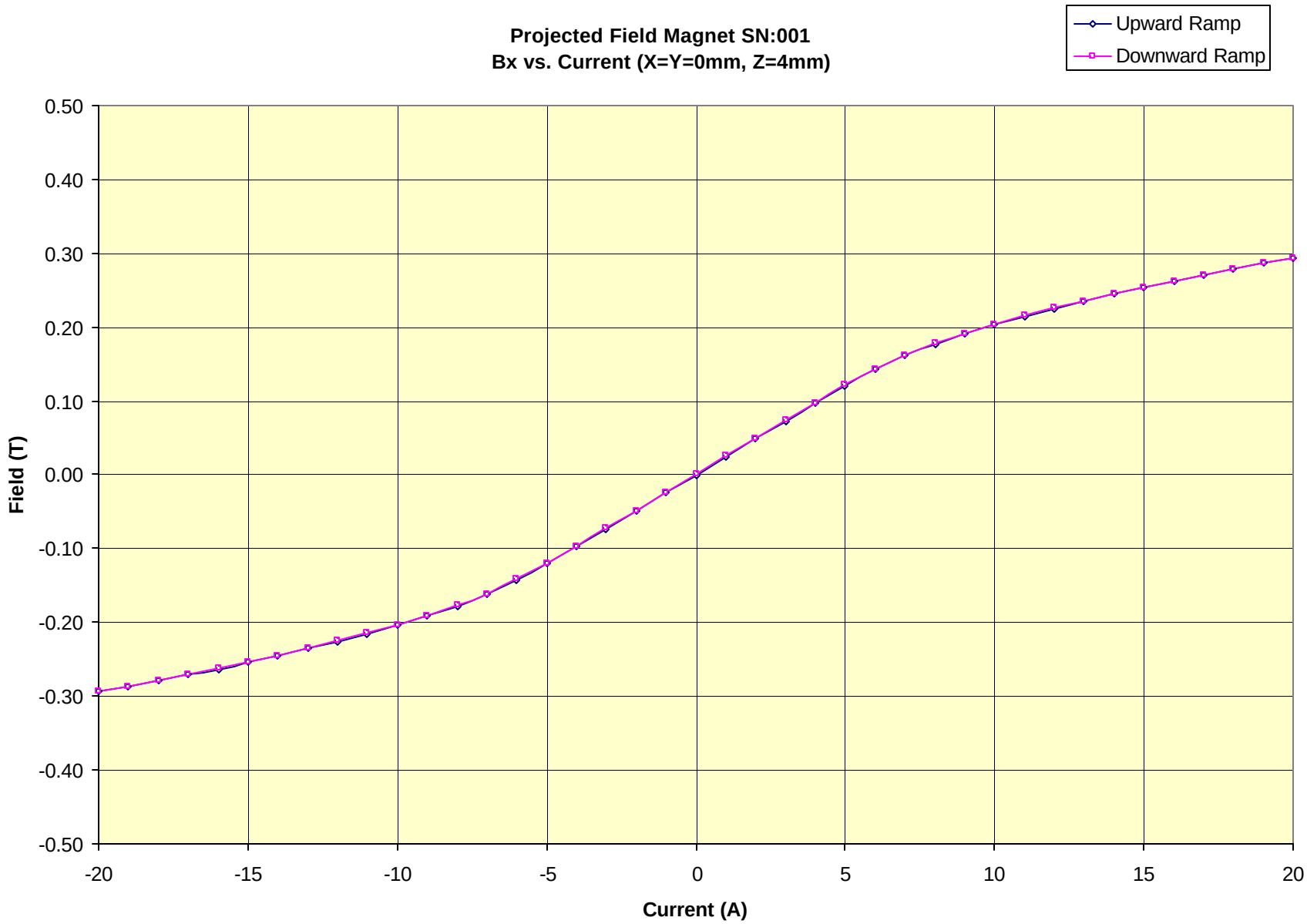
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-20
-15
-10
-5
0
5
10
15
20
Current (A)


Projected Field Magnet SN:001
Bx vs. Current (X=Y=0mm, Z=4mm)
Upward Ramp
Downward Ramp
Field (T)
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0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
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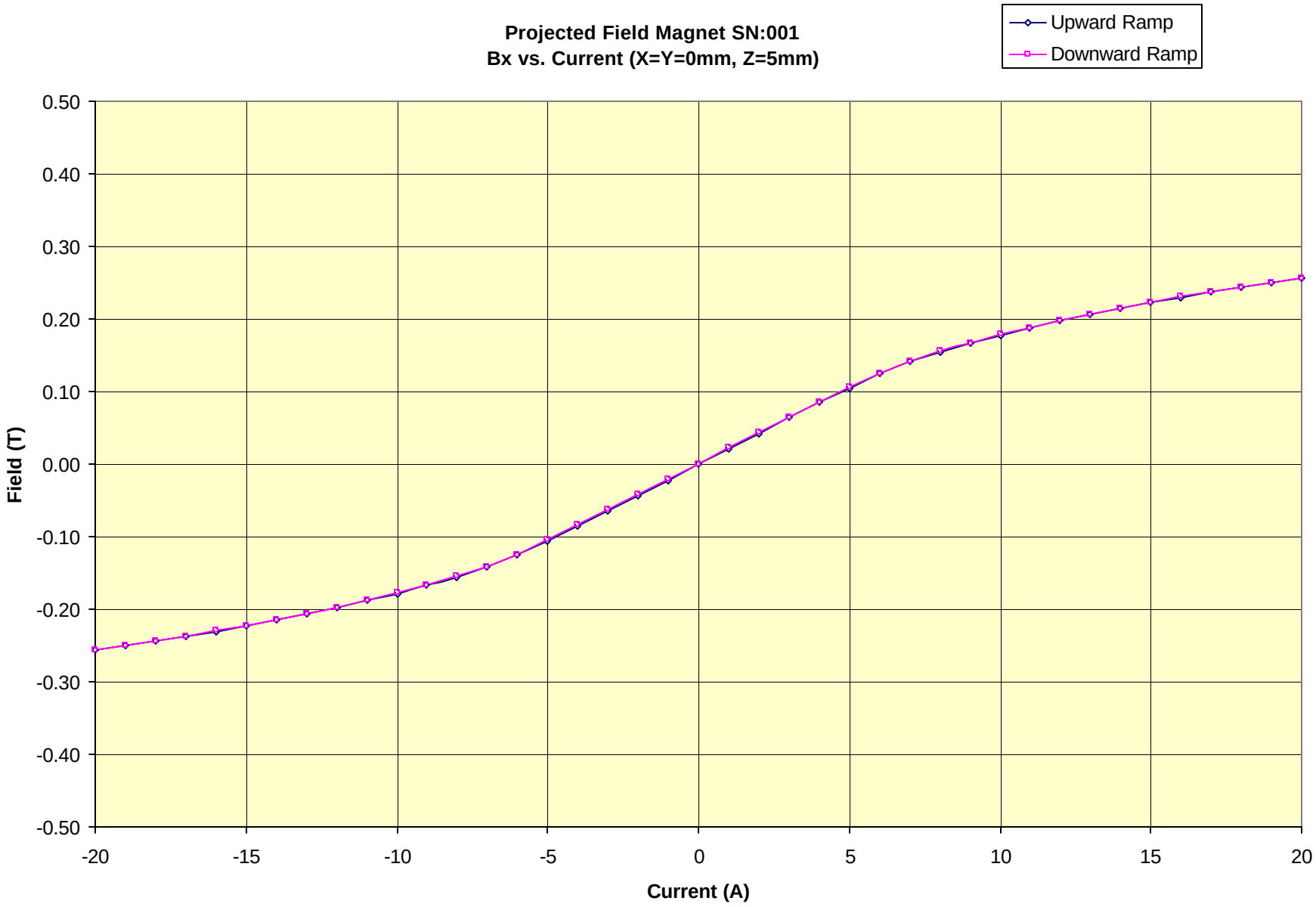
-0.50
-20
-15
-10
-5
0
5
10
15
20
Current (A)


