



PM EnDat Start Guide

Guide to set up HPV1000 drive with ECD controller with permanent magnet motor and EnDat encoder



May 2024



PM ENDAT QUICK START-UP GUIDE

NOTE: This quick start-up guide just outlines the general wiring and parameters that should be changed / verified when a drive is installed with an ECD 100-1xx controller. Most parameters are factory set prior to shipping; however, motor data, speeds and acceleration/deceleration curves must be set by the installer. For more information and safety warnings please refer to the supplied ECD 100-1xx manual and Magnetek HPV1000 manual.

Controller Installation

Before disconnecting the old controller measure the actual lift speed, motor RPM and brake voltage as the data plates are not always accurate.

Nb: Use a hand-held tacho for accurate speed measurement.

Controller cabinet must be installed in a location free from;

- Dust and dirt.
- Excessive heat and humidity.
- Internal controller temperature not to exceed 40°C /104°F
- Excessive vibrations.
- Mist or water

When mounting controller cabinet, ensure it is suitably supported.

Weight of controllers can range from approx. 60-120kg.

Wall mounted controllers may need to be supplemented with a stand under the cabinet.

All internal components of the controller must be protected against contamination from dirt, dust, metal filings etc resulting from the mounting process and general operation.

A 100mm square open top duct mounted directly under the controller cabinet access panels is recommended for cable entry to the controller.

Ensure controller cabinet and the controller cabinet doors (use earth studs on doors) are grounded. Keep doors closed to minimize electrical noise.

Controller-Motor Wiring

It is recommended that all existing motors be re-wound to Class F specifications for variable frequency control.

Connect motor windings to terminals U, V, W and PE

- Motor cable must be shielded and grounded **BOTH** controller and motor ends. Cable should be suitably sized for the KW rating of the motor. Ensure the inverter and motor housing are grounded.
- Install the motor cable in separate conduit/duct from other wiring.
- The motor cable shield must be connected to the inverter PE terminal and the motor ground terminal.
- If an existing motor is being re-connected ensure motor is wired in a configuration which will provide full speed operation. Eg, Connect a 2-speed motor to the fast speed winding. Slow speed winding will not be used.
- Wire hoist motor over temp thermistor to terminals marked on circuit diagrams.



Brake

To prevent voltage spikes and back emf/noise affecting the microprocessor; Brakes **MUST** be suppressed **AT THE BRAKE COIL** with supplied reverse biased diode or, a reverse biased diode with appropriate series resistor (100 Ohm, 5W) recommended.

Connect brake coils to terminals marked on circuit diagrams.

If using ECD brake board, set up VMAX and V1 according to brake coil voltage

Braking Resistor

The braking resistor should be mounted externally to the controller to and as close as possible to the controller cabinet. The braking resistor may be mounted on top of controller cabinet. (Nb. If drilling holes in cabinet protect against metal filings entering the cabinet).

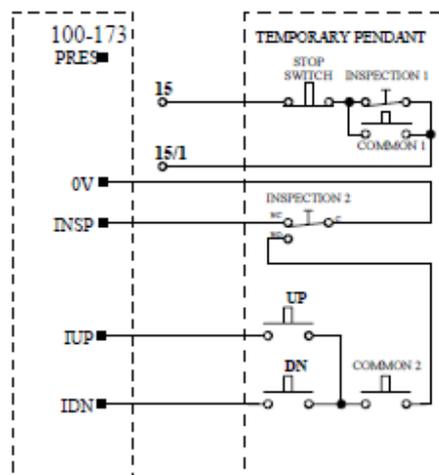
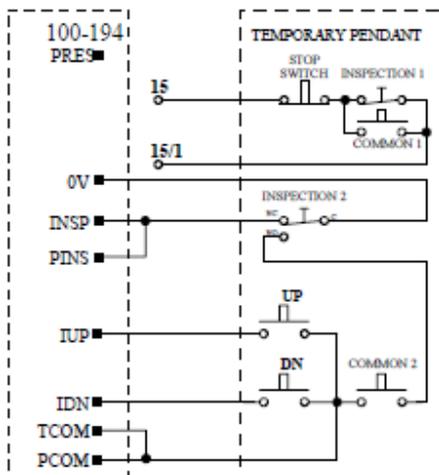
If mounting resistor to the wall, do not mount vertically with the terminals towards the top. Rising heat from resistor can damage the terminals in this position.

- Ensure that ventilation air can move freely around and through the resistor unit.
- Ensure the brake resistor metal enclosure is grounded.
- Wire the braking resistor terminals B1 and B2 to the HPV1000 terminals using 4 mm shielded cable and ring lugs. Ground the shield at the inverter.
- Keep the brake wiring segregated from other control wiring and the run as short as possible.
- Ensure the braking resistor temperature is monitored to avoid the brake resistor overheating. Connect the brake resistor temp switch sensor terminals on the braking resistor to terminals 61 and 62 (or 63 and 64) – Thermistor Relay trip with manual reset.
- If the braking resistor temp switch opens due to an overheating brake resistor, the circuit will drop C1 contactor, removing power from the drive. This shall also prevent a faulty brake IGBT from overheating the brake resistor to dangerous levels.

