

MAGNETEK

E L E V A T O R

HPV1000-App_Note_02

Closed Loop Start Guide

Guide to set up HPV1000 drive in Closed Loop





CLOSED-LOOP QUICK START-UP GUIDE

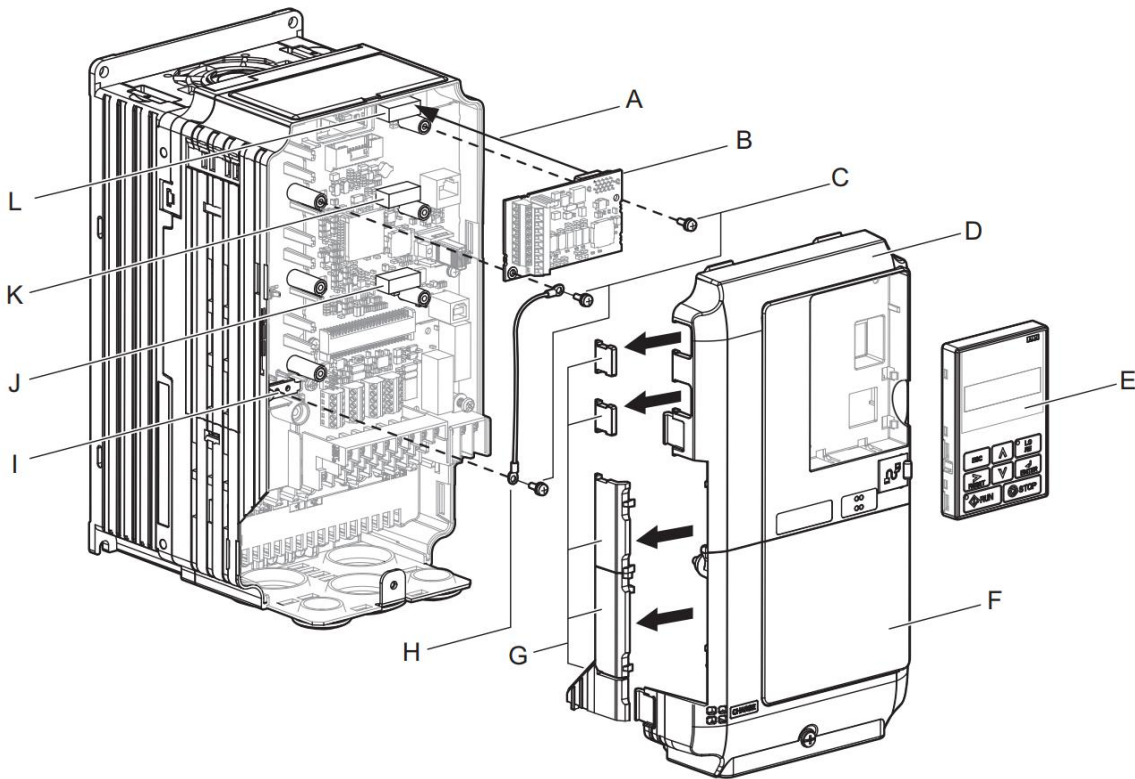
NOTE: This quick start-up guide just outlines the general parameters that should be changed / verified when a drive is installed with information that are readily available. The drive will **not** run if **only** these parameters are set. Because different controller manufacturers have different interfaces, it is recommended that the parameters in the drive be set to what is recommended by the elevator controller in their technical manual.

Closed-Loop Operation Set-up

- 1) Enter / verify that the drive is set to run in Closed Loop Vector in the Drive Mode menu (U8)

Option Card

- 2) The drive will need an option card to run in closed loop mode. Confirm that the encoder board is installed in the drive. The most common variant for closed loop induction is the PG-X3 card. The card should be installed as follows:

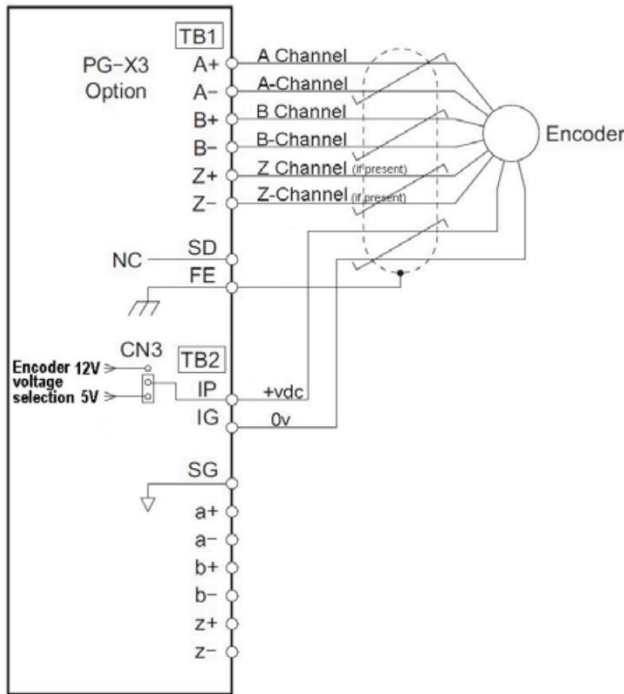


- | | |
|--|--|
| A – Insertion point for CN5 | H – Ground wire |
| B – Option card | I – Drive grounding terminal (FE) |
| C – Included screws | J – Connector CN5-A
(Not available for PG option installation.) |
| D – Front cover | K – Connector CN5-B |
| E – Keypad | L – Connector CN5-C |
| F – Terminal cover | |
| G – Removable tabs for wire routing | |



Encoder Wiring

- 3) The encoder should be wired to the drive as follows:
Quadrature Operation



Single Ended Operation

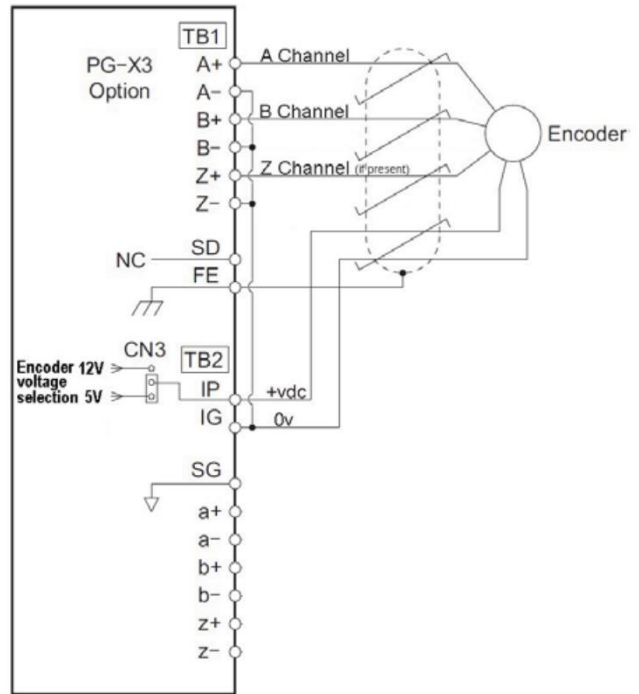


Table 1 CL: PG-X3 Encoder connections

- IP is the +VDC, and IG as the common.
- The encoder voltage is selected via the jumper CN3 as either 5.5V or 12V
- Note that the encoder is wired in to the upper case terminals. The lower case terminals are an output from the drive and won't necessarily be used.
- If wired single ended, PG Card Detect (C1) must be Disabled

Hoistway Parameter Set-up

- 4) Enter / verify the following parameters:
- CONTRACT CAR SPD (A1) parameter should be the lift contract speed in m/s. This can be verified with a hand tachometer if required and adjusted if required.
 - CONTRACT MTR SPD (A1) parameter should be set to the RPM that is required to make the lift travel at contract car speed

NOTE: The above two parameters are utilised by the drive for many purposes regarding speed control of the lift, therefore its important these are set correctly prior to continuing any further.

Input Voltage

- 5) Enter the Line Voltage in the A4 menu:
- INPUT VOLTAGE (A4) parameter should be set to the measured incoming phase to phase voltage.

Encoder Set-up

- 6) Verify the encoder has been selected and installed in accordance with the following:



Electrical interference and mechanical speed modulations are common problems that can result in improper speed feedback getting to the drive. To help avoid these common problems, the following electrical and mechanical considerations are suggested.

IMPORTANT- Proper encoder speed feedback is essential for a drive to provide proper motor control.