Projected Field Magnet SN:001
Bx vs. Current (X=Y=0mm, Z=5mm)
Upward Ramp
Downward Ramp
Field (T)
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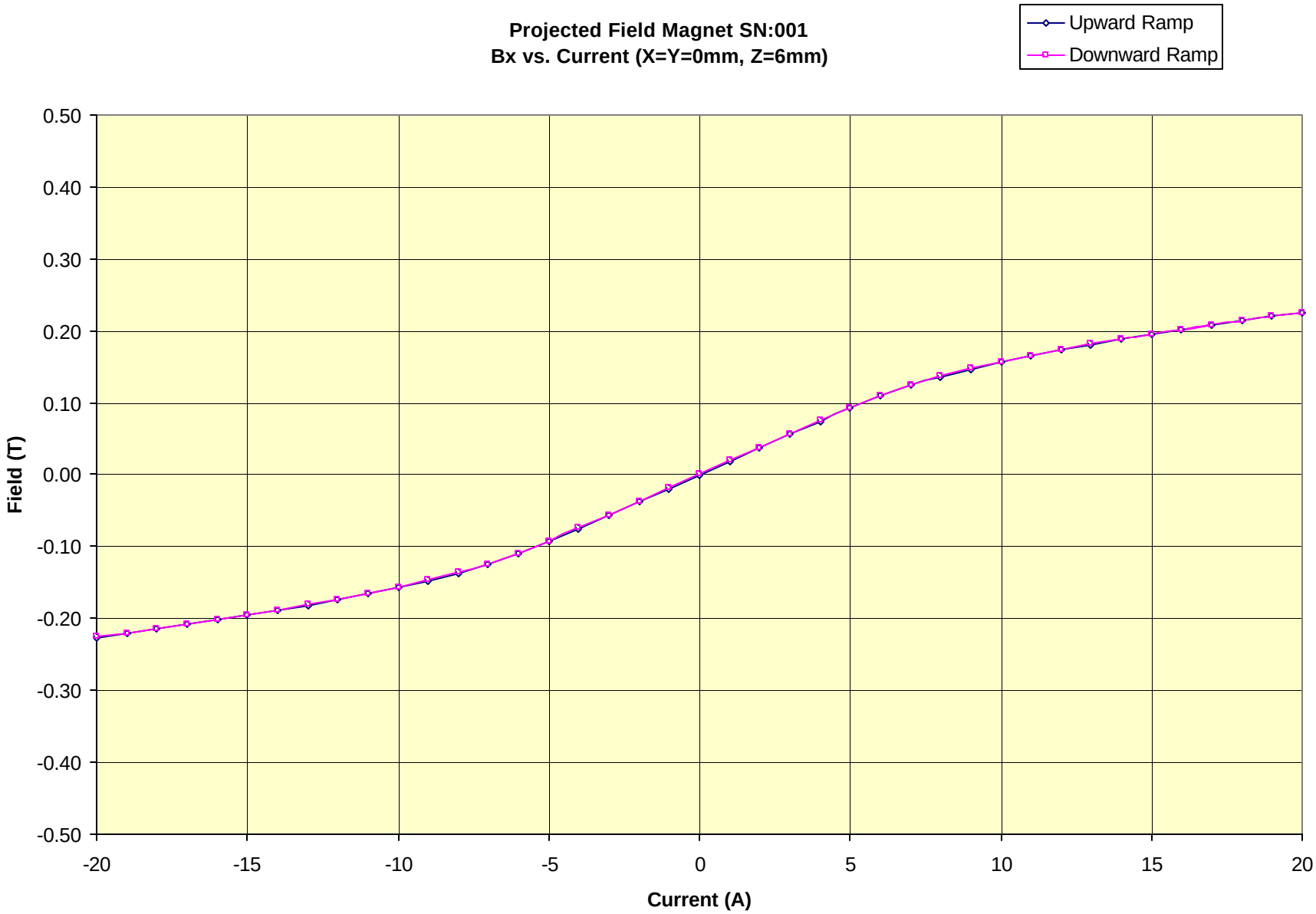
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-20
-15
-10
-5
0
5
10
15
20
Current (A)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Bx vs. Current (X=Y=0mm, Z=6mm)
Upward Ramp
Downward Ramp
Field (T)
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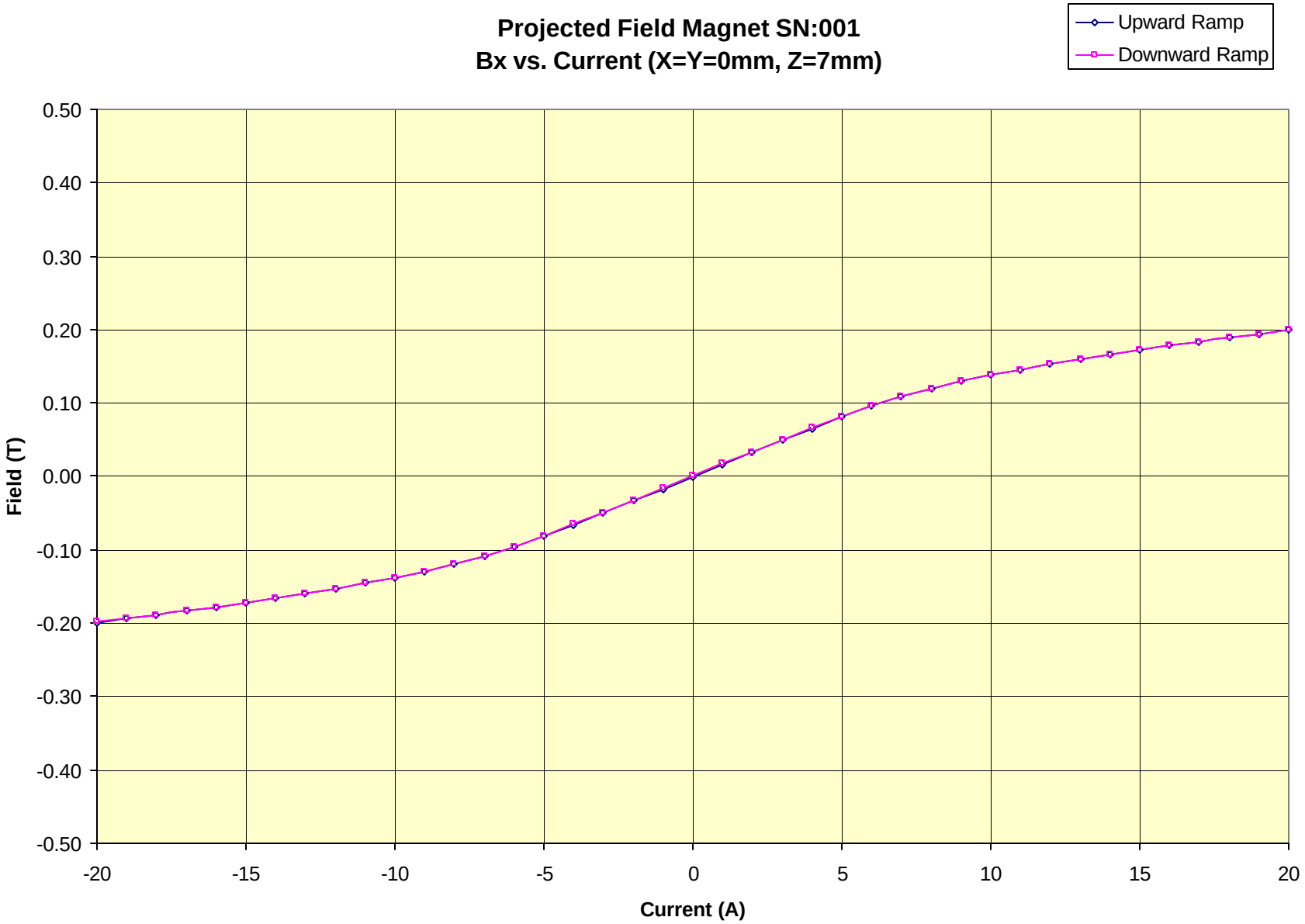
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-20
-15
-10
-5
0
5
10
15
20
Current (A)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Bx vs. Current (X=Y=0mm, Z=7mm)
Upward Ramp
Downward Ramp
Field (T)
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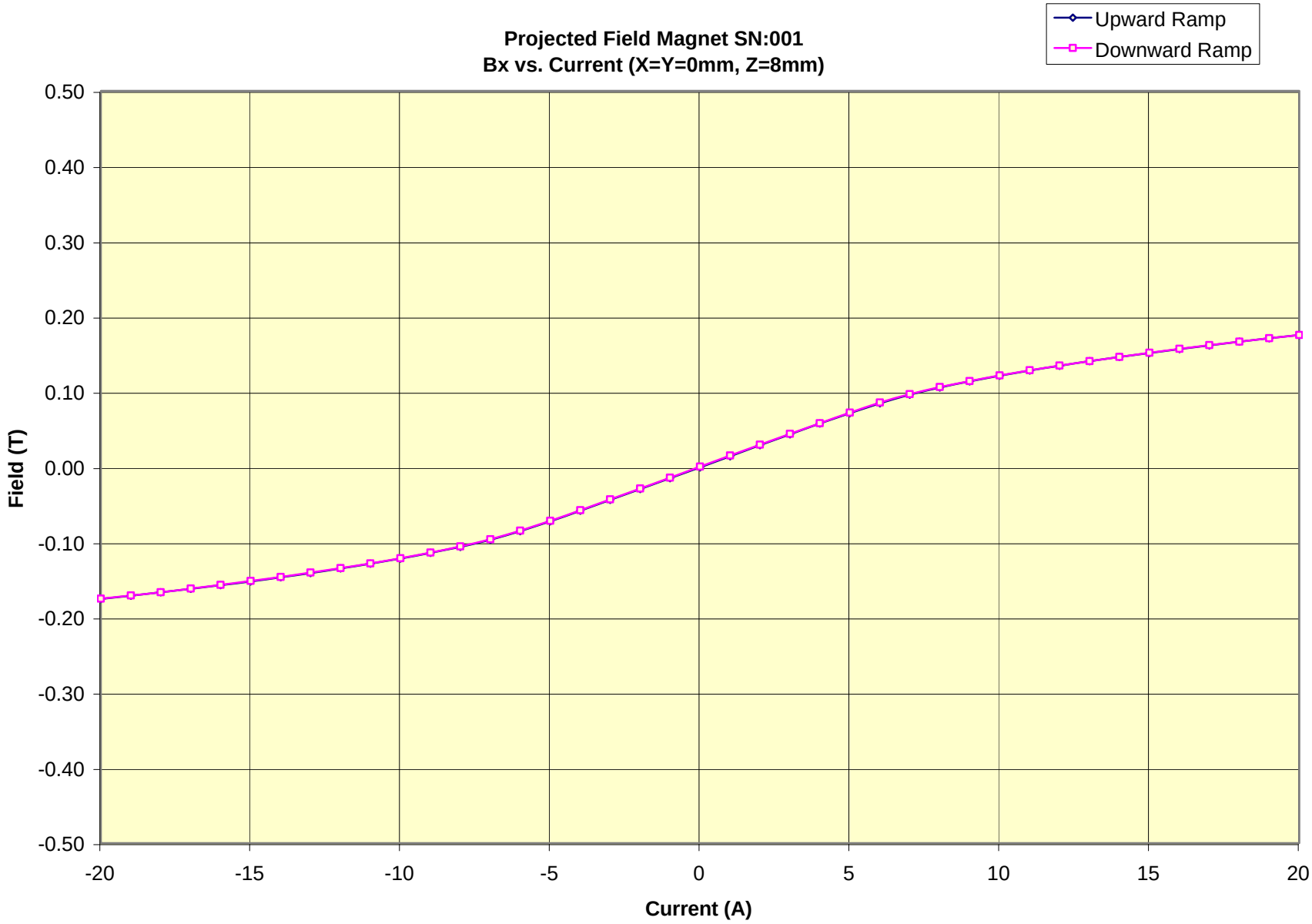
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-20
-15
-10
-5
0
5
10
15
20
Current (A)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Bx vs. Current (X=Y=0mm, Z=8mm)
Upward Ramp
Downward Ramp
Field (T)
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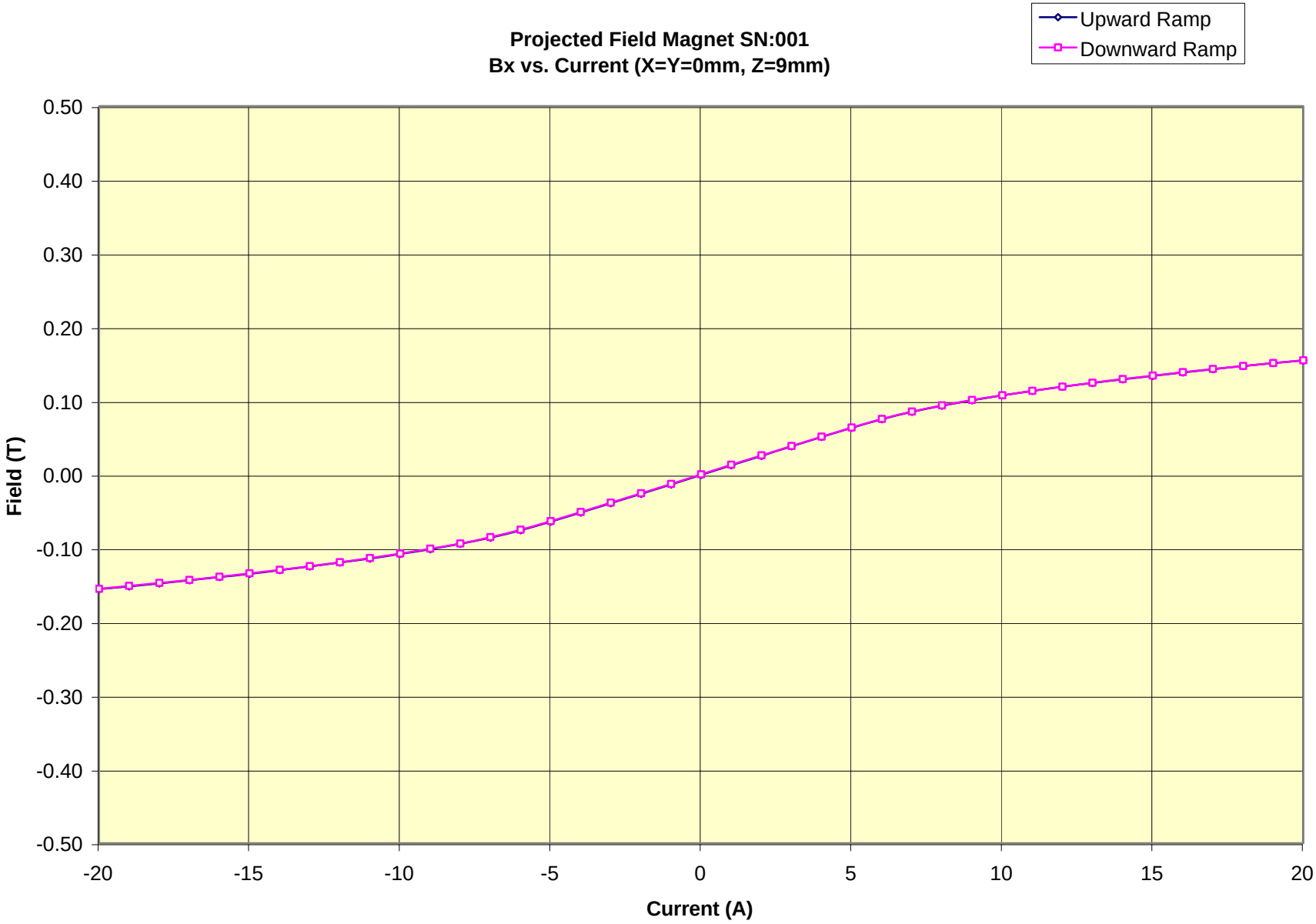
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-20
-15
-10
-5
0
5
10
15
20
Current (A)


Projected Field Magnet SN:001
Bx vs. Current (X=Y=0mm, Z=9mm)
Upward Ramp
Downward Ramp
Field (T)
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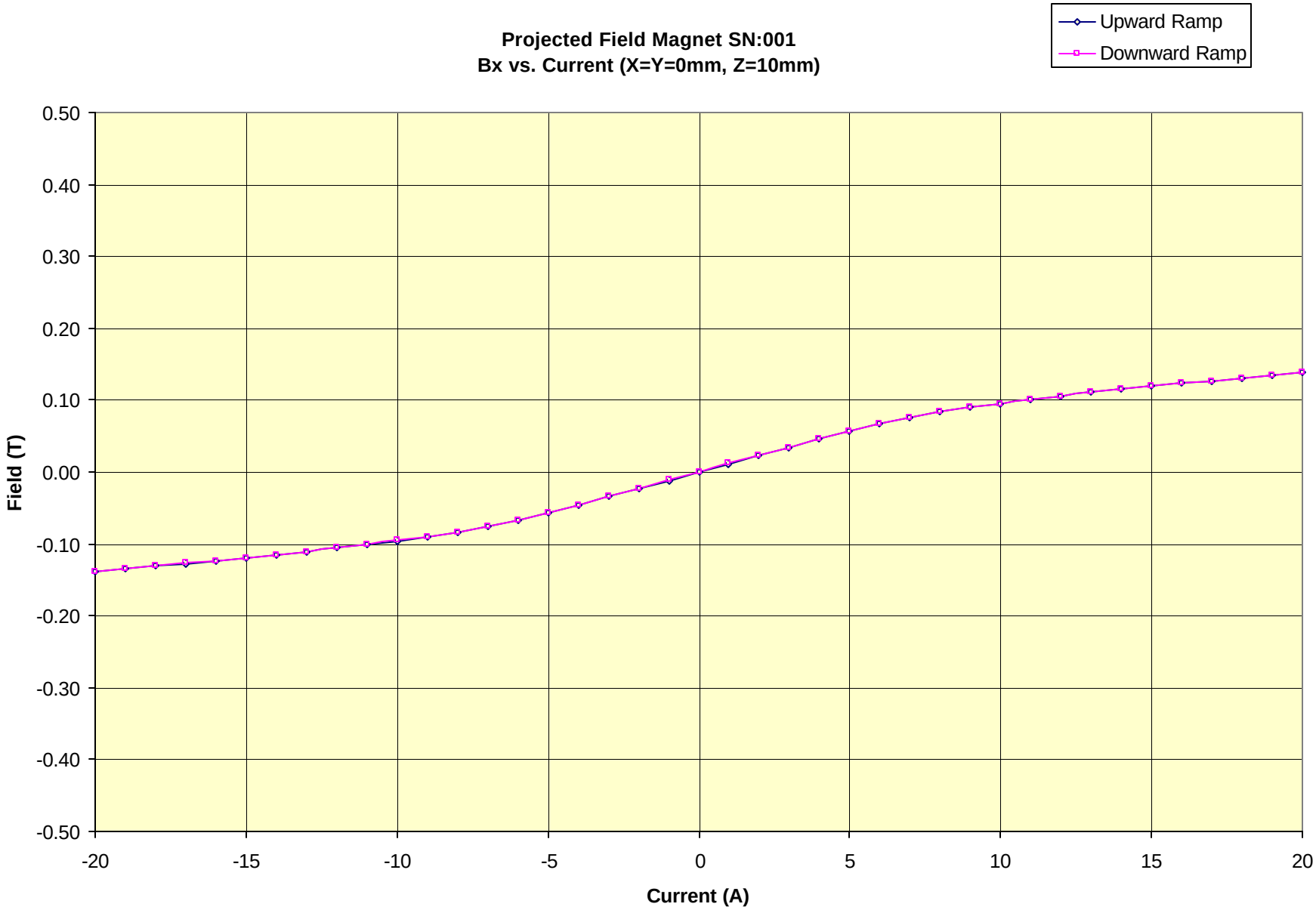
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-20
-15
-10
-5
0
5
10
15
20
Current (A)


Projected Field Magnet SN:001
Bx vs. Current (X=Y=0mm, Z=10mm)
Upward Ramp
Downward Ramp
Field (T)
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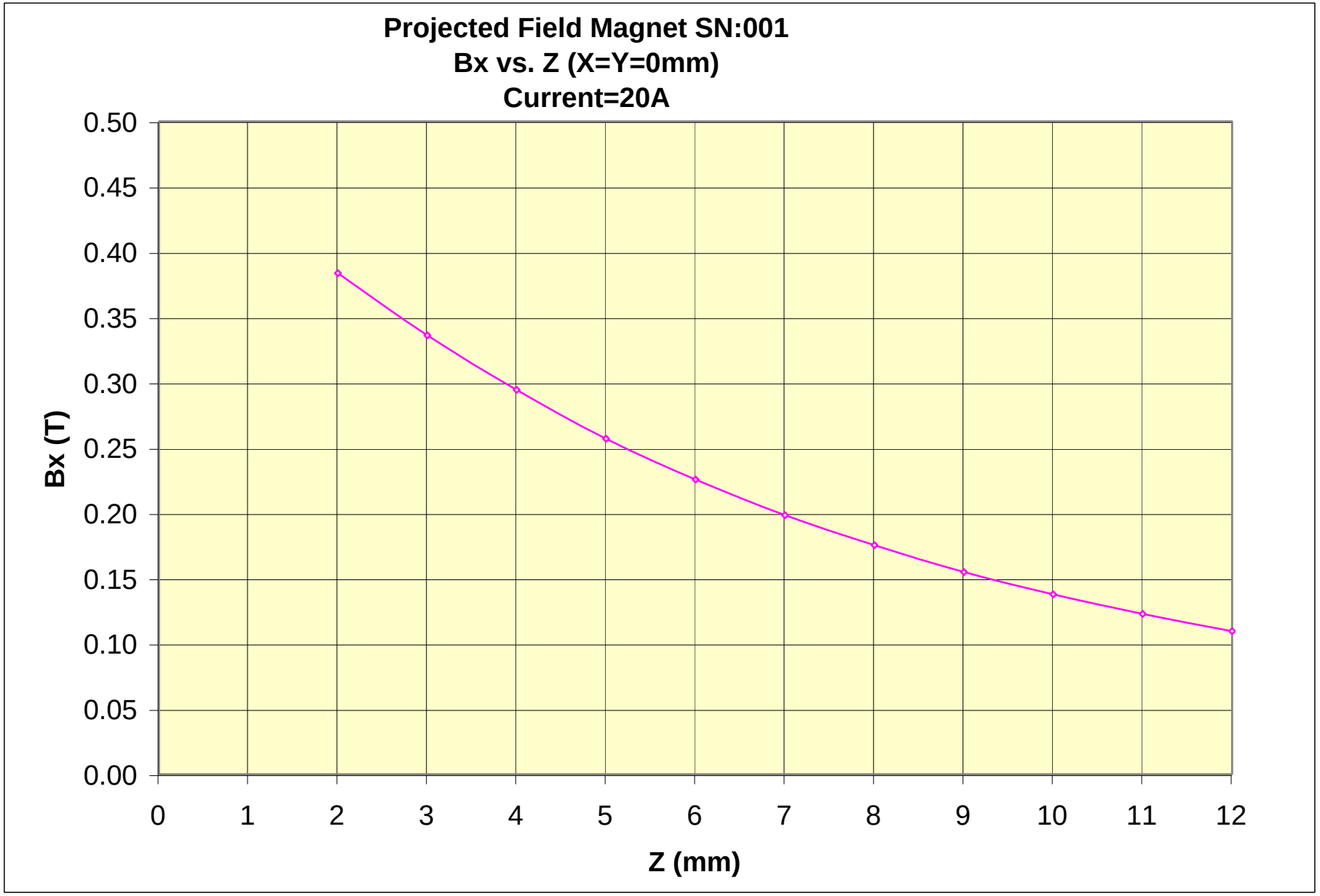
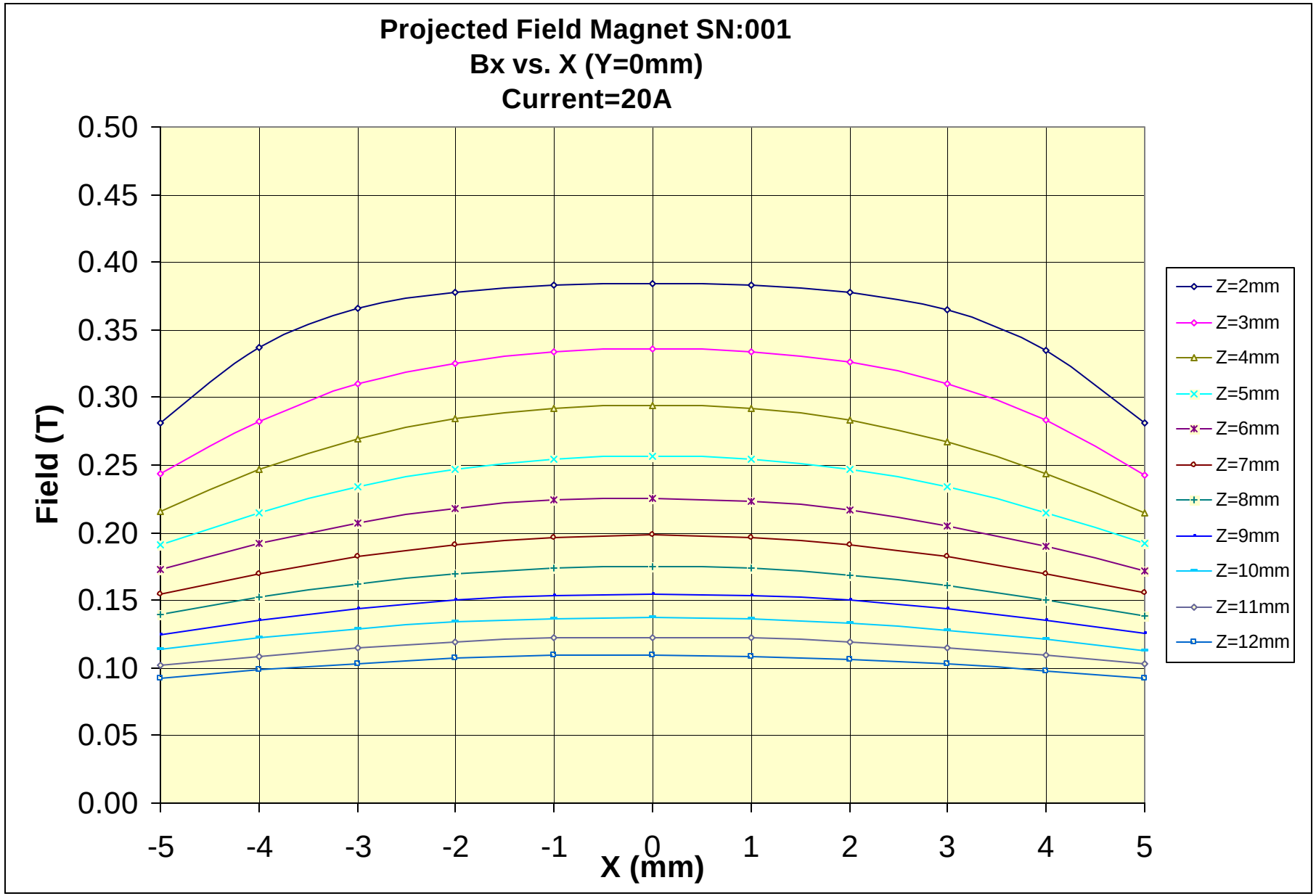
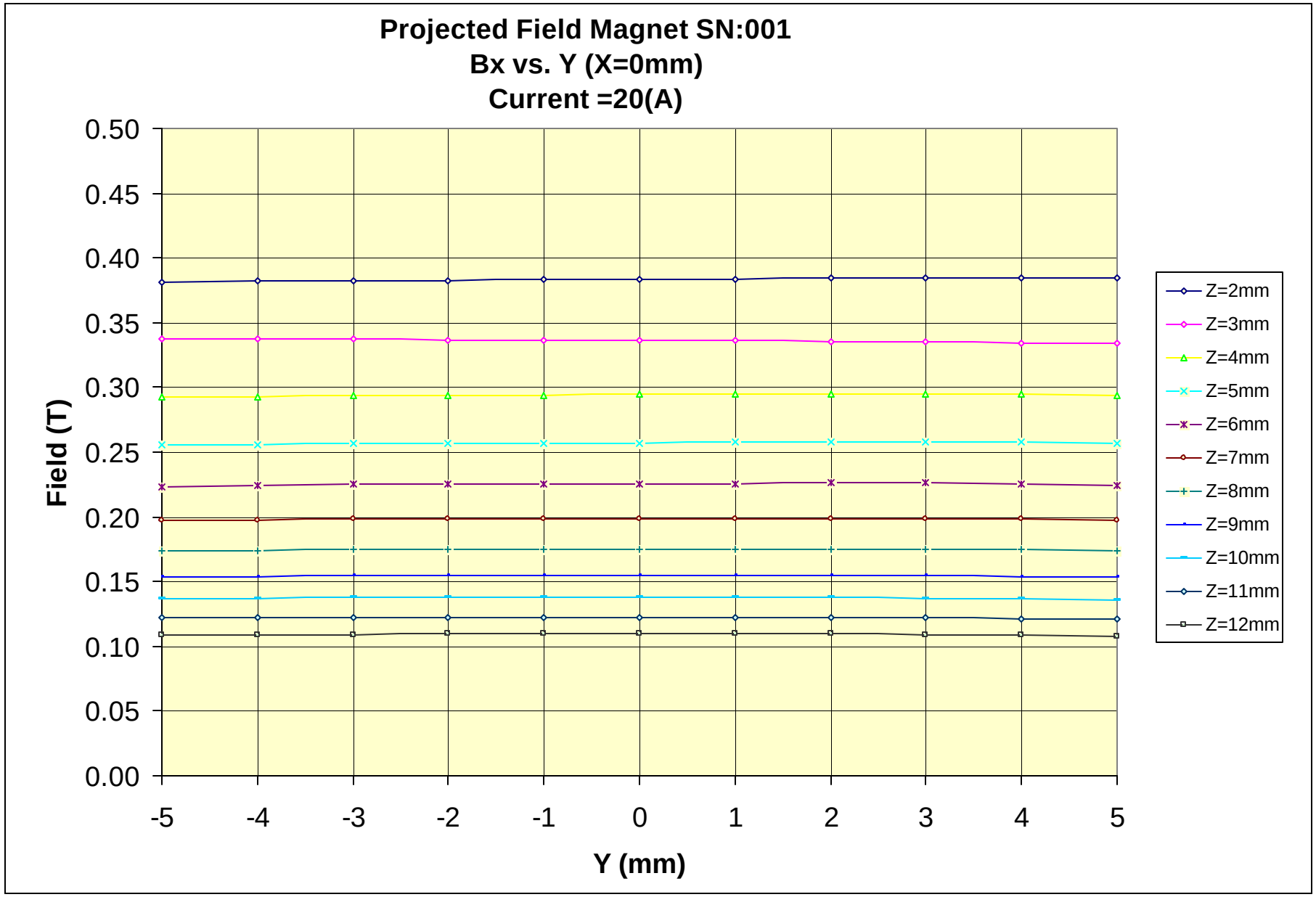
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-20
-15
-10
-5
0
5
10
15
20
Current (A)

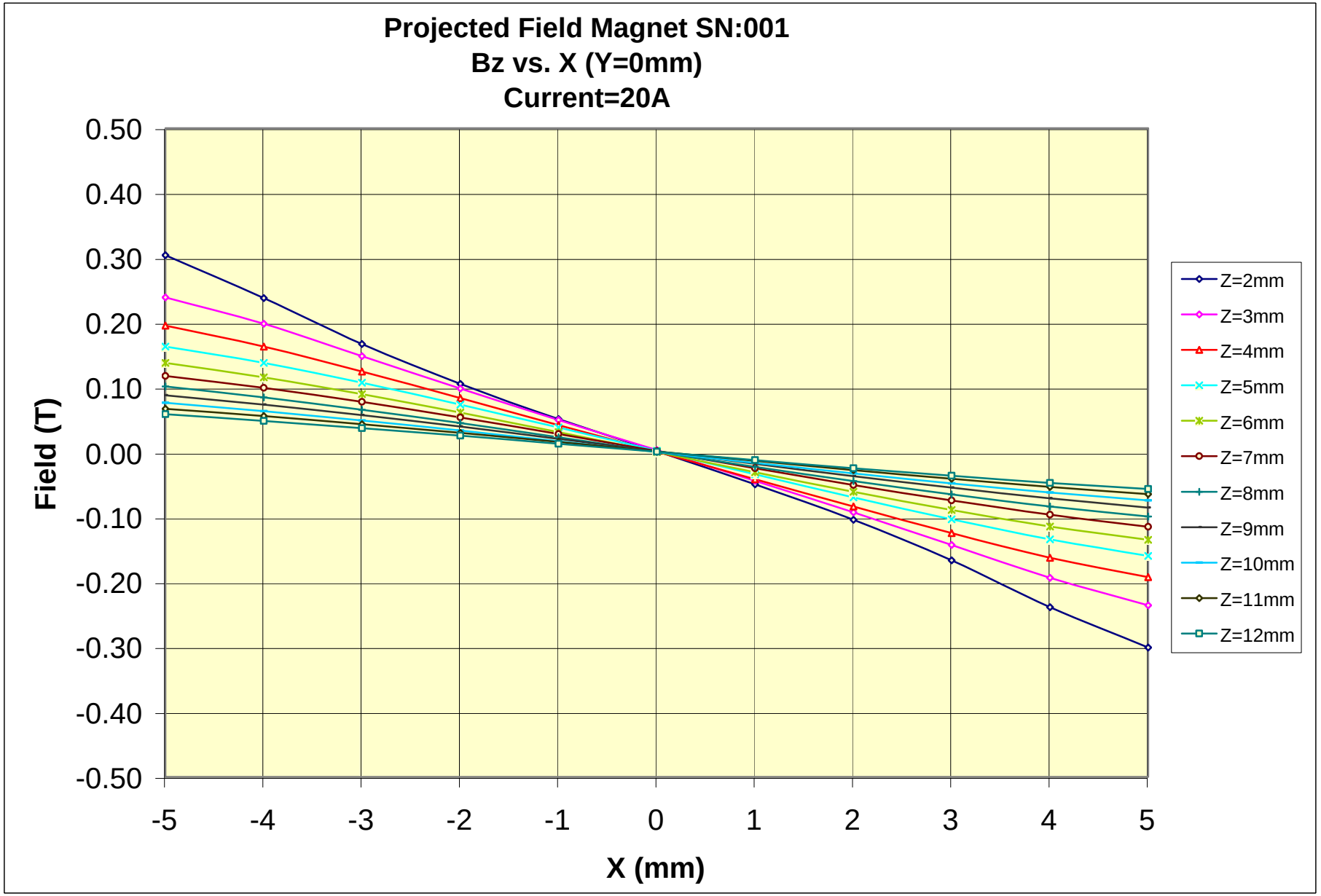
Section 7

TEST DATA


Projected Field Magnet SN:001
Bx vs. Z (X=Y=0mm)
Current=20A
Bx (T)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
1
2
3
4
5
6
7
8
9
10
11
12
Z (mm)


