

APPLICATION NOTE	AN-Lift2-0008v100EN
Unbalanced load compensation with backlash compensation	

Inverter type	FRENIC-Lift (LM2A)
Software version	L2S1_05001540 (or later)
Required options	OPC-PR OPC-PS OPC-PSH
Related documentation	INR-SI47-1909a-E
Author	Carlos Arjona
Use	Public, web
Date	07/02/2020
Version	1.0.0
Languages	English

1. Introduction

For the purpose of avoidance instabilities (shock, noise, etc.) when brakes are released, the unbalanced load compensation can be performed with backlash compensation. With this function, a position control is performed when the brake is opened after the travel, achieving a more silent brake release and smoother starting.

Absolute position is stored before turning off its torque, after certain period (specified by L134) after applying brake (internal BRKS = OFF). Stored position is used as target position of APR with absolute position mode which performs as unbalanced load compensation.

2. Operation conditions

In order to perform backlash compensation, all following conditions have to be fulfilled:

- L65 is set to 2.
- APR P gain (L73) setting different than 0.
- Absolute encoder is needed: OPC-PR/PS/PSH card and SinCos/EnDat/SSI/BiSS-C/Hiperface encoder accordingly.
- Position gap between stored position and final stop position is less than 5 mechanical degrees (θ_m).
- BRKE, BRKE1 or BRKE2 have never been in released status during stopping after stored position. (e.g. after performing Brake-rescue function, stored position will be discarded, and inverter will perform ULC without backlash compensation.)

3. Conditions for disabling backlash compensation

When either of following conditions is fulfilled, inverter discards stored position and performs unbalanced load compensation without backlash compensation in next start.

- Changing encoder settings (e.g. L01, L02, L201, etc. which need writing parameters to OPC-PR/PS/PSH.)
- Performing motor parameter tuning and pole position tuning.
- Occurring alarm.
- Using standby mode, because power supply to OPC and encoder is shut-down. Inverter cannot detect any mechanical movement during this situation.
- Performing forced deceleration stop by DRS command.

4. Setting example

An example of parameter configuration for backlash compensation is listed as follows:

Table 1. Backlash compensation related functions

Function code	Name	Recommended Value
F24	Starting time (holding time)	0.8
L65	Unbalanced Load Compensation (Operation)	2
L68	Unbalanced Load Compensation (ASR P Constant)	2.5
L69	Unbalanced Load Compensation (ASR I Time)	0.005 s
L73	Unbalanced Load Compensation (APR I Time)	1.0
L82	Brake control (ON delay time)	0.20
L134	Backlash (Delay time)	0.2 ~ 0.4 s

L134 has to be set with a time which ensures that the position is saved after mechanical brake is completely closed, and motor still has torque.

With this setting, the sequence of the procedure is as shown in the graphic below:

