**IMPULSE® G+/VG+ Series 4 Operational Manual**

**OVERVIEW**

The following procedure is a supplement to other documentation supplied with this equipment and will guide the user in properly wiring the Series 4 and motor. It will also show the user how to configure the Series 4 in open loop, vector mode for a crane application.

**DANGER!** Improper wiring can and will cause bodily harm as well as damage to the equipment.

When installing the system, be sure to follow good wiring practices and all applicable codes. Ensure that the mounting of components is secure and that the environment, such as extreme dampness, poor ventilation, etc., will not cause system degradation.

Read this document, provided with the Series 4, thoroughly before attempting installation. Refer to the technical manual, as needed, available at: http://www.magnetekmh.com/MaterialsHandling/Product%20Manuals

**Step 1**

Connect Motor and Line Power

The figure below shows the electrical connections for the input power and motor terminals for various Series 4 models. **WITH POWER OFF** install the PG-X3 card as shown below. Make sure to follow good wiring practices and all applicable codes. Ensure that the feedback card is grounded properly as shown below.

**DANGER! LETHAL VOLTAGES ARE PRESENT.** Before applying power to the Series 4, ensure that the terminal cover is fastened and all wiring connections are secure. After the power has been turned off, wait at least five minutes until the charge indicator extinguishes completely before touching any wiring, circuit boards or components.

**WARNING: DO NOT CONNECT ANY OF THE FOLLOWING TERMINALS TO EARTH GROUND B1 B2 + + - -**

- DC bus terminals
- Motor terminals
- Input terminals
- Output terminals
- Braking terminals
- Encoder terminals

**Step 2**

Typical Wiring Diagram

This step shows a typical wiring diagram and connection points for the Series 4. Wiring connections should only be made by trained and authorized personnel when power to the drive is turned off.

**Step 3**

PG-X3 Feedback Card and Encoder Wiring (VG+ Only)

In this step the PG-X3 encoder feedback and card is installed. **WITH POWER OFF** install the PG-X3 card as shown below. Make sure to follow good wiring practices and all applicable codes. Ensure that the feedback card is grounded properly as shown in item H below.

Option Card Installation

This option card can be inserted into the CN5-C connector located on the drive’s control board.

**Encoder Power Supply (Max. 200mA)**

Select Encoder Power Supply (IP + 3G TB2) with Jumper CN3.

**Encoder Connection**

It is required to use a quadrature encoder in Flux Vector control mode. With POWER OFF, install the PG-X3 encoder card as shown above.

- **Encoder Setup**
  - A - Connector CN5-C
  - B - Connector CN5-B
  - C - Connector CN5-A
  - D - Drive grounding terminal (FE)
  - E - External dynamic braking option
  - F - Option card
  - G - Mounting screw
  - H - Use wire cutter to create an opening for cable ties
  - J - Front cover
  - K - Digital output
  - L - Terminal cover

**Encoder Signals**

(Reduced for Vector Operation)

- **X1**
  - A1 - Encoder A Slow Out A1
  - A2 - Encoder B Slow Out A2
  - B1 - Encoder A Slow Out B1
  - B2 - Encoder B Slow Out B2

- **X2**
  - Z+ - Encoder A Slow Out Z+
  - Z- - Encoder B Slow Out Z-

- **X3**
  - PG-X3 Option Card

- **X4**
  - Encoder Power Supply (Max. 200mA)

**Encoder Power Supply Rating**

- 50VDC or 24VAC (max. 200mA)

- **Encoder Connection**

- **Encoder Signals**

- **Encoder Setup**
  - A - Connector CN5-C
  - B - Ground terminal (installation hole)
  - C - Jumper for PG power supply voltage (CN3)
  - D - Terminal block TB1
  - E - Model number
  - F - Installation hole
  - G - Connector (CN5)

**Encoder Wiring**

- **Encoder Wiring**
  - A1 - Multi-function analog Input 1
  - A2 - Multi-function analog Input 2
  - B1 - Multi-function analog Output 1
  - B2 - Multi-function analog Output 2

- **Encoder Communication**
  - A4 - Encoder Signal (CN2)
  - A5 - Encoder Signal (CN2)

- **Encoder Wiring Diagram**
  - X - Installation hole
  - K - Connector (CN5)
  - J - Drive grounding terminal (FE)
  - B - Option card
  - D - Connector CN5-A
  - C - Connector CN5-C
  - E - Connector CN5-B
  - A - Ground terminal (installation hole)

- **Encoder Terminal Block**
  - Option Card Installation
  - Encoder B Slow Out A2
  - Encoder A Slow Out B1
  - Encoder A Slow Out B2
  - Encoder A Slow Out A1