Projected Field Magnet SN:001
Bx vs. X (Y=0mm)
Current=20A
Field (T)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
-5
-4
-3
-2
-1
0
1
2
3
4
5
X (mm)
Z=2mm
Z=3mm
Z=4mm
Z=5mm
Z=6mm
Z=7mm
Z=8mm
Z=9mm
Z=10mm
Z=11mm
Z=12mm


Projected Field Magnet SN:001
Bx vs. Y (X=0mm)
Current =20(A)
Field (T)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
-5
-4
-3
-2
-1
0
1
2
3
4
5
Y (mm)
Z=2mm
Z=3mm
Z=4mm
Z=5mm
Z=6mm
Z=7mm
Z=8mm
Z=9mm
Z=10mm
Z=11mm
Z=12mm


Projected Field Magnet SN:001
Bz vs. X (Y=0mm)
Current=20A
Field (T)
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-5
-4
-3
-2
-1
0
1
2
3
4
5
X (mm)
Z=2mm
Z=3mm
Z=4mm
Z=5mm
Z=6mm
Z=7mm
Z=8mm
Z=9mm
Z=10mm
Z=11mm
Z=12mm

Section 8

DRAWINGS

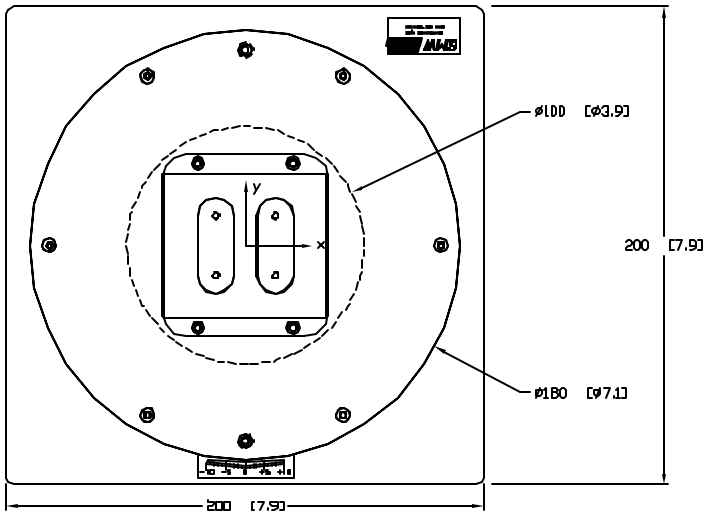
PROPRIETARY

THE INFORMATION CONTAINED IN THIS DRAWING IS THE PROPRIETARY PROPERTY OF GMW INC. IT MUST NOT BE REPRODUCED OR DISCLOSED TO OTHERS OR USED IN ANY WAY WITHOUT THE WRITTEN PERMISSION OF GMW INC.

REVISIONS				
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		03/01/03	G.DOUGLAS

TOP VIEW

NOTE: WATER COOLING & ELECTRICAL CONNECTIONS NOT SHOWN THIS VIEW

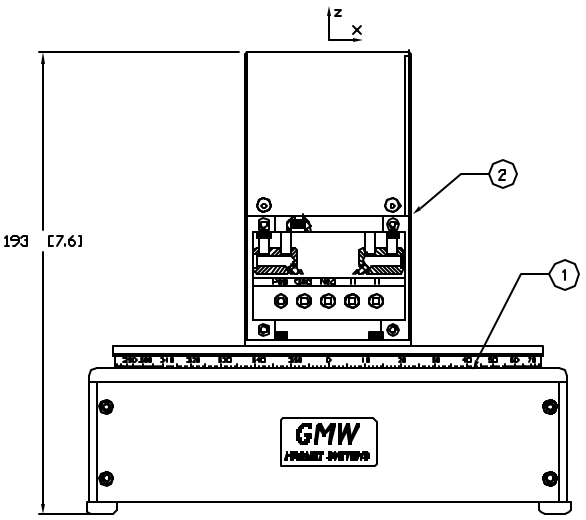


MAGNET SPECIFICATIONS

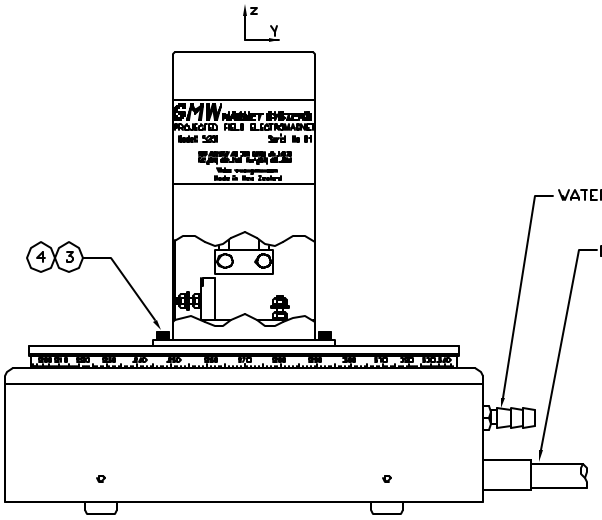
FIELD (@x max):	0.3T [4 mm above pole tips]
COIL	
RESISTANCE (20 °C)	0.85 ohm
RESISTANCE (Hot)	1.02 ohm
MAX POWER:	30V/20A [400 W]
COOLING:	0.5 liter/min 1.0 bar [14 psig]
THERMAL INTERLOCK:	OPEN CIRCUIT ABOVE 75° C [167° F]
MASS:	4 kg

MOTORIZED ROTATING DRIVE SPECIFICATIONS

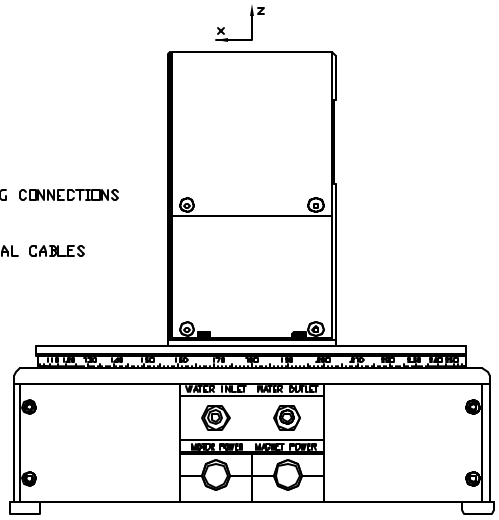
MAXIMUM ROTATION:	± 200 deg
RESOLUTION:	0.2 deg
MASS:	4 kg



FRONT VIEW



SIDE VIEW



REAR VIEW

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
4	4	BN 792	WASHER, LOCK, BOSSARD	
3	4	DIN 912	SHCS, M3 x 10 S/S	
2	1	11901860	PROJECTED FIELD MAGNET ASSEMBLY	
1	1	11901950	MINI ROTATING BASE ASSEMBLY	

PART'S LIST

DRAWN	G.DOUGLAS
DATE	11/21/02
CHECK	
DATE	
ENGINEERING	
DATE	
NEXT ASSY	5201
SYSTEM	
SOFTWARE	AUTOCAD 2000

DO NOT SCALE FROM DRAWING
UNLESS OTHERWISE SPECIFIED

UNLESS	INCHES	mm
X.XXX	±.005	±0.10
XX.XX	±.02	±0.5
X.X	±.06	±1
ANGLES	±1°	±1°
FINISH	63	1.6

THIRD ANGLE PROJECTION

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

TITLE: MAGNET/BASE ASSY MODEL: 5201

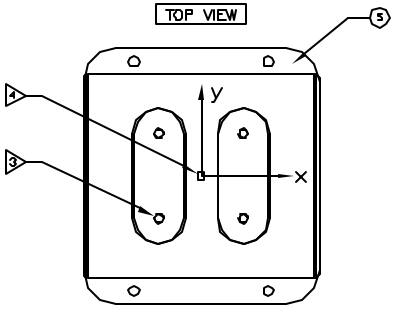
SIZE	DRAWING NO.	REV
A1	11901960	A

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

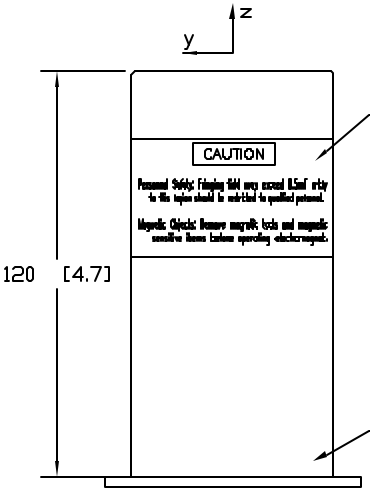
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		04/10/03	G.DOUGLAS

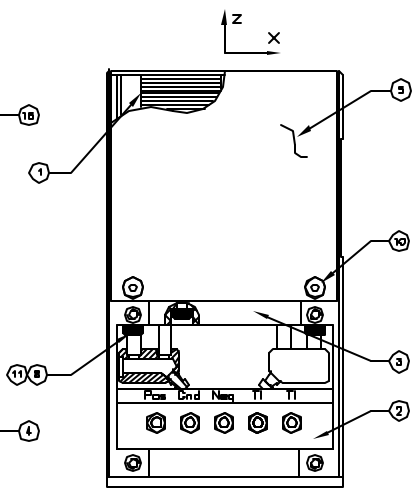
TOP VIEW



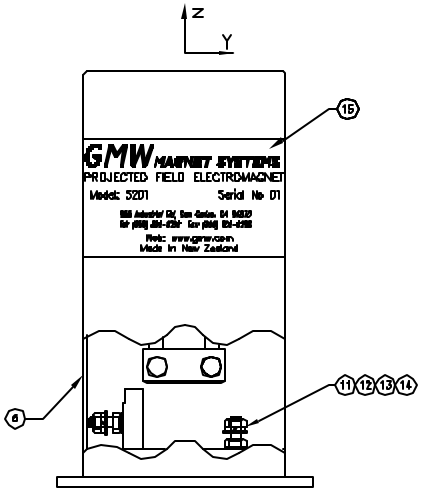
L.H SIDE VIEW



FRONT VIEW



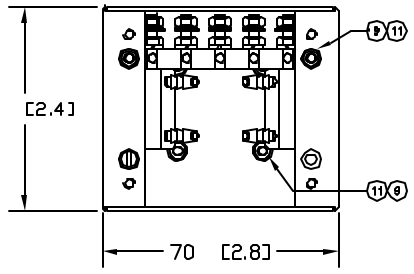
R.H SIDE VIEW



BOTTOM COVER [ITEM 6] NOT SHOWN THIS VIEW

NOTE

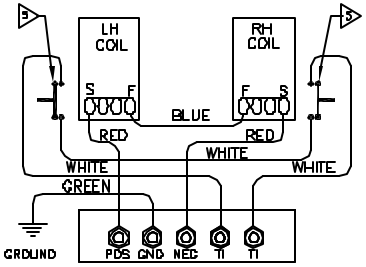
1. SEE DWG NO 11902010 FOR MAGNET WIRING DETAILS.
2. THIS DRAWING SHOWS MAGNET WITH ROTATING BASE MOUNTING. FOR DESKTOP MOUNTING MAGNET SEE DWG NO: 11901940.
3. FILL HOLES WITH BLACK COLORED EPOXY RESIN [4 PLS]
4. ROI [REGION OF INTEREST]
5. TEMPERATURE SWITCHES SELCO B02L-D75



TRANSITION PLATE [ITEM 7] NOT SHOWN THIS VIEW

BOTTOM VIEW

MAGNET SCHEMATIC



MAGNET TERMINAL BLOCK

MAGNET SPECIFICATIONS

FIELD (Bx max):	0.3T [4 mm above pole face]
COIL	
RESISTANCE (20 °C)	0.85 ohm
RESISTANCE (Hot)	1.02 ohm
MAX POWER:	20V/20A [400 W]
COOLING:	0.6 liter/min 1.0 bar [14 psid]
THERMAL INTERLOCK:	OPEN CIRCUIT ABOVE 75° C [167° F]
MASS:	4 kg

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
16	1	10900870	LABEL, CAUTION	
15	1	10900660	LABEL, SPECIFICATION	
14	1	DIN 84A	SCREW, M3 X 10 CHEESE HD SLOTTED BRASS	
13	2	DIN 934	NUT, M3 BRASS	
12	1	DIN 433	WASHER, FLAT M3 x 6 x 0.5 BRASS	
11	12	BN 792	WASHER, RIBBED LOCK SPRING/STEEL	
10	8	DIN 7991	SHCS, M3 x 5 FLAT HD S/S	
9	6	DIN 912	SHCS, M3 x 6 S/S	
8	4	DIN 912	SHCS, M3 x 12 S/S	
7	1	17905190	TRANSITION PLATE	
6	2	17905130	COVER, BOTTOM	
5	1	17905120	COVER, TOP	
4	2	17905070	SHIELD POLE	
3	1	17905060	YOKE	
2	1	11901910	TERMINAL BLOCK ASSEMBLY	
1	2	11901870	POLE/COIL ASSEMBLY	

