

**Encoder check and pole tuning procedure for PMSM in Lift Applications**

<b>Inverter type</b>	FRENIC 5000 VG7 Lift version
<b>Software version</b>	H1/H2 316 or earlier Lift version
<b>Required options</b>	OPC-VG7-SPG and matching encoder
<b>Related documentation</b>	VG7-Elevator manual INR-HF51516_-E VG7-User manual MEH407_-E Lift specification HF-5F3313g-E
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<b>Use</b>	Public, Web
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<b>Version</b>	1.0.1
<b>Languages</b>	English

## 1. Introduction.

This document describes how to do a simple check of the EnDat Encoder (Heidenhain ECN 1313 or 413 series) connected to the Encoder interface OPC-VG7-SPG for FRENIC5000VG7S Series inverters. In addition it describes how to make a static pole-offset-tuning.

## 2. Encoder simple check.

In general if the serial protocol for absolute (single turn) information is missing or faulty the inverter normally will show an Error. If no Error appears, the only point to be checked is that the A/B channel of the encoder is correctly read. In order to check encoder pulses please check the sequence specified in figure 1.

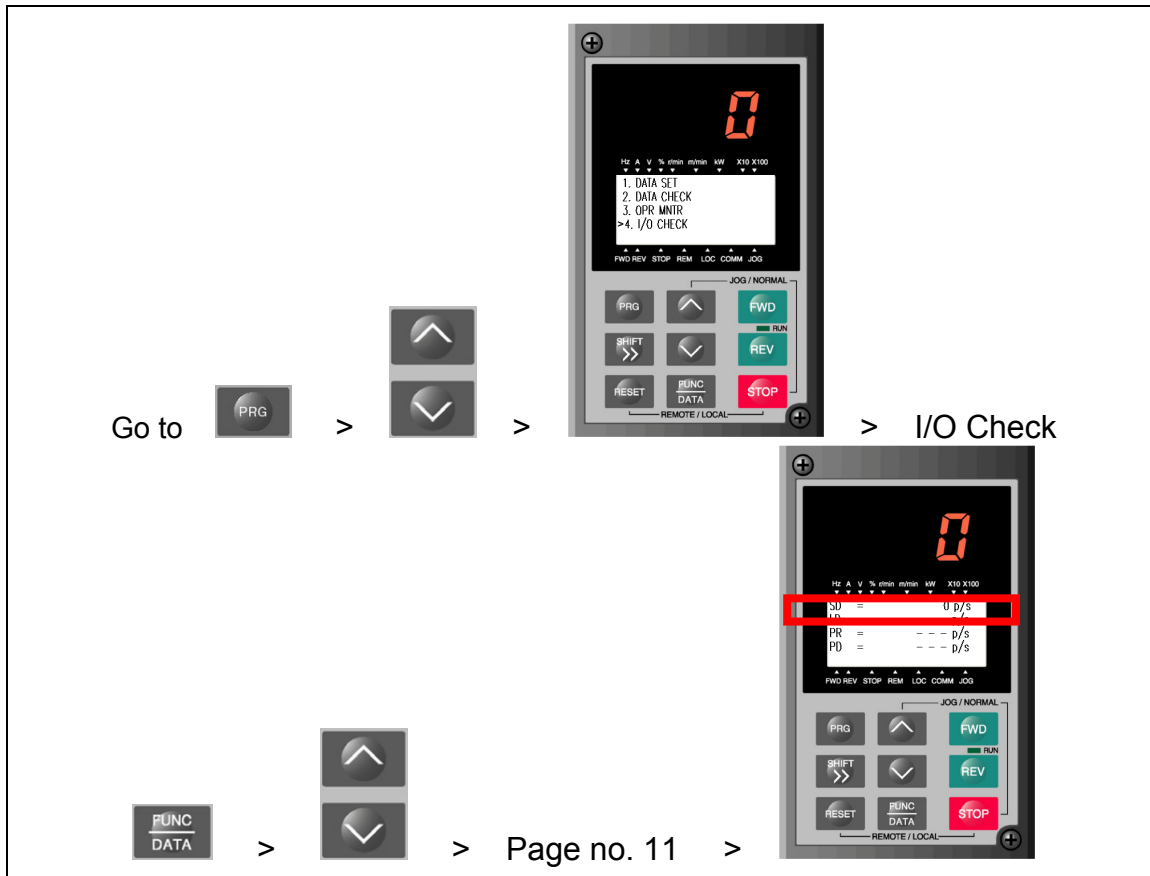


Figure 1: How to access to menu 4 (I/O Check) to check encoder pulses (pulses per second)

In line “SD” of Menu 4 (I/O Check) encoder pulses are displayed.