Preparation for Power Up

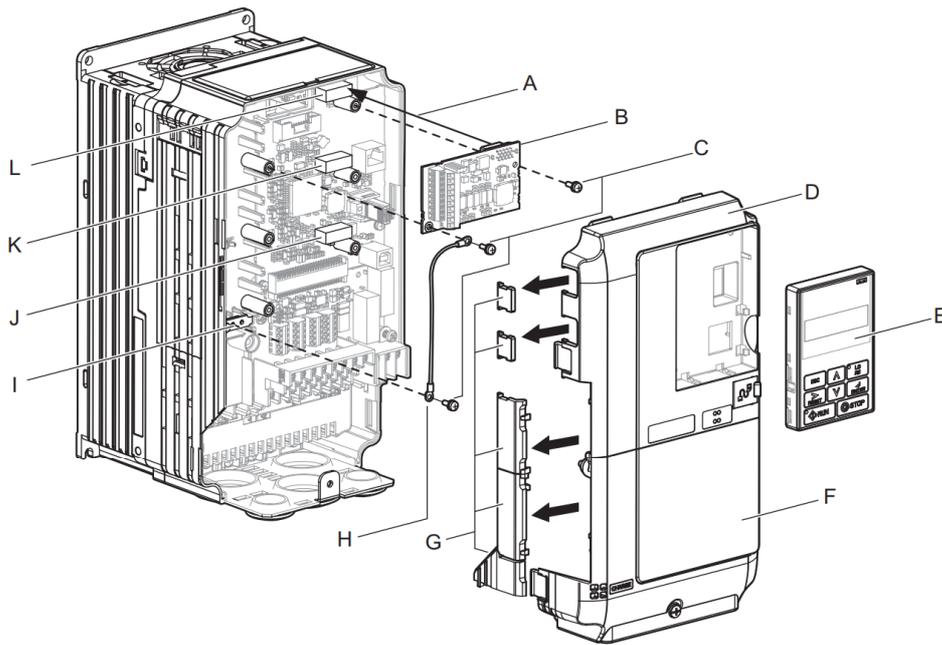
To prepare for **controller inspection operation**, check the following;

- Check controller is mounted securely.
- Wire 3 Ph. supply from main circuit breaker to controller terminals R, S, T, N, GRD.
- Ensure all connections are tight.
- Check all existing connections on controller, paying particular attention to all motor terminal and contactor connections. These may have loosened due to transport etc.
- Check braking resistor is installed, wired and grounded correctly.
- Check hoist motor is wired and grounded correctly; shield grounded both ends.
- Correct encoder card installed (PG-F3) for PM EnDat.
- Ensure brake has been wired correctly and diode installed.
- Ensure final limits and direction limits are in circuit and operational.
- Safety circuit and door locks to be wired in as per page 2 of circuit diagrams.
- Switch "INSP controller" on main circuit board to ON. This should be left on until the lift is ready for automatic operation. Top of car and Pit inspection can be used and take priority while on board inspection is on.
- Top of car inspection must on NORMAL (INSP ON) to allow controller inspection operation and to complete the safety circuit (common breaks the safety line). See circuit diagrams.
- For 100-194 EN81 controller, PINS and SIN1 input must also be ON to allow on board inspection. If board powers up with PINS input open, a pit reset is necessary. Pit reset is achieved by activating "PRES" for 3 seconds. Cycling power will not reset pit inspection.
- If connecting a pendant for construction operation, please see below examples



Option Card

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 | 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