- **Encoder Signals**
  - Encoder A Slow Out A1
  - Encoder B Slow Out B1
  - Encoder A Slow Out B2
  - Encoder B Slow Out A2

- **Encoder Setup**
  - A - Connector CN5-C
  - B - Connector CN5-B
  - C - Connector CN5-A
  - D - Drive grounding terminal (FE)
  - E - External dynamic braking option
  - F - Option card
  - G - Mounting screw
  - H - Use wire cutter to create an opening for cable ties
  - J - Front cover
  - K - Digital output
  - L - Terminal cover

**Encoder Power Supply (Max. 200mA)**

Select Encoder Power Supply (IP + 3G TB2) with Jumper CN3.
Step 4
Changing Parameters and Monitoring the Series 4

This step will explain how to change the monitor settings for the Series 4 and how to monitor Series 4 signals such as output frequency and motor current.

Make sure all protective covers have been re-attached and power is turned on. DO NOT RUN THE MOTOR.

Access Parameter Menu and Change Parameter Value

Press [V] two times until the digital operator shows the parameter menu.

Monitor Motor Frequency and Motor Current

Output Frequency and Motor Current can be monitored simultaneously.

To monitor output frequency and motor current or other signals individually, press [A] once, then press [V] to save.

Next press [A] to select monitor.

Use [V] to select monitor signal.

Please refer to the Series 4 Technical Manual on how to access other drive monitors and parameters.

Step 5
Selecting a Control Method

This step will explain the available Control Method settings that are specific to a G+ and VG+ drive.

V/f:
- Set parameter A01-02 = 0 (V/f).
- This setting is only available for G+ drives and is recommended for most Traverse and Mechanical Load Brake hoist applications.

Open Loop Vector:
- Set parameter A01-02 = 1 (Open Loop Vector).
- This setting is only available for G+ drives and is recommended for Traverse and Mechanical Load Brake hoist applications that require finer speed control or torque limiting.

Vector:
- Set parameter A01-02 = 3 (Vector). This setting is only available for VG+ drives and is locked to this setting. It is recommended for hoist applications with no load brake and requires encoder feedback.

NOTE: An Auto-Tune is recommended when using the Open Loop Vector or Vector control methods.

Step 6
Selecting a Motion

This step will explain how to configure the drive for a Hoist or Traverse application.

Traverse:
- Set parameter A01-03 = 0 (Traverse).

Hoist (with Mechanical Load Brake):
- Set parameter A01-03 = 1 (Standard Hoist).
- This setting is not available for VG+ drives.

Hoist (with No Load Brake):
- Set parameter A01-03 = 2 (NLB Hoist).
- This setting is not available for G+ drives.

NOTE: An Auto-Tune is recommended when using a No Load Brake Hoist motion.

Step 7
Selecting a Speed Reference

This step will list the speed reference settings.

- Default speed settings will be automatically applied via X-Press Programming. Reference the technical manual for more details and wiring instructions.

- 2-Speed Multi-Step: A01-04 = 0
- Uni-Polar Analog: A01-04 = 5

- 3-Speed Multi-Step: A01-04 = 1
- Bi-Polar Analog: A01-04 = 6

- 5-Speed Multi-Step: A01-04 = 2
- Industrial Communication: A01-04 = 7

- 2-Step Infinitely Variable: A01-04 = 3
- RS485 Communication: A01-04 = 8

- 3-Step Infinitely Variable: A01-04 = 4

WARNING! SUDDEN MOVEMENT HAZARD. The motor will spin during a standard Auto-Tune.

WARNING! ELECTRIC SHOCK HAZARD. High voltage will be supplied to the motor when Auto-Tuning is performed. Do not touch the motor during Auto-Tuning.

Step 8
Auto-Tuning

In this step the Series 4 is set up for use with the motor. Make sure all protective covers have been re-attached and then apply power to the Series 4. DO NOT RUN THE MOTOR.

From the main reference press [V] until the Digital Operator shows the Auto-Tuning menu. Then press [V].

V/f:
- Set T01-01 = 2 (Term Resistance)

Open Loop Vector and Flux Vector:
- Decouple motor from load and disengage brake.
- Set T01-01 = 0 (Standard Tuning)


For Europe: Enter Motor Power in kW
For USA: Enter Motor Power in HP

Press [A] to select the digit you would like to change and use [V] to adjust value, then press [V] to save.

Press [A] to select the next parameter and follow the same procedure described above to adjust its value.

