# PM EnDat Start Guide

Guide to set up HPV1000 drive with Permanent Magnet motor and EnDat Encoder

# PM EnDat 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 'PM Closed Loop Vector' in the Drive Mode menu (U8)

## Option Card

2) The drive will need an option card to run in PM mode, and for EnDat encoders this will be the PG-F3 card. Confirm that the encoder board is installed in the drive as follows:
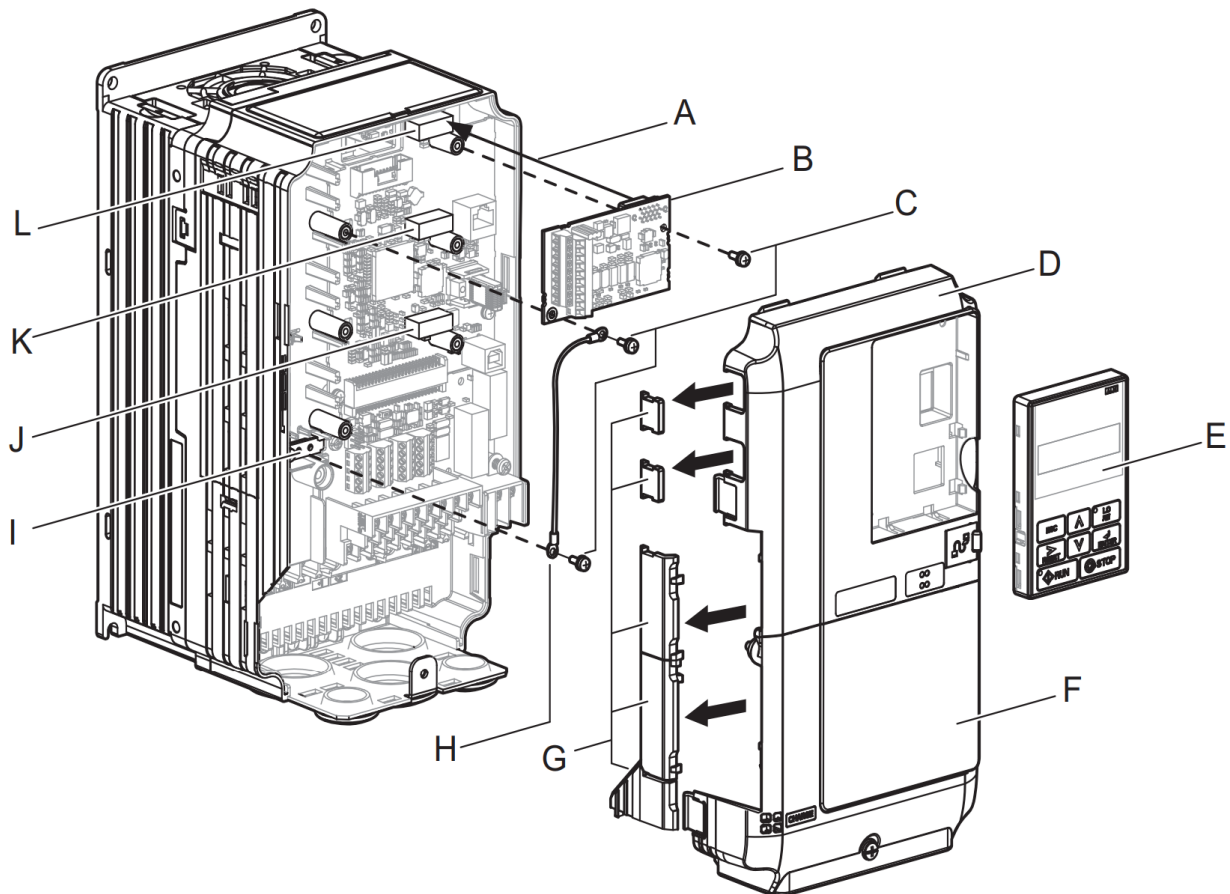


| | |
|---|---|
| **A** – Insertion point for CN5 | **G** – Removable tabs for wire routing |
| **B** – Option card | **H** – Ground wire |
| **C** – Included screws | **I** – Drive grounding terminal (FE) |
| **D** – Front cover | **J** – Connector CN5-A |
| **E** – Digital operator | **K** – Connector CN5-B |
| **F** – Terminal cover | **L** – Connector CN5-C |