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

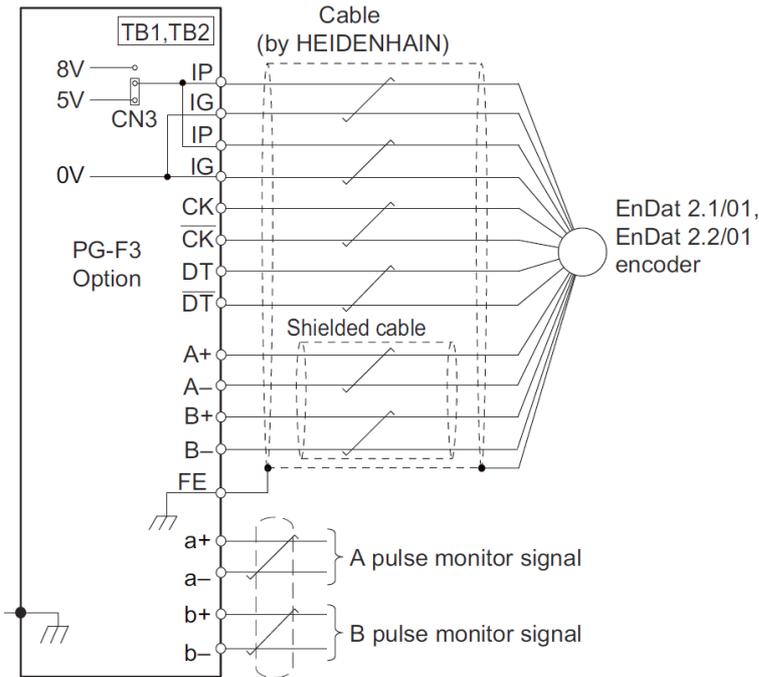


Table 1 CL: PG-F3 Encoder connections

- *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



Power Up of Controller and Drive

- Turn circuit breakers on.
- Red led under LCD display on circuit board will flash. Yellow led will be on.
- Nb. When re-powering; ensure the lift is off for 10 seconds before turning back on.
- Safety circuit inputs. LR, SAF, LRX red led's on circuit board must be on.
- The INSP led must be OFF.

Controller LCD will show controller on inspection or pit inspection, IDL.
If SAF appears, safety circuit is open.
Also refer LCD section in ECD manual.

??	INS	IDL	—
ECD Aust. V-6.07			

- The controller is ready to run on controller inspection operation.
- Before attempting to run the elevator, the VF Drive parameters must be entered into the drive.
- If using ECD brake board, this must be set up prior to attempting to drive lift. See brake board manual for instructions.

Closed-Loop Operation Set-up

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

Hoistway Parameter Set-up

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

- 2) 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

- 3) 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

- 4) 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

5) 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.



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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

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



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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 CLOSEDL OOP VCT	V/f Control Open Loop Vect Closed Loop Vect 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



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Autotune U9

Parameter	Description	Default	Choices	Suggested Adjustment
Autotune	Autotune menu	Standard Tune	Standard Tune Tune-No Rotate Term Resistance InitiPoleEstPrms PolePos-norotate PolePos-rotate Ind VoltageConst	<p>'Tune-No Rotate' is the method to use for autotune if the motor is already roped. If the motor is not roped.</p> <p>Note that when performing the autotune, the drive will also ask for the following parameters:</p> <ul style="list-style-type: none"> • 'Tune-No Rotate' • Rated Motor Power in kW • Rated Voltage in V • Rated Current in A • Number of Motor Poles • Rated Speed • Encoder Pulses – should be 2048 <p>An alignment should then be performed. use:</p> <ul style="list-style-type: none"> • PolePos – Norotate <p>To determine a Z Pulse Offs value</p>

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

ECD Specific Parameters

NOTE: These parameters **MUST** be checked before running and will need to be re-entered if drive is replaced or factory defaulted.

A3 Multistep Reference Submenu

Parameter	Description	Default	Suggested Adjustment
Speed Command 1	Levelling Speed	0m/s	0.05m/s
Speed Command 2	Not used	0m/s	0m/s
Speed Command 3	Intermediate Speed	0m/s	0.5m/s-1m/s
Speed Command 4	Not Used	0m/s	0m/s
Speed Command 5	Contract Speed	0m/s	Rated speed of Lift (m/s)
Inspect Oper Spd	Inspection Speed	0m/s	0.25m/s
Rescue Speed	Rescue Operation Speed	0m/s	0.1m/s



C1 User Switches Submenu

Parameter	Description	ECD Default
BRAKE PICK CONFIRM	This parameter defines how the mechanical brake signal is monitored by the drive. A setting of None, will result in the drive not waiting for any brake pick confirmation signaling. A setting of External TB will look to a logic input for confirmation the mechanical brake is lifted by means of brake pick switches. A setting of Internal Time will result in the drive waiting Brake Pick Time (A1) before beginning travel.	Internal Time
AUTO STOP	Rated motor output powerEnabling Auto Stop will allow the drive to complete a travel on removal of the speed command only (with the run command still present). The run command is required to be cycled prior to a new travel. When enabled, the run command is not accepted until a speed command is also provided.	Enabled

C2 Logic Inputs Submenu

Parameter	Description	ECD Default
LOGIC INPUT S1	Logic Input on terminal S1	Drive Enable
LOGIC INPUT S2	Logic Input on terminal S2	Run Up
LOGIC INPUT S3	Logic Input on terminal S3	Run Dn
LOGIC INPUT S4	Logic Input on terminal S4	Multistep Ref 1
LOGIC INPUT S5	Logic Input on terminal S5	Multistep Ref 2
LOGIC INPUT S6	Logic Input on terminal S6	Multistep Ref 3
LOGIC INPUT S7	Logic Input on terminal S7	Inspection Operation
LOGIC INPUT S8	Logic Input on terminal S8	Not Used

C3 Logic Outputs Submenu

Parameter	Description	ECD Default
LOGIC OUPUT P1	Terminal P1-C1 Function selection (photocoupler)	Zero Speed
LOGIC OUPUT P2	Terminal P2-C2 Function selection (photocoupler)	Not Used
RELAY M1-M2	M1-M2 Function Selection (Relay)	Brake Pick
RELAY M3-M4	M3-M4 Function Selection (Relay)	Close Contact
RELAY M5-M6	M5-M6 Function Selection (Relay)	!SafeDisablStat