T01-03 Rated Voltage (e.g., 230 V, 460 V)
T01-04 Rated Current (e.g., 11.0 A, 22.0 A)
T01-05 Rated Frequency (e.g., 60.0 Hz)
T01-06 Number of Poles (e.g., 4 Poles)
T01-07 Rated Speed (e.g., 1750 rpm)
T01-08 Encoder Pulses per Rev (e.g., 1024)
T01-09 No-Load Current
T01-10 Motor Rated Slip

Press the RUN key to start the Auto-Tune.
Next, press on the Digital Operator. The Series 4 will now start the Auto-Tuning procedure. The display will show message "Tune Successful" when the Auto-Tuning procedure has been successfully completed. Please reference the Series 4 User Manual or repeat the procedure again if the display shows an error message.

Check the motor speed monitor U01-05 while turning the motor manually in forward direction (CW). If the sign displayed is negative, power down the drive, wait at least five minutes until the charge indicator extinguishes completely, then swap encoder wires A+ with A- on the PG-X3 card. Next, power up the drive and repeat this test. Or, reverse the encoder direction with parameter F01-02.

**Frequently Asked Questions**

**Question:** How do I reset the drive back to factory default settings?

**Answer:** Go to parameter A01-05 and enter 1110.

**Question:** How do I adjust the time it takes the motion to speed up or slow down?

**Answer:** Adjust the acceleration time parameter B05-01 and deceleration time B05-02.

**Question:** How do I prevent my drive from tripping on an OV fault (overvoltage) while my motor is ramping down?

**Answer:** Increase deceleration time parameter B05-02 and check braking resistor.

**Question:** How do I prevent my drive from tripping on an OL fault (overload) while my motor is ramping down?

**Answer:** Verify motor rated current parameter E02-01 and motor overload parameter settings L01-01 Motor overload selection, L01-02 Motor overload protection time.

**Question:** How can I run my motor above the base motor speed?

**Answer:** Increase the value of parameter E01-04 Maximum Frequency. Verify that the motor and system allow for this.

**Question:** How can I change motor direction without changing the motor leads?

**Answer:** Set parameter B03-04 to 1 (exchange phases).

### Step 9

**Quick Start Parameters**

The following table lists the general purpose application parameters as well as frequently asked questions.

This section may require you to change one or more Series 4 parameters. Please refer to Step 4 for a detailed explanation on how to change parameters.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Settings</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A01-01</td>
<td>Access Level</td>
<td>0 = User, 1 = Basic, 2 = Advanced</td>
<td></td>
</tr>
<tr>
<td>A01-02</td>
<td>Control Method</td>
<td>0 = V/f, 2 = Open Loop Vector*, 3 = Flux Vector*</td>
<td></td>
</tr>
</tbody>
</table>
* Auto-Tune recommended |
| A01-03    | Motion | 0 = Traverse, 1 = Hoist w/ Load Brake (G+ only), 2 = Hoist w/o Load Brake (VG+ only), 3 = Brakelronic |
| A01-04    | Speed Reference | 0 = Two-Speed Multi-Step, 1 = Three-Speed Multi-Step, 2 = Five-Speed Multi-Step, 3 = Two-Step Infinitely Variable, 4 = Three-Step Infinitely Variable, 5 = Uni-Polar Analog (5-10VDC, 4-20mA), 6 = Bi-Polar Analog (-10 – +10VDC), 7 = Industrial Communication, 8 = RS485 Communication |
| B05-01    | Acceleration Time | 0.0 - 25.5 Seconds |
| B05-02    | Deceleration Time | 0.0 - 25.5 Seconds |

**Parameter Description**

- **A01-01**: Access Level
  - 0 = User
  - 1 = Basic
  - 2 = Advanced

- **A01-02**: Control Method
  - 0 = V/f
  - 2 = Open Loop Vector*
  - 3 = Flux Vector*

  * Auto-Tune recommended

- **A01-03**: Motion
  - 0 = Traverse
  - 1 = Hoist w/ Load Brake (G+ only)
  - 2 = Hoist w/o Load Brake (VG+ only)
  - 3 = Brakelronic

- **A01-04**: Speed Reference
  - 0 = Two-Speed Multi-Step
  - 1 = Three-Speed Multi-Step
  - 2 = Five-Speed Multi-Step
  - 3 = Two-Step Infinitely Variable
  - 4 = Three-Step Infinitely Variable
  - 5 = Uni-Polar Analog (5-10VDC, 4-20mA)
  - 6 = Bi-Polar Analog (-10 – +10VDC)
  - 7 = Industrial Communication
  - 8 = RS485 Communication

**Limited by E01-04**

- **B05-01**: Acceleration Time
  - 0.0 - 25.5 Seconds

- **B05-02**: Deceleration Time
  - 0.0 - 25.5 Seconds