## Encoder Wiring

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



Table 1 CL: PG-F3 Encoder connections

- *IP is the +VDC, and IG as the common.*
- *The encoder voltage is selected via the jumper CN3 as 5V*
- *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.*

| Encoder Signal | PG-F3 Terminal | Cable Colours | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Heidenhain | Ziehl | CEG | IMEM (Ext) | Wittur | Wittur (Ext) | Sassi ECN 1313 | Sicor |
| A/ | A- | Yellow & Black | Red & Blue | Brown | Purple | Yellow | Pink | Purple | Red & Blue |
| A | A+ | Green & Black | Grey & Pink | White | Green | Green | Grey | Red | Grey & Pink |
| B/ | B- | Red & Black | Red | Yellow | Pink | Pink | Yellow | White | Violet |
| B | B+ | Blue & Black | Blue | Green | Blue | Grey | Green | Brown | Black |
| Data/ | /DT | Pink | Brown | Pink | Brown | White | Brown | Blue | Pink |
| Data | DT | Grey | White | Grey | Grey | Brown | White | Yellow | Grey |
| Clock/ | /CK | Yellow | Black | Red | White | Black | Purple | Pink | Yellow |
| Clock | CK | Purple | Purple | Blue | Black | Purple | Black | Green | Green |
| 0V Com | IG | Green & White | Pink | Purple | Yellow | Blue | Blue | Red & Blue | White |
| +5V | IP | Green & Brown | Grey | Black | Red | Red | Red | Grey & Pink | Brown |
| 0V Sense | IG | White | Yellow | N/A | N/A | N/A | N/A | Black | Blue |
| +5V Sense | IP | Blue | Green | N/A | N/A | N/A | N/A | Grey | Red |
| Shield | FE | Shield | Shield | Shield | Shield | Shield | Shield | Shield | Shield |

![MAGNETEK ELEVATOR logo]

## Power up and parameterisation

When all connections and terminations are made, and the controller switched to 'Test/Inspection Controls' you can then power up the installation. You will next need to verify the parameters entered in the drive match that of the motor data plate, please do not assume that these are already entered correctly.

You may wish to note your motor data in the adjacent box for reference:

Note * Some motors do not quote the number of motor poles however this can be simply calculated using this formula:

*120 x Rated Motor Frequency*
      *Rated Motor Speed*

| Rated Motor Power (KW) | KW |
|---|---|
| Rated Motor Volts | Volts |
| Rated Motor Current | Amps |
| Motor Poles* | Poles |
| Rated Motor Speed* | RPM |
| Rated Motor Frequency* | Hz |

Ensure that the motor connections are phased correctly, that is U,V,W (A,B,C ) terminals on the control panel terminal rail are connected to the hoist motor terminals U,V,W.

## 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.

## Autotune

6) The autotune can now be performed by navigating to the U9 menu. The drive has several options for autotuning the motor, however as usually the motor is roped we recommend the 'Tune-No Rotate1' (Static) method is 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 Rotate' (TUNING MODE SEL(U9))
   - Rated Motor Power in kW (MTR RATED POWER(U9))
   - Rated Voltage in V (RATED VOLTAGE(U9))
   - Rated Current in A (RATED CURRENT(U9))
   - Number of Poles (NUMBER OF POLES(U9))
   - Rated Speed (RATED SPEED (U9))
   - Encoder Pulses – should be 2048 (PG PULSE/REV (U9))

   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)
- Max Motor Speed (A5)
- Rated Speed (A5)
- Rated Mtr Curr (A5)
- Number of Poles (A5)
- Stator Resistance (A5) - *calculated from autotune*
- D Axis Induct (A5) - *calculated from autotune*
- Q Axis Induct (A5) - *calculated from autotune*
- PM Mtr Ind V 1 - *calculated from autotune*
- PM Mtr Ind V 2 - *calculated from autotune*

The drive is now ready for an alignment to be carried out using the steps below. If the ropes are off, use option A – Rotating. If the ropes are already on skip to option B – Non Rotating.