PARTS LIST

DRAWN	G.DOUGLAS	DATE 08/13/02
CHECK		DATE
ENGINEERING		DATE
	C71280	
NEXT ASSY		SYSTEM
SOFTWARE	AUTOCAD 2000	

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

	INCHES	mm
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 ✓

THIRD ANGLE PROJECTION

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

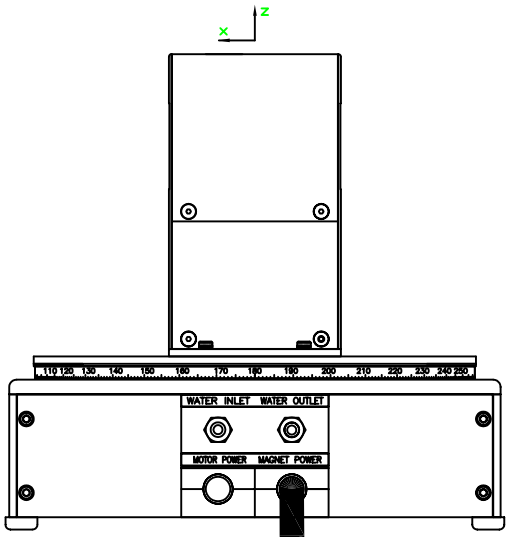
TITLE
PROJ FIELD MAGNET
MODEL: 5201

SIZE	DRAWING NO.	REV
A2	11901860	A

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

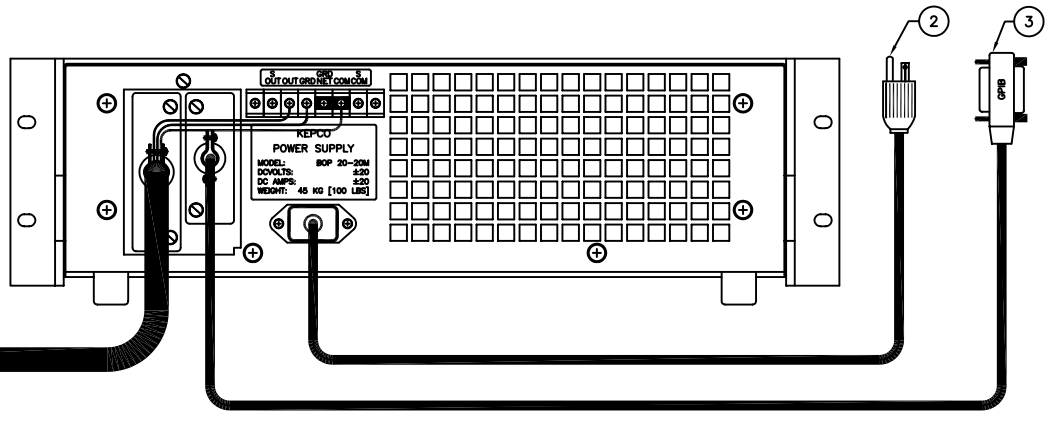
REVISIONS				
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		06/04/95	G.DOUGLAS

MODEL: 5201 MAGNET



MAGNET REAR VIEW

KEPCO MODEL: BOP 20-20M BIPOLAR POWER SUPPLY



POWER SUPPLY REAR VIEW

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

NOTE

1. POWER SUPPLY SHOWN WITH 115V AC INPUT
2. GPIB INTERFACE IS OPTIONAL EQUIPMENT
3. REFER TO TABLE ON DWG 13900420 FOR AC INPUT RATINGS OTHER THAN 115V AC INPUT

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
3	1	SNQ 488-2	GPIB CABLE [2M LONG]	2
2	1	KEPCO	AC POWER CORD [115V US TYPE]	
1	1	16900460	CURRENT & INTERLOCK CABLE 20A	

PARTS LIST

DRAWN G.DOUGLAS	DATE 06/04/95	DO NOT SCALE FROM DRAWING (DIMENSIONS & TOLERANCES UNLESS OTHERWISE SPECIFIED)
CHECK	DATE	
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 5201	SYSTEM	THIRD ANGLE PROJECTION
SOFTWARE AUTOCAD 2000		

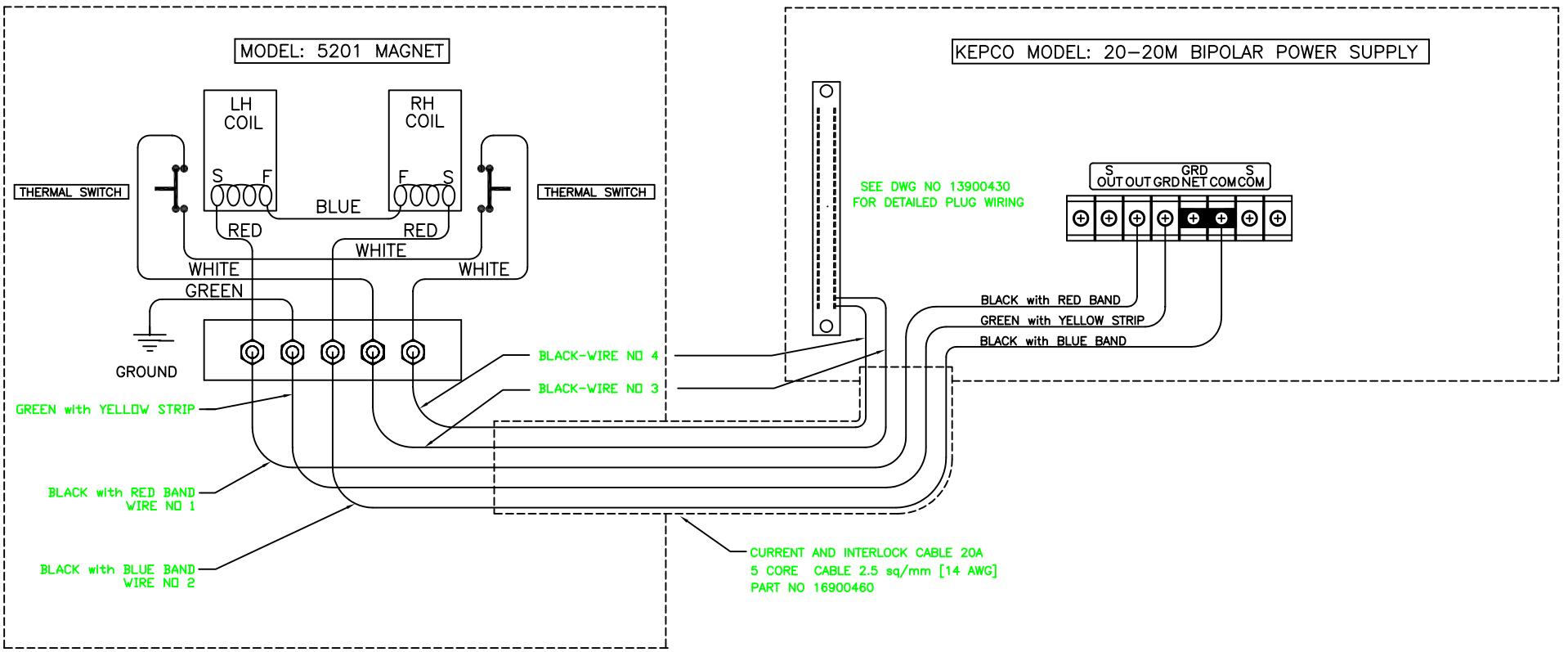
GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE: ELECTRICAL ASSY 5201/BOP 20-20M

SIZE	DRAWING NO.	REV
A1	11901950	A

SCALE NTS | WT kg | SHEET 1 OF 1

REVISIONS				
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		04/10/03	G.DOUGLAS



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	15	10	10
RECOMMENDED AC POWER OUTLET	5-15R	–	–
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			

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN G.DOUGLAS 04/10/03
CHECK
ENGINEERING
5201
NEXT ASSY | SYSTEM
SOFTWARE AUTOCAD 2000

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

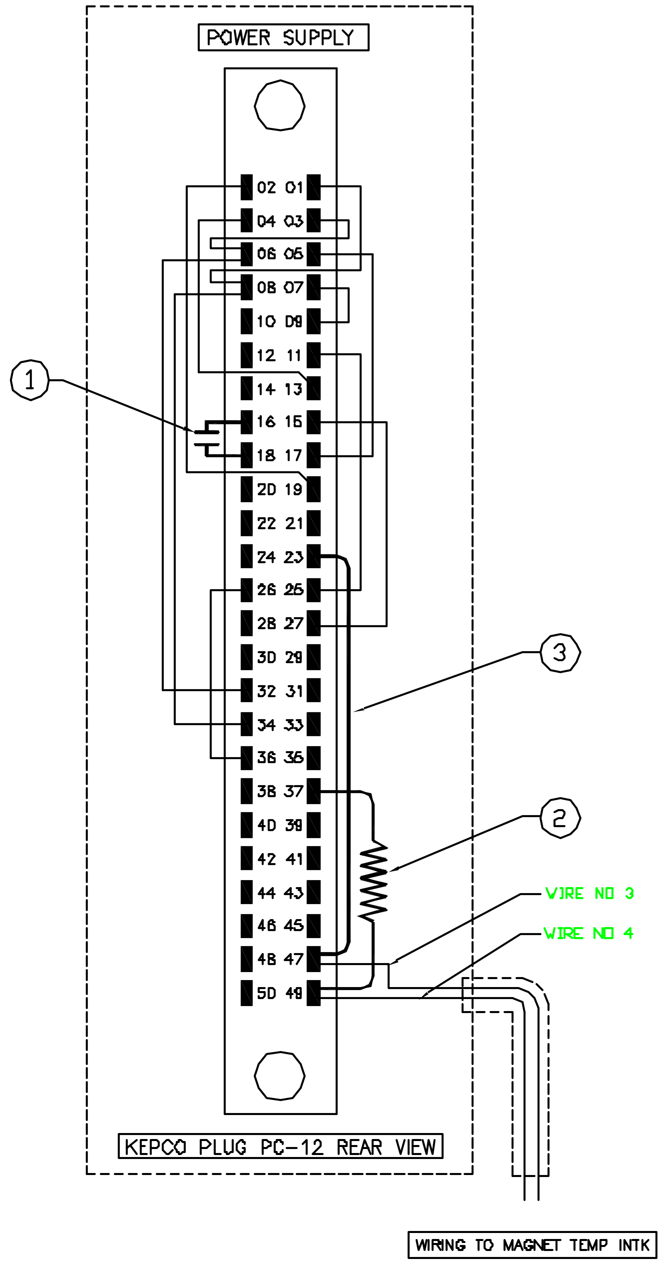
	LINEAR INCHES	LINEAR mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

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

TITLE
ELECTRICAL WIRING
5201/BOP 20-20M

SIZE A1 | DRAWING NO. 13900420 | REV A
SCALE NTS | WT kg | SHEET 1 OF 1



REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		04/10/03	G.DOUGLAS

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
3	1		WIRE LINK, HOOK UP WIRE 0.5 SQ/MM	
2	1		RESISTOR, 680 OHM/0.25 W	
1	1		CAPACITOR, MYLAR 0.33uF	

DRAWN G.DOUGLAS DATE 04/10/03
CHECK DATE
ENGINEERING DATE
NEXT ASSY SYSTEM 5201
SOFTWARE AUTOCAD 2000
DO NOT SCALE FROM DRAWING
THIRD ANGLE PROJECTION

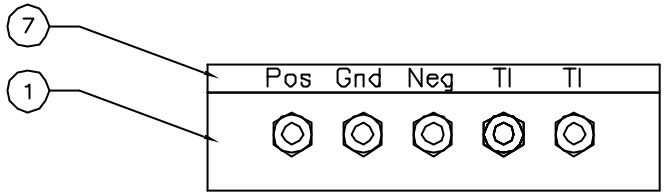
GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292, Fax (650)802-8298

TITLE: ELECTRICAL WIRING BOP 20-20M

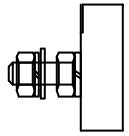
SIZE A1 DRAWING NO. 13900430 REV A
SCALE NTS WT kg SHEET 1 OF 1

REVISIONS				
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		10/24/12	G.DOUGLAS

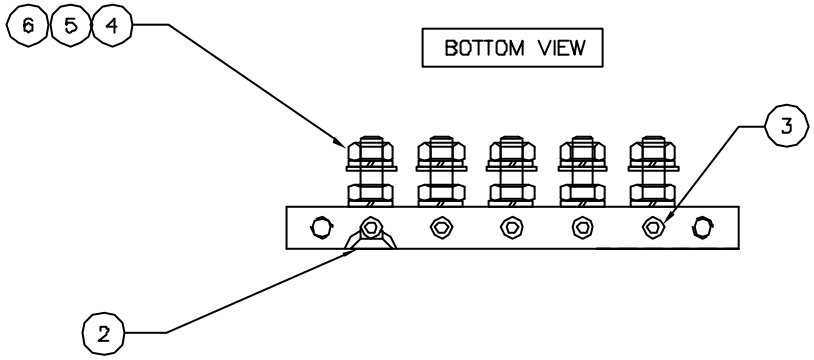
FRONT VIEW



SIDE VIEW



BOTTOM VIEW



NOTE:

1. ASSEMBLE SCREW, NUT, AND LOCKWASHER FIRST [ITEMS 2,4,6]
2. LOCK SCREW [ITEM 2] TO STOP ROTATION WITH SETSREW [ITEM 3]

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
7	1	10900680	LABEL, TERMINAL BLOCK	
6	12	BN 1401	NUT, M3 HEX JAM BRASS	
5	5	BN 560	WASHER, FLAT M3 x 7 x 0.5 BRASS	
4	10	DIN 7980	WASHER, M3 LOCK S/S	
3	5	DIN 914	SETSCREW, M3 x 5 CONE POINT S/S	
2	5	DIN 963 A	SCREW, M3 x 16 FLAT HD BRASS	
1	1	17905110	TERMINAL BLOCK	

PARTS LIST

DRAWN G.DOUGLAS	DATE 09/13/02
CHECK	DATE
ENGINEERING	DATE
11901860	5201
NEXT ASSY	SYSTEM
SOFTWARE AUTOCAD 2000	

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

	INCHES	mm
LINEAR		
X.XXX	±.005	±0.13
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEB.	±.5	±0.8
FINISH	63	1.6

THIRD ANGLE PROJECTION

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

TITLE
PROJ FIELD MAGNET
TERMINAL BLOCK GA

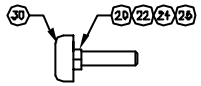
SIZE	DRAWING NO.	REV
A2	11901910	A

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

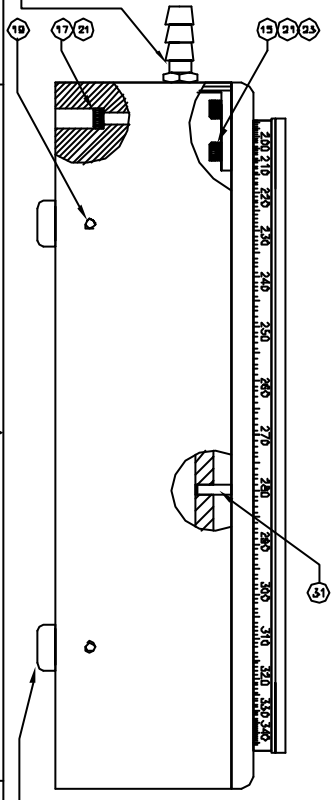
PROPRIETARY

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.