Check that the pulse count meets following conditions:

- In motor/encoder forward direction (**FWD** command, see Figure 2) the pulse count should be always positive
- In motor/encoder reverse direction (**REV** command, see Figure 2) the pulse count should always be negative
- Turning the motor/encoder at 1rev/s (60 rpm) the pulse count should be ~2048 p/s (positive or negative depending on the direction, the value might change between two values around the theoretical value)

If the inverter not reacts to the encoder check the wiring and **o09** (3 for EnDat).  
 If the first two conditions are not ok it is assumed that the encoder or wiring is defective.

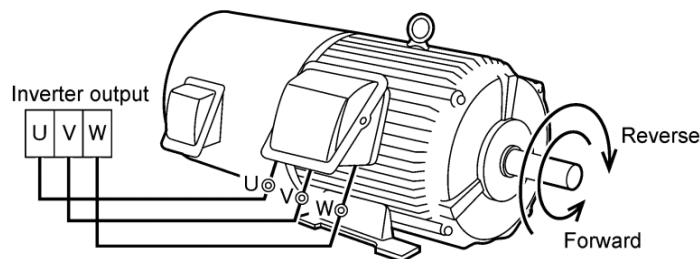


Figure 2: Forward/reverse direction of motor/encoder

### 3. Pole Tuning Procedure.

Preparation:

Before any pole tuning procedure is attempted, please make sure that the motor parameters **P** and **F03~F05** are correctly set.

In particular following parameters are critical for a correct pole tuning:

- **P05**: Motor Pole number (e.g. 16 or 20 poles)
- **P28**: Encoder pulses (2048 p/s for ECN x13 series)
- **P06**: Motor Resistance ( $P06 = 1.73 \cdot \frac{I_{Motor} \cdot R_{Motor+Cable}}{V_{Motor}}$  in %)

The tuning has to be done manually on the inverter without commands from the Lift controller. Make sure that:

1. The inverter is in LOCAL mode as is shown in figure 3:

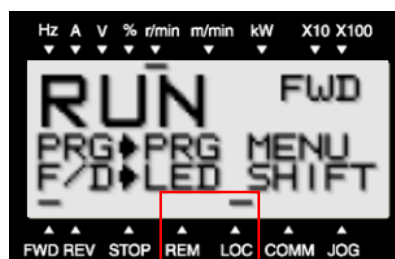




Figure 3. Inverter in **LOC** mode (local mode)

(pushing **RESET** and **STOP** Key simultaneously will move from remote **REM** to local **LOC** mode)

2. The inverter is enabled (e.g. **X7** and **CM** closed when **E07**=7 and **E14**(bit6)=1 [inverse of **BX**])
3. The output contactors are closed during the tuning (mechanically or by direct supply on A1/A2)
4. The brake is safely disabled by one of these options:
  - a. disconnect brake supply or coil etc.
  - b. Set **U14** to 5000 (5s)

Adjust, **H71=5** and press  two times. A progress bar will appear showing the status of the pole tuning. Pressing  key on the keypad will start the tuning. The pole tuning would take only few seconds. If any error occurs during pole tuning, Error **E-5** will appear on the LED display. In such case recheck wirings. After the pole tuning is complete, parameter **o10** should show the offset value of the pole/encoder orientation in degrees.

It is recommendable to, perform more than one pole tuning in different shaft positions and check that the **o10** resulting values are consistent, without big discrepancies (+/- 15°).

Rewire the brake (or set back to original value **U14**) and put the inverter back to remote mode (**REM**).

Try to move the motor at low speeds with inspection or auxiliary mode. Check that output current is according the load conditions. If it is OK, then Pole tuning procedure is finished.

\* Please, change **U31=0** and **F61**(P gain) to small values if you try to move motor without load (without ropes).

#### 4. Document history.

Version	Changes applied	Date	Written	Checked	Approved
1.0.0	First version	10/10/2014	M. Fuchs	J. Alonso	
1.0.1	Small changes	10/11/2014	M. Fuchs	J. Alonso	