## A - Alignment – Rotating

This procedure is used if the ropes are free of the sheave. This will require the sheave to be able to turn freely with no resistance, and so the ropes will have to be fully lifted off the sheave.
Navigate to the U9 menu and set:
- ''PolePos-rotate' (TUNING MODE SEL U9)

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 A5 menu:
- Enc Z-Pulse Offs (A5)

## B - Alignment – Non Rotating

If the motor is already roped we recommend the 'PolePos-norotate' (Static) alignment method. As above Navigate to the U9 menu and set:
- 'PolePos-norotate' (TUNING MODE SEL U9)

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 A5 menu:
- Enc Z-Pulse Offs (A5)

## Inspection Run

7) Run the drive in low speed inspection mode and…
- Start with a value of 0.5s for INERTIA (A1)
- Ensure Motor Contactors are closing, Brake is lifting, and the car can move freely in the shaft
- Verify encoder polarity. The motor phasing should match the encoder phasing. If you experience Speed Dev Flt/HIT TRQ LIM alarm the phasing may be incorrect –the most likely cause is incorrect motor phasing. Swap two motor phases, perform alignment and run again
- Verify proper hoistway direction. If this is running with correct speed and control, but in the incorrect direction, swap both Encoder Connect (C1) and Motor Rotation (C1), and repeat alignment procedure.

## 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 | 0.0 | m/s | Adjust to speed the installation is rated to run at. |
| CONTRACT MTR SPD | Motor speed at elevator contract speed | 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 | 2048 | 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. |
| 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 PM: Important parameters in A1 menu to set/check when setting up a drive in PM

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### 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 PM: Important parameters in A4 menu to set/check when setting up a drive in PM

### Motor A5

| Parameter | Description | Default | Units | Suggested Adjustment |
|---|---|---|---|---|
| RATED MTR 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 | V | Set to motor Voltage as per the motor nameplate (Should be set in U9 during autotune) |
| MAX MOTOR SPEED | Upper Limit for motor speed | 0 | RPM | This is the upper limit for the motor speed. The Rated Motor Speed and Contract Motor Speed CANNOT be set higher than this value |
| RATED MTR SPEED | Rated Motor Speed | 0 | RPM | Set to motor RPM rating as per the motor nameplate (Should be set in U9 during autotune) |
| RATED MOTOR CURR | Rated Motor Current | 0 | A | Set to motor Current rating as per the motor nameplate (Should be set in U9 during autotune) |
| NUMBER OF POLES | Motor Poles | 0 | N/A | Set to motor nameplate Motor Poles or use the formula above (Should be set in U9 during autotune) |
| STATOR RESISTANCE | Stator Resistance | 0 | Ohms | Should be learnt from 'Tune No Rotate' in U9 |
| D AXIS INDUCT | D Axis Induct | 0 | mH | Should be learnt from 'Tune No Rotate' in U9 |
| Q AXIS INDUCT | Q Axis Induct | 0 | mH | Should be learnt from 'Tune No Rotate' in U9 |
| PM MTR IND V 1 | Induced Phase Peak Voltage | 0 | mH | Should be learnt from 'Tune No Rotate' in U9'. !IMPORTANT! ONLY Ind 1 OR Ind 2 should be used, the other should be set to '0' |
| PM MTR IND V 1 | Induced Phase Peak Voltage | 0 | mH | Should be learnt from 'Tune No Rotate' in U9'. !IMPORTANT! ONLY Ind 1 OR Ind 2 should be used, the other should be set to '0' |
| ENC Z-PULSE OFFS | Encoder Offset Value | 0 | Deg | This parameters should be learnt during the PolPos procedure (U9) |

Table 5 PM: Important parameters in A5 menu to set/check when setting up a drive in PM

### Basics U8

| Parameter | Description | Default | Choices | Suggested Adjustment |
|---|---|---|---|---|
| DRIVE MODE | Drive operation | PM CLOSED LOOP VCT | V/f Control<br>Open Loop Vect<br>Closed Loop Vect<br>PM ClosedLoop Vct | Set to PM ClosedLoopVct (Note: not "Closed Loop Vect"!) to run in PM mode. |

Table 6 PM: 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<br>Tune-No Rotate<br>Term Resistance<br>InitiPoleEstPrms<br>PolePos-norotate<br>PolePos-rotate<br>Ind VoltageConst | 'Tune-No Rotate' is the method to use for autotune if the motor is already roped. If the motor is not roped.<br><br>Note that when performing the autotune, the drive will also ask for the following parameters:<br>• 'Tune-No Rotate'<br>• Rated Motor Power in kW<br>• Rated Voltage in V<br>• Rated Current in A<br>• Number of Motor Poles<br>• Rated Speed<br>• Encoder Pulses – should be 2048<br><br>An alignment should then be performed. use:<br><br>• PolePos – Norotate<br><br>To determine a Z Pulse Offs value |

Table 7 PM: Important parameters in U9 menu to set/check when setting up a drive in PM