FOOT DETAIL

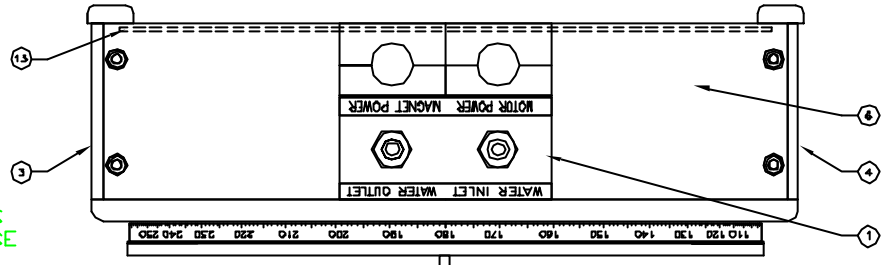


WATER CONNECTIONS
6.0mm [0.25"] ID HOSE



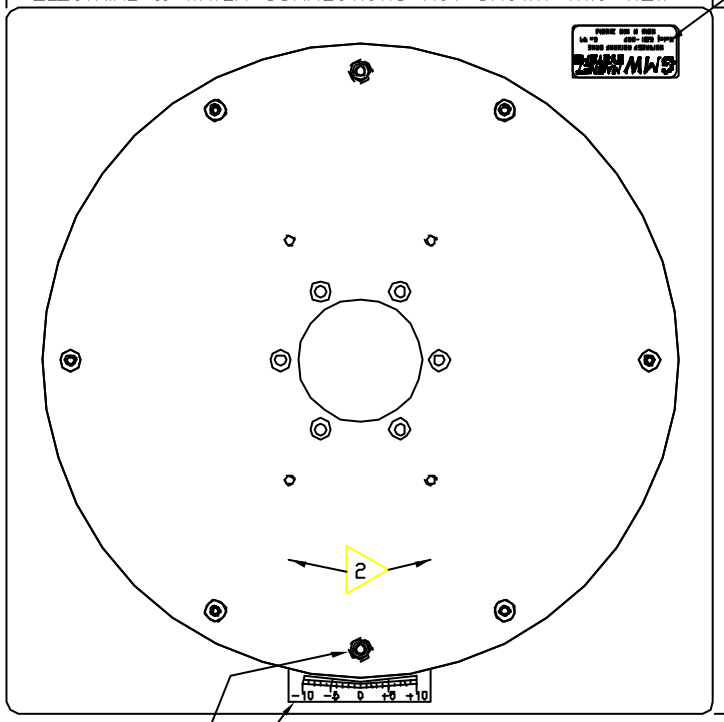
TO ADJUST HEIGHT
SCREW FOOT IN/OUT
AND LOCK IN PLACE
WITH ITEM 19

SEE DRAWING
NO 11902060 FOR
ROTATING DRIVE WITH
MOTORIZED ROTATING
DRIVE UNIT FITTED.

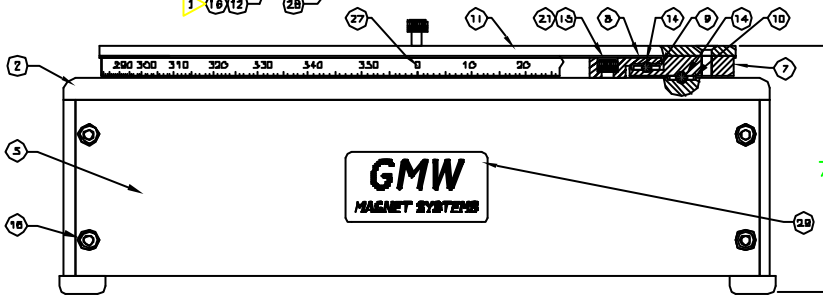


200.0 [7.9]

ELECTRIAL & WATER CONNECTIONS NOT SHOWN THIS VIEW



200.0 [7.9]



70.0 [2.8]

REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		12/03/02	G.DOUGLAS

1 ITEM 16 REMOVED, WHEN MOTOR DRIVE UNIT FITTED

2 DO NOT ROTATE PLATTER BY HAND, WHEN MOTOR DRIVE IS FITTED

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
31	2	DIN 1481	ROLL PIN 3.0 x 10.0	
30	4	H-1736	FEET, RUBBER ø14 x 6.5H DSE	
29	1	10901050	LABEL, GMW MAGNET SYSTEMS	
28	1	10901020	LABEL, VERNIER	
27	1	10901010	LABEL, INDEX	
26	1	10901000	LABEL, IDENTIFICATION	
25	4	DIN 934	NUT, M4 HEX S/S	
24	4	DIN 433	WASHER, M4 FLAT	
23	4	DIN 433	WASHER, M3 FLAT S/S	
22	4	BN 792	WASHER, M4 LOCK, BOSSARD	
21	10	BN 792	WASHER, M3 LOCK, BOSSARD	
20	4	DIN 7985A	SCREW, M4 x 20 PAN HD	
19	4	DIN 913 A2	SHSS, M3 x 3 S/S	
18	14	DIN 7991	SHCS, M3 x 6 FLUSH HD S/S	
17	8	DIN 912	SHCS, M3 x 40 S/S	
16	2	DIN 912	SHCS, M3 x 12 S/S	
15	10	DIN 912	SHCS, M3 x 8 S/S	
14	32	3.00 DIA, NYLON	BALL/BEARING, [Pastic/Metal Componets	Co]
13	1	17905400	BOTTOM COVER	
12	1	17905390	CLAMP PAD	
11	1	17905370	MOUNTING PLATE	
10	1	17905360	BEARING SPACER [Lower]	
9	1	17905350	BEARING SPACER [Upper]	
8	1	17905340	BEARING RETAINER	
7	1	17905330	THRUST BEARING	
6	2	17905290	REAR COVER	
5	1	17905280	FRONT COVER	
4	1	17905270	SIDE PLATE [RH Side]	
3	1	17905260	SIDE PLATE [LH Side]	
2	1	17905250	TOP PLATE	
1	1	11902080	SERVICE PANEL ASSEMBLY	

PARTS LIST

DRAWN G.DOUGLAS	DATE 11/04/02	DO NOT SCALE FROM DRAWING
CHECK	DATE	DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)
ENGINEERING	DATE	
NEXT ASSY	5201 SYSTEM	
SOFTWARE AUTOCAD 2000		

LINEAR	INCHES	mm
X.XXX	±.003	±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.

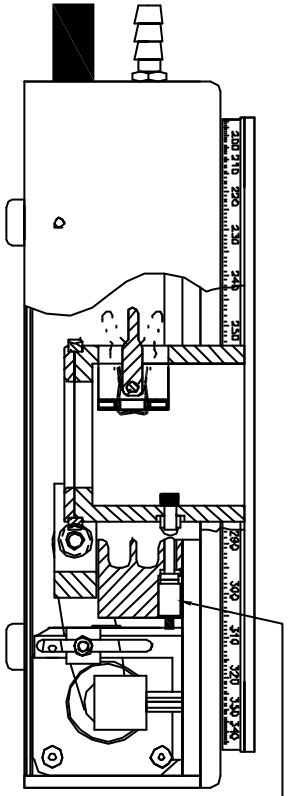
TITLE
ROTATING DRIVE
GENERAL ASSEMBLY

SIZE	DRAWING NO.	REV
A2	11902050	A

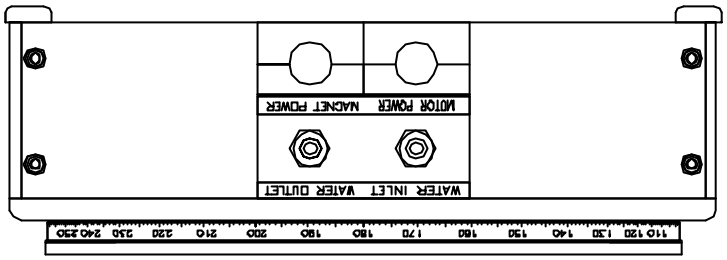
SCALE 1:1 | WT kg | SHEET 1 OF 1

REVISIONS				
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		11/22/02	G.DOUGLAS

L.H SIDE VIEW

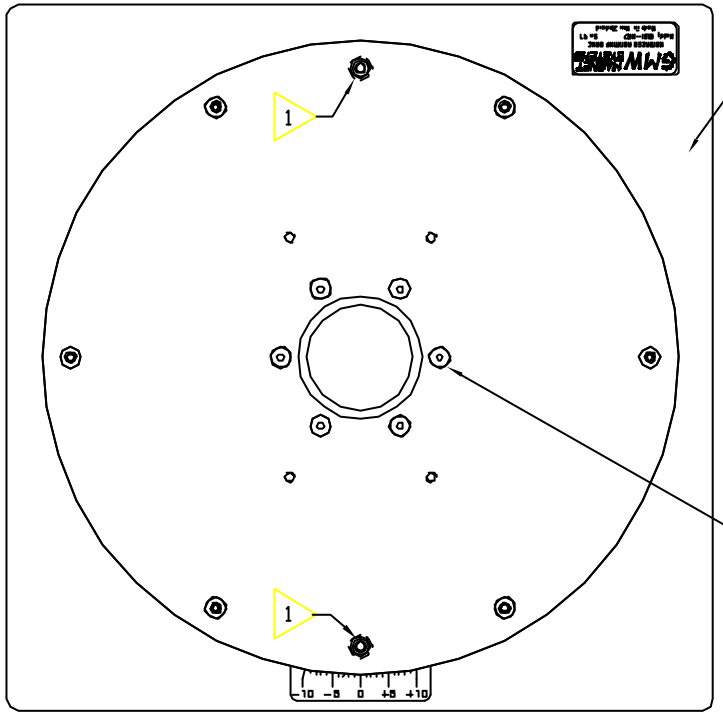


HOMING MICROSWITCH
0.0 DEG POSITION



REAR VIEW

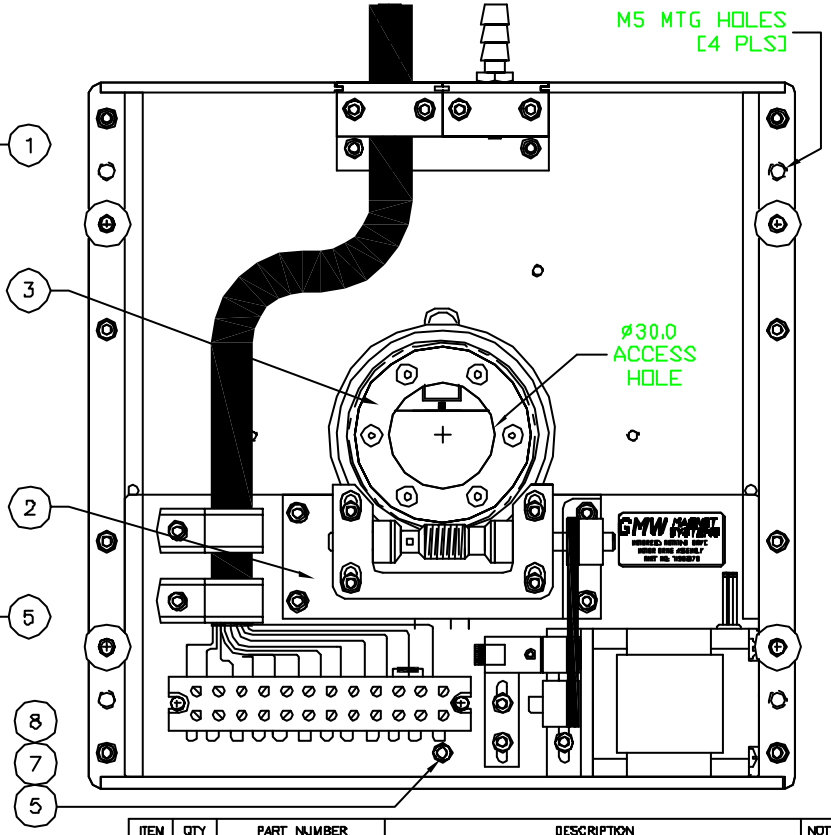
ELECTRIAL & WATER CONNECTIONS NOT SHOWN THIS VIEW

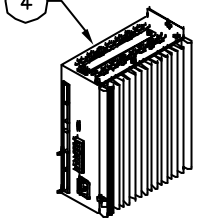


TOP VIEW

UNDERNEATH VIEW

[SHOWN WITH BOTTOM COVER REMOVED]





FOR DETAILS ON
ROTATING DRIVE ASSEM
SEE DWG NO:11902050

1 REMOVE ROTATION LOCK SCREWS BEFORE OPERATING WITH STEPPER MOTOR

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
8	1	DIN 433	WASHER, M3 FLAT S/S	
7	1	BN 792	WASHER, M3 LOCK, BOSSARD	
6	1	DIN 912	SHCS, M3 x 8 S/S	
5	6	DIN 7991	SHCS, M3 x 6 FLAT HD S/S	
4	1	Z6104	CONTROLLER, STEPPER MOTOR, COMPUMOTOR	
3	1	11902090	SPOOL ASSEMBLY	
2	1	11902070	MOTOR DRIVE ASSEMBLY	
1	1	11902050	ROTATING DRIVE ASSEMBLY	

PARTS LIST

DRAWN G.DOUGLAS	DATE 11/21/02	DO NOT SCALE FROM DRAWING
CHECK	DATE	DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)
ENGINEERING	DATE	
11901960	5201	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
DEC.	±.5	±0.5
FINISH	63	1.6

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

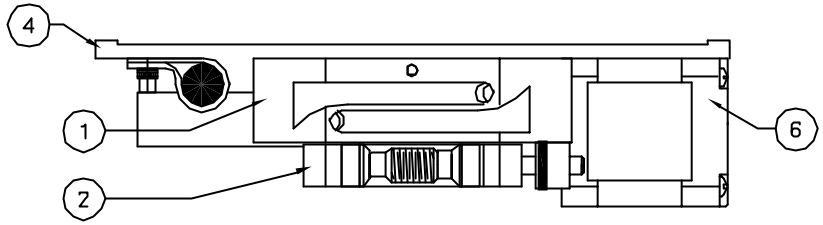
TITLE
ROTATING DRIVE
GENERAL ASSEMBLY

SIZE	DRAWING NO.	REV
A2	11902060	A

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

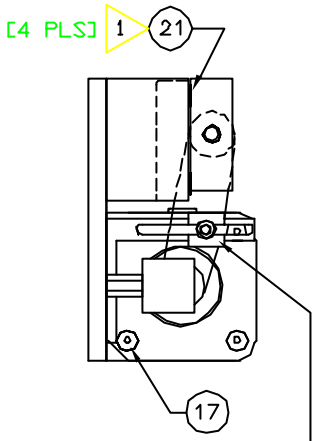
REVISIONS				
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE			

FRONT VIEW



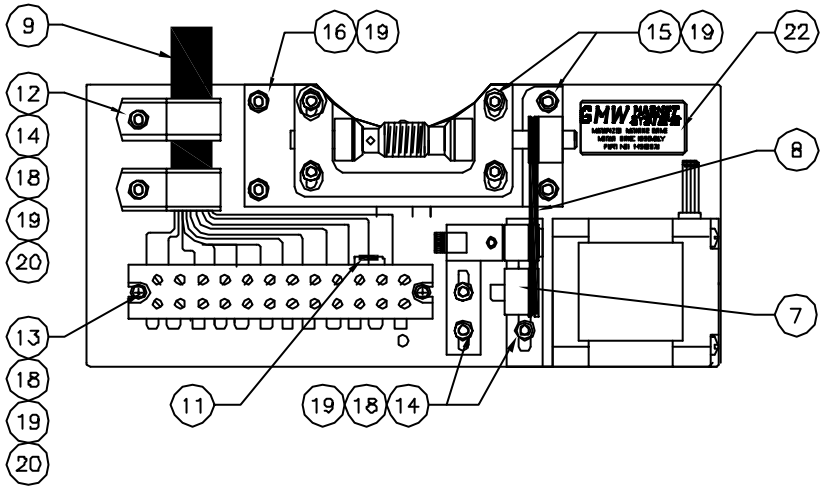
NOTE 1 NOMINAL 5 SHIMS AT EACH POSITION ADD/REMOVE TO ADJUST WORM C/L HEIGHT TO MATCH SPOOL GEAR C/L.