Electrical Considerations

- If possible, insulate both the encoder case and shaft from the motor.
- Use twisted pair cable with shield tied to chassis ground at drive end
- Use limited slew rate differential line drivers.
- Do not allow capacitors from internal encoder electronics to case.
- Do not exceed the operating specification of the encoder/drive.
- Use the proper encoder supply voltage and use the highest possible voltage available. (i.e. 12V_{DC} is preferred because less susceptible to noise)

Mechanical Considerations

- Use direct motor mounting without couplings where possible.
- Use hub or hollow shaft encoder with concentric motor stub shaft.
- If possible, use a mechanical protective cover for exposed encoders.

Autotune

- 7) The autotune can now be performed by navigating to the U9 menu. The drive has several options for autotuning the motor, however usually the motor will be roped, and so the ‘Tune-No Rotate1’ (Static) method will be used.
If the ropes are off, and the motor can turn freely, the ‘Standard Tune’ (Rotating) method can be used.

Navigate to the U9 menu and enter the following information:

- ‘Tune-No Rotate1’ (TUNING MODE SEL(U9))
- Motor Rated Power in kW (MTR RATED POWER(U9))
- Rated Voltage in V (RATED VOLTAGE(U9))
- Rated Current in A (RATED CURRENT(U9))
- Rated Frequency in Hz (RATED FREQUENCY (U9))
- Number of Poles (NUMBER OF POLES(U9))
- Rated Motor Speed* (RATED SPEED (U9)) - *This is after slip, so NOT synchronous speed.*
- Encoder Pulses (ENCODER PPR (U9))
- No Load Current (NO-LOAD CURRENT(U9)) - *Enter 35% of the RATED MOTOR CURRENT entered above for 4 pole motors or 45% for a 6 pole motor*

***Note** The rated motor rpm entered must equal what it can achieve at rated frequency, at full load and full speed. If synchronous speed is given on the dataplate, a lower RPM must be entered. Table 2 gives an indication of typical motor rated rpm for lift applications.

Synchronous speed (50hz)	Rated motor Speed (rpm)	Number of motor poles	Typical No Load Current
1500	1480 - 1340	4	35%
1000	980 - 840	6	45%

Table 2: Synchronous/Asynchronous Motor Speeds & Motor Poles Reference for 50Hz

Once the above information has been entered and the bottom of the menu is reached the screen will display: ‘Auto-tuning. Waiting for command – Tune Ready? Give Run/Hit Enter’.

At this point **DO NOT** press any keypad buttons.

Using your inspection controls, **PRESS AND HOLD** the buttons to run the lift in the **UP DIRECTION** (the lift will not move, however the tune will begin) If the drive has control of the motor contactors they will now pull in and the tune will begin.

During this process the drive will display motor speed and motor current for reference.

Once complete the drive will display “END Tune Successful”. The test run UP button can now be released.



The drive will then automatically populate the following parameters in the A1 and A5 menus:

- Encoder Pulses (A1)
- Rated Mtr Power (A5)
- Rated Mtr Volts (A5)
- Rated Motor Freq (A5)
- Rated Motor Curr (A5)
- Number of Poles (A5)
- Motor Rated Slip (A5) – calculated from autotune
- No-Load Current (A5)
- Leak Inductance (A5) – calculated from autotune
- Term Resistance (A5) – calculated from autotune

Low speed inspection mode

- 8) Run the drive in low speed inspection mode and...
- Start with default value of 2 for INERTIA (A1)
 - Verify encoder polarity. The motor phasing should match the encoder phasing. If you experience Speed Dev Flt/ PGO Fault the phasing may be incorrect -this can be reversed changing ENCODER CONNECT (C1) between Forwards and Reverse
 - Verify proper hoistway direction. This can be reversed by changing both the MOTOR ROTATION and ENCODER CONNECT (C1) parameters.

Key Drive Parameters

NOTE: Key parameters that are **not** listed below are parameters that are set for drive/controller interface in the C0 menu and A2 and A3 sub menus

Drive Menu A1

Parameter	Description	Default	Units	Suggested Adjustment
CONTRACT CAR SPD	Elevator contract speed	2.0	m/s	Adjust to speed the installation is rated to run at.
CONTRACT MTR SPD	Motor speed at elevator contract speed	1450.0	rpm	Adjust this value to ensure the actual running speed of the car matches the parameter above. If the car is traveling too fast then reduce this value, if too slow then increase it.
RESPONSE	Sensitivity of the speed regulator	10.0	rad/sec	Set to 20 to improve the drive response to changes in speed reference. If the motor current and speed becomes unstable, reduce however if the value is too small, the response will be sluggish.
INERTIA	System inertia	2.00	sec	Determines the system inertia in terms of the time it takes the elevator to accelerate to contract speed. If the car is light, the value will be smaller than the default and vice versa if the car is heavy.
ENCODER PULSES	Encoder counts per revolution	1024	PPR	Obtain the Encoder PPR from the encoder nameplate and enter in this parameter.
MTR TORQUE LIMIT	This parameter sets the maximum motoring torque the drive will produce in the motor	200.0	%	Determines the maximum torque allowed when in the motoring direction. This is generally left at the default setting. If the drive intermittently gives 'Hit Torque Limit' messages, this can be increased. 250% would be a recommended value.