SIDE VIEW

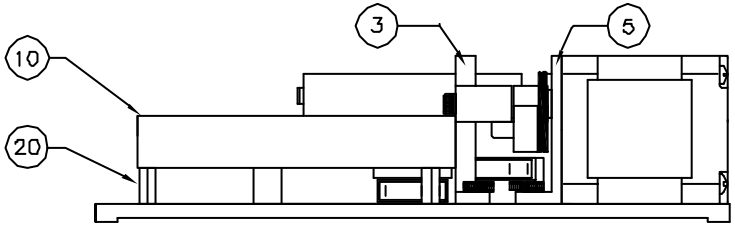


SLIDE BLOCK UP/DN TO TENSION BELT AND LOCK IN PLACE WITH CAP SCREW

TOP VIEW



REAR VIEW



SEE DWG NO 13900350 FOR ELECTRICAL WIRING DETAILS

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
22	1	10901060	LABEL, IDENTIFICATION	
21	20	DIN 988	SHIM RING 3.0 x 6.0 x 0.1 STEEL	
20	2	222-480	SPACER, HEX BRASS 10mm LONG R-S	
19	16	DIN 6797	WASHER, INT LOCK M3 X 0.4 S/S	
18	8	DIN 433	WASHER, FLAT M3 X 0.3 S/S	
17	4	DIN 7991	SHCS, M3 x 5 FLAT HD S/S	
16	2	DIN 912	SHCS, M3 x 20 S/S	
15	6	DIN 912	SHCS, M3 x 12 S/S	
14	6	DIN 912	SHCS, M3 x 6 S/S	
13	2	DIN 7985A	SCREW PAN HD, M3 x 25 S/S	
12	2	ECC8	P CLIPS 10mm	
11	1	0.33uF	CAPACITOR	
10	1	2412.6	TERMINAL BLOCK, 12 WAY WEIDMULLER	
9	3M	8778	CABLE, 6 SHIELDED PAIRS, 22 AWG, BELDEN	
8	1	8TP-104-20	BELT, TIMING, BERG 132mm [5.2"]	
7	1	12900230	PULLEY,TIMING BELT 20 TEETH	
6	1	VS13B-SFRIO	MOTOR, STEPPER, COMPUMOTOR	
5	1	17905480	MOTOR MOUNT	
4	1	17905450	BASE PLATE	
3	1	11902100	BELT TENSIONER ASSEMBLY	
2	1	11902120	WORM MOUNT ASSEMBLY	
1	1	11902110	STOP BLOCK ASSEMBLY	

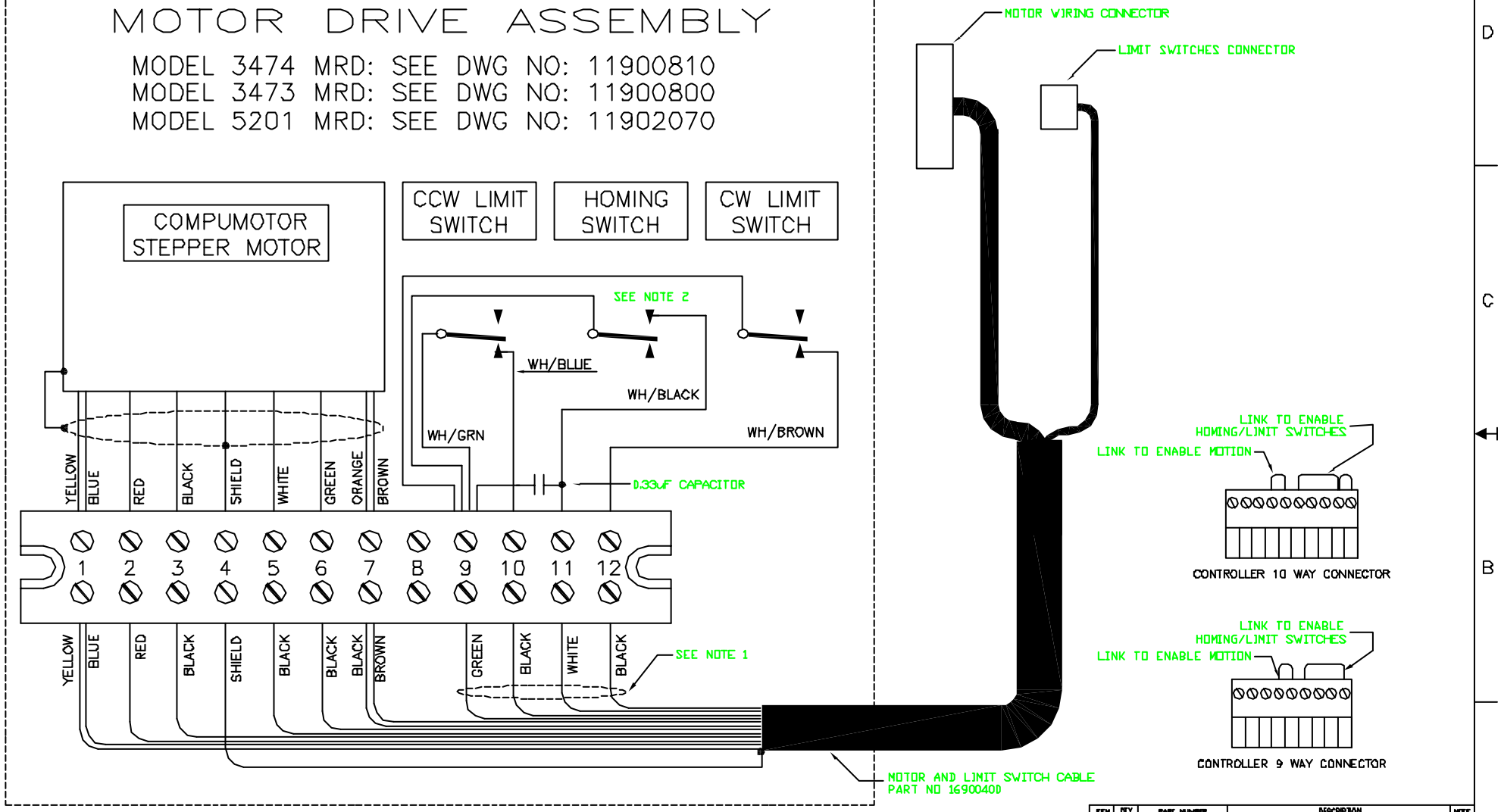
PARTS LIST

DRAWN G.DOUGLAS	DATE 11/21/02	DO NOT SCALE FROM DRAWING	GMW
CHECK	DATE	DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)	955 Industrial Rd, San Carlos, CA 94070
ENGINEERING	DATE	LINEAR: INCHES / mm; X.XXX ±.005 ±0.13; X.XX ±.01 ±0.1; X.X ±.03 ±0.3; X ±.06 ±1; DEC. ±.5 ±0.5; FINISH 63 1.6	Tel: (650)802-8292. Fax: (650)802-8298.
			TITLE: ROTATING DRIVE MOTOR DRIVE ASSEM
11902050	5201	THIRD ANGLE PROJECTION	SIZE A2 · DRAWING NO. 11902070 · REV —
NEXT ASSY	SYSTEM		SCALE 1:1 · WT kg · SHEET 1 OF 1
SOFTWARE AUTOCAD 2000			

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

DRAWN G.DOUGLAS 02/13/98
CHECK
ENGINEERING
DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)
THIRD ANGLE PROJECTION
SOFTWARE AUTOCAD 2000

11902070	5201
11900800	3473
11900810	3474

NEXT ASSY | SYSTEM

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

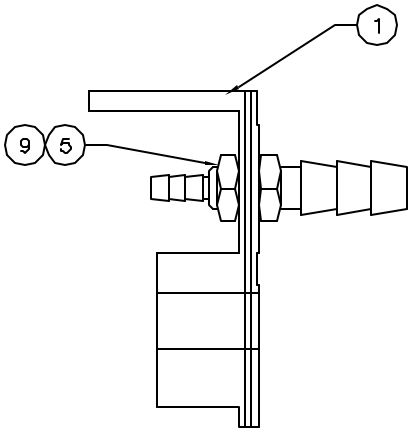
TITLE: MOTORIZED.ROT.DRIVE ELECTRICAL WIRING

SIZE A1 | DRAWING NO. 13900350 | REV B

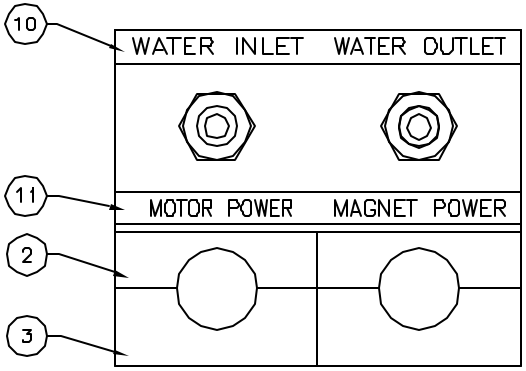
SCALE 2:1 | WT kg | SHEET 1 OF 1

REVISIONS				
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		11/08/02	G.DOUGLAS
B	CORRECT HEIGHT OF ITEM 3		01/29/03	G.DOUGLAS

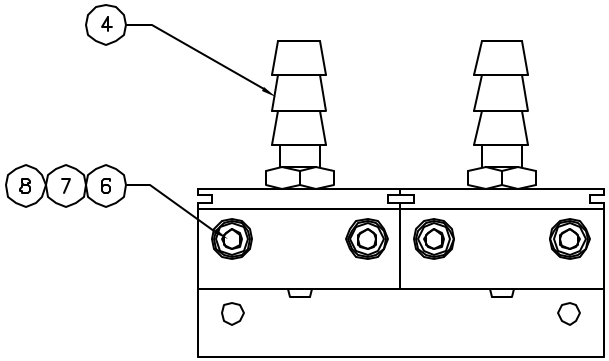
END VIEW



FRONT VIEW



BOTTOM VIEW



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
11	1	10901040	LABEL, POWER ENTRY	
10	1	10901030	LABEL WATER ENTRY	
9	2	BN 792	WASHER, M6 LOCK SP/S	
8	4	DIN 433	WASHER, M3 FLAT S/S	
7	4	BN 792	WASHER, M3 LOCK SP/S	
6	4	DIN 912	SHCS, M3 x 25 S/S	
5	2	DIN 439 B	NUT, M6 JAM BRASS	
4	2	17905380	HOSE FEEDTHRU	
3	2	17905320	CABLE CLAMP [Lower]	
2	2	17905310	CABLE CLAMP [Top]	
1	1	17905300	SERVICE BRACKET	

PARTS LIST

DRAWN G.DOUGLAS DATE 11/05/02
CHECK DATE
ENGINEERING DATE
11902050
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

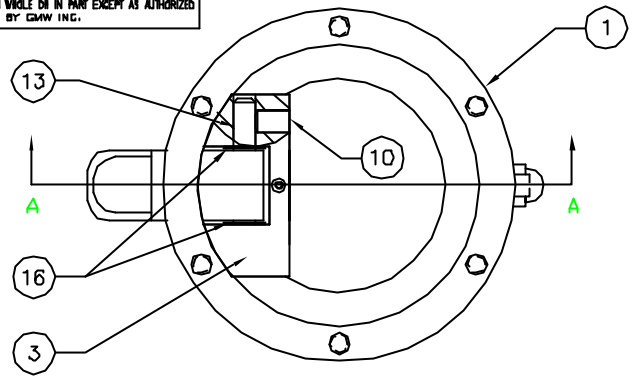
THIRD ANGLE PROJECTION

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

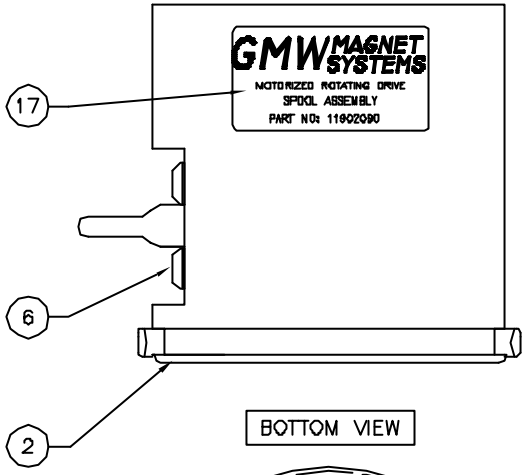
TITLE
ROTATING DRIVE SERVICE PANEL ASSY

SIZE A2 | DRAWING NO. 11902080 | REV B
SCALE 2:1 | WT kg | SHEET 1 OF 1

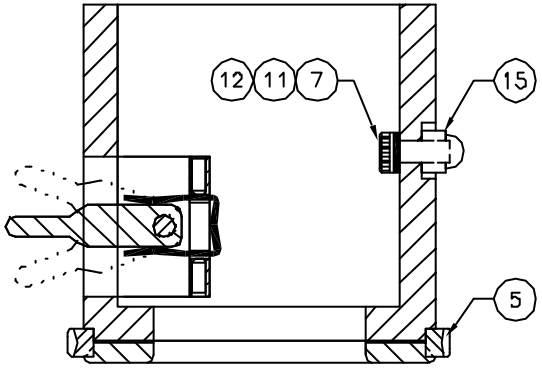
TOP VIEW



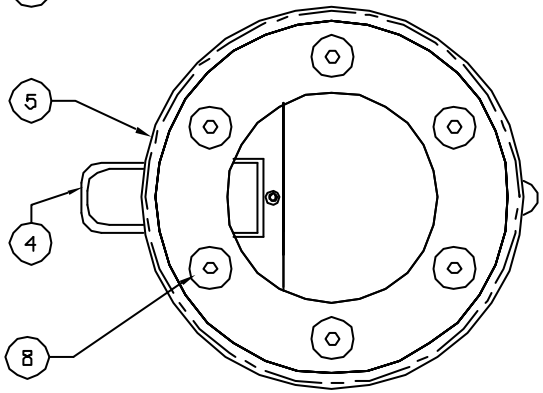
SIDE VIEW

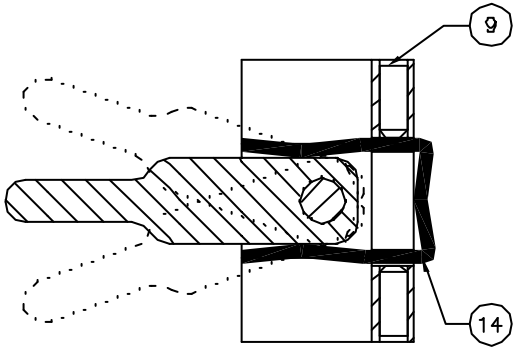


SECTION A–A



BOTTOM VIEW





REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		12/04/02	G.DOUGLAS

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
17	1	10901050	LABEL, IDENTIFICATION	
16	4	DIN 988	SHIM RING 3.0 x 6.0 x 0.1 STEEL	
15	1	DIN 1587	NUT, M3 HEX DOME [ACORN] BRASS	
14	A/R		PIANO WIRE ø1.00 S/S	
13	1	VSM 12771B	DOWEL PIN ø3.00 x 24 S/S	
12	1	DIN 433	WASHER, M3 FLAT S/S	
11	1	BN 792	WASHER, M3 LOCK, BOSSARD	
10	2	DIN 913 A2	SHSS, M3 x 5 S/S	
9	2	DIN 913 A2	SHSS, M2 x 5 S/S	
8	6	DIN 7991	SHCS, M3 x 5 FLUSH HD S/S	
7	1	DIN 912	SHCS, M3 x 6 S/S	
6	4	ISO 7380	SHCS, M3 x 10 BUTTON HD S/S	
5	1	12900210	WORM GEAR	
4	1	17905500	STOP BAR	
3	1	17905490	STOP BAR HOUSING	
2	1	17905520	SPOOL CLAMP	
1	1	17905510	SPOOL	

PARTS LIST

DRAWN G.DOUGLAS	DATE 11/18/02
CHECK	DATE
ENGINEERING	DATE
11902060	5201
NEXT ASSY	SYSTEM
SOFTWARE AUTOCAD 2000	

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

	INCHES	mm
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

THIRD ANGLE PROJECTION

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

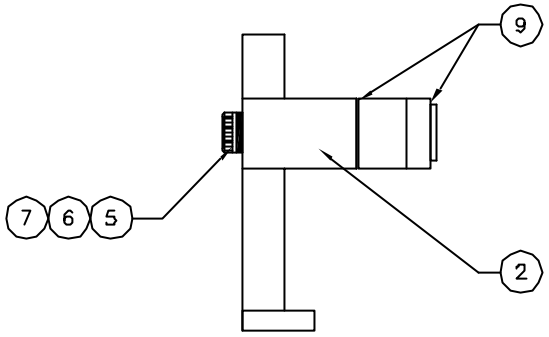
TITLE
ROTATING DRIVE SPOOL ASSEMBLY

SIZE	DRAWING NO.	REV
A2	11902090	A

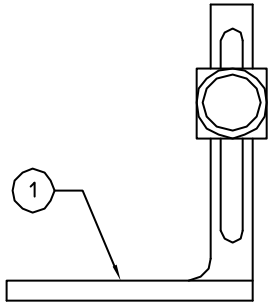
SCALE 2:1 | WT kg | SHEET 1 OF 1

REVISIONS				
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		12/03/02	G.DOUGLAS

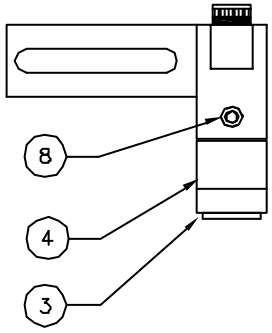
SIDE VIEW



FRONT VIEW



TOP VIEW



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
9	2	DIN 988	WASHER, SHIM 4 x 16 x 0.1 THICK	
8	1	DIN 913 A2	SHSS, M3 x 3 S/S	
7	1	DIN 433	WASHER, M3 FLAT S/S	
6	1	BN 792	WASHER, M3 LOCK, BOSSARD	
5	1	DIN 912	SHCS, M3 x 10 S/S	
4	1	STP-104-15	PULLEY, BERG	
3	1	17905550	PULLEY SHAFT	
2	1	17905540	BELT TENSIONER BLOCK	
1	1	17905530	BELT TENSIONER BRACKET	

PARTS LIST

DRAWN G.DOUGLAS	DATE 11/16/02	
CHECK	DATE	
ENGINEERING	DATE	
11902070	5201	
NEXT ASSY	SYSTEM	

SOFTWARE AUTOCAD 2000

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

	INCHES	mm
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

THIRD ANGLE PROJECTION

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

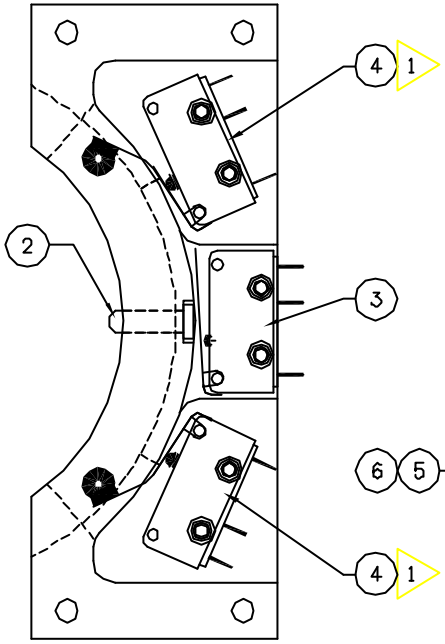
TITLE
ROTATING DRIVE
BELT.TENSIONER.ASSY

SIZE	DRAWING NO.	REV
A2	11902100	A

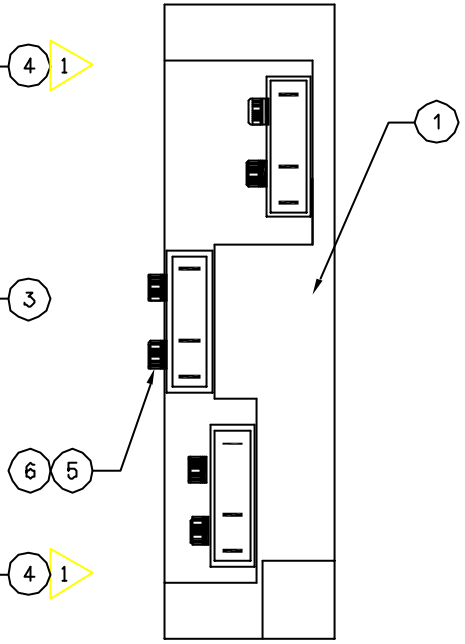
SCALE 2:1 | WT kg | SHEET 1 OF 1

REVISIONS				
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		11/22/02	G.DOUGLAS

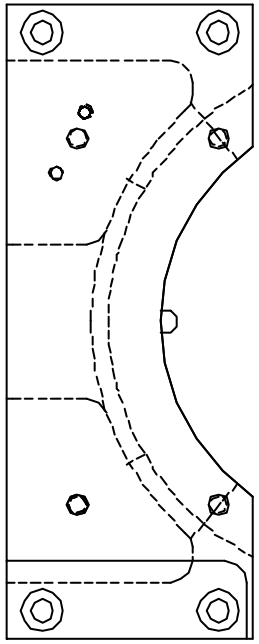
BOTTOM VIEW



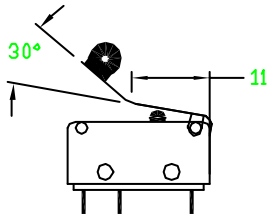
REAR VIEW



TOP VIEW



NOTE:
1. BEND MICROSWITCH ARM AS SHOWN BEFORE ASSEMBLY



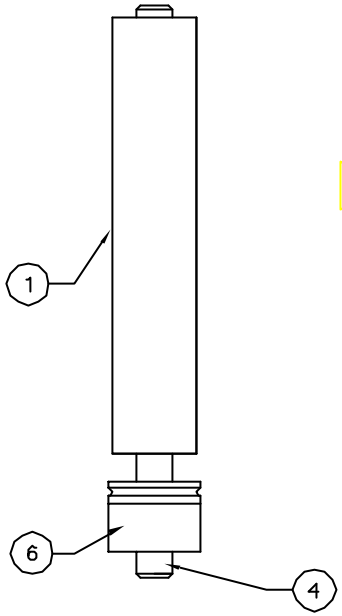
ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
6	6	BN 752	WASHER, LOCK SP/S M2 X 0.5 SP/S	
5	6	DIN 912	SHCS M2 X 10 S/S	
4	2	V4NT7	MICROSWITCH, BURGESS [travel limit]	
3	1	V4NT9	MICROSWITCH, BURGESS [zero position]	
2	1	17905440	ZERO SHAFT	
1	1	17905460	STOP BLOCK	

PARTS LIST

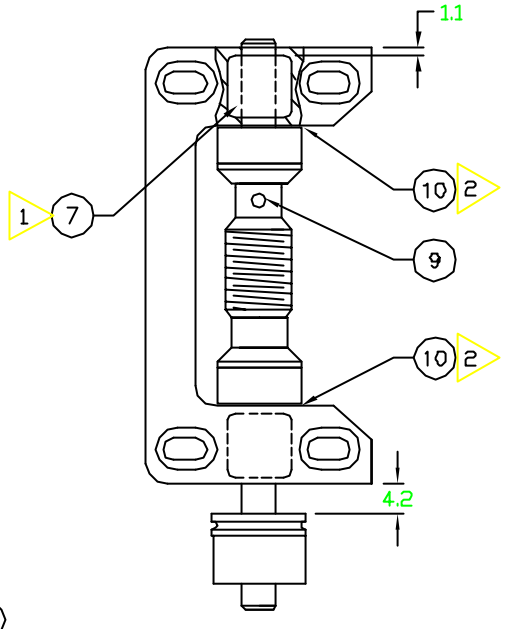
DRAWN G.DOUGLAS	DATE 11/19/02	DO NOT SCALE FROM DRAWING	GMW
CHECK	DATE	DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)	955 Industrial Rd, San Carlos, CA 94070
ENGINEERING	DATE	LINEAR: INCHES / mm; X.XXX ±.005 ±0.13; X.XX ±.01 ±0.1; X.X ±.03 ±0.3; X ±.06 ±1; DEG. ±.5 ±0.5; FINISH 63 1.6	Tel: (650)802-8292. Fax: (650)802-8298.
11902070	5201	THIRD ANGLE PROJECTION	TITLE: ROTATING DRIVE STOP BLOCK ASSY
NEXT ASSY	SYSTEM		SIZE A2 · DRAWING NO. 11902110 · REV A
SOFTWARE AUTOCAD 2000			SCALE 2:1 · WT kg · SHEET 1 OF 1

REVISIONS				
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		12/03/02	G.DOUGLAS

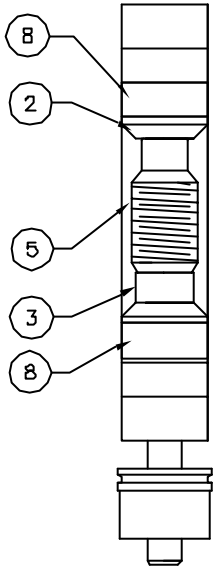
REAR VIEW



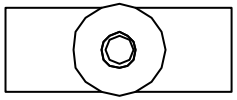
TOP VIEW



FRONT VIEW



END VIEW



NOTE
1. USE SUITABLE MANDLE TO INSERT PRESS FIT BEARING IN PLACE.
2. REMOVE ALL END PLAY BY STACKING SHIM RINGS [ITEM 10] BEHIND THRUST BEARING [ITEM 8].

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
10	A/R	BN 1976	SHIM RING 5.0 x 10.0 x 0.1 BOSSARD	
9	1	DIN 1481	ROLL PIN, 2.0 x 8.0	
8	2	B5M-2-SS	BEARING, THRUST	
7	2	NRB-5	BEARING, NEEDLE ROLLER BERG	
6	1	12900230	PULLEY	
5	1	12900220	WORM	
4	1	1290200	SHAFT	
3	1	17905570	SPACER [long]	
2	1	17905560	SPACER [short]	
1	1	17905470	WORM MOUNT	

PARTS LIST

DRAWN G.DOUGLAS	DATE 11/19/02	
CHECK	DATE	
ENGINEERING	DATE	
11902070	5201	
NEXT ASSY	SYSTEM	
SOFTWARE AUTOCAD 2000		

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

	INCHES	mm
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

THIRD ANGLE PROJECTION

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

TITLE
ROTATING DRIVE
WORM MOUNT ASSY

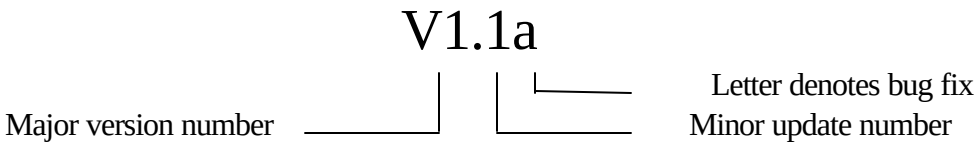
SIZE	DRAWING NO.	REV
A2	11902120	A

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

Section 9

SOFTWARE REVISION LIST

The Software revision number has the following format.



V1.0 First release April 10, 2003.