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Parameter	Description	Default	Units	Suggested Adjustment
REGEN TORQUE LIMIT	This parameter sets the maximum regenerating torque the drive will produce in the motor	200	%	Determines the maximum torque allowed when in the regenerating direction. This is generally left at the default setting. If the drive intermittently gives 'Hit Torque Limit' messages, this can be increased. 250% would be a recommended value.

Table 3 CL: Important parameters in A1 menu to set/check when setting up a drive in closed-loop

Power Convert A4

Parameter	Description	Default	Units	Suggested Adjustment
INPUT VOLTAGE	Nominal line-line AC input Voltage, RMS	0	Volts AC	Adjust to match the voltage across R, S, and T of the drive. The drive uses this value for its undervoltage alarm and fault detection circuit
UV DETECT LEVEL	DC Bus Voltage level for undervoltage fault	500	Volts DC	Usually set to around 70% of the DC Bus voltage while idle (Can be monitored in the D2 menu)
PWM FREQUENCY	Carrier frequency	8	kHz	Setting this parameter to 8kHz is a good starting value to ensure low motor noise. Increasing this value will derate the drive.

Table 4 CL: Important parameters in A4 menu to set/check when setting up a drive in closed-loop

Motor A5

Parameter	Description	Default	Units	Suggested Adjustment
MTR RATED POWER	Rated motor output power	0	kW	Set to motor kW rating as per the motor nameplate (Should be set in U9 during autotune)
RATED MTR VOLTS	Rated Motor Voltage	0	VAC	Set to motor Voltage rating as per the motor nameplate (Should be set in U9 during autotune)
RATED MOTOR FREQ	Rated excitation frequency	0	Hz	Set to motor frequency rating as per the motor nameplate (Should be set in U9 during autotune)
RATED MOTOR CURR	Rated motor current	0	Amps	Set to motor nameplate rated current (Should be set in U9 during autotune)
NUMBER OF POLES	Motor poles	4	none	Adjust to set number of motor poles (Should be set in U9 during autotune)
MOTOR RATED SLIP	The slip frequency of the motor	0	Hz	Set to the slip frequency of the motor (Should be set in U9 during autotune)
NO-LOAD CURRENT	No Load Current	0	A	If it is not known, use the default value in the U9 menu (Should be set in U9 during autotune)
LEAK INDUCTANCE	Leakage Inductance	0	%	These parameters should be set during the autotune (U9)
TERM RESISTANCE	Phase to phase resistance of motor	0	%	

Table 5 CL: Important parameters in A5 menu to set/check when setting up a drive in closed-loop

Basics U8

Parameter	Description	Default	Choices	Suggested Adjustment
DRIVE MODE	Drive operation	Closed Loop Vect	V/f Control Open Loop Vector Closed Loop Vector PM ClosedLoop Vct	Set to Closed Loop Vect (Note: not "PM ClosedLoop Vct") to run in Closed Loop mode. Can be set to Open Loop Vect to run without encoder feedback for diagnosis purposes

Table 6 CL: Important parameter in U8 menu to set/check when setting up a drive in closed-loop



Autotune U9

Parameter	Description	Default	Choices	Suggested Adjustment
Autotune	Autotune menu	Standard Tune	Standard Tune Tune-No Rotate1 Tune-No Rotate2 Term Resistance	<p>'Tune-No Rotate1' is the method to use if the motor is already roped. If the motor is not roped then the 'Standard Tune' method can be used to learn the No Load Current value.</p> <p>Note that when performing the autotune, the drive will also ask for the following parameters:</p> <ul style="list-style-type: none"> • Rated Motor Power in kW • Rated Motor Voltage in V • Rated Motor Current in A • Rated Motor Frequency in Hz • Number of Motor Poles • Rated Motor Speed • Encoder Pulses • No Load Current

Table 7 CL: Important parameters in U9 menu to set/check when setting up a drive in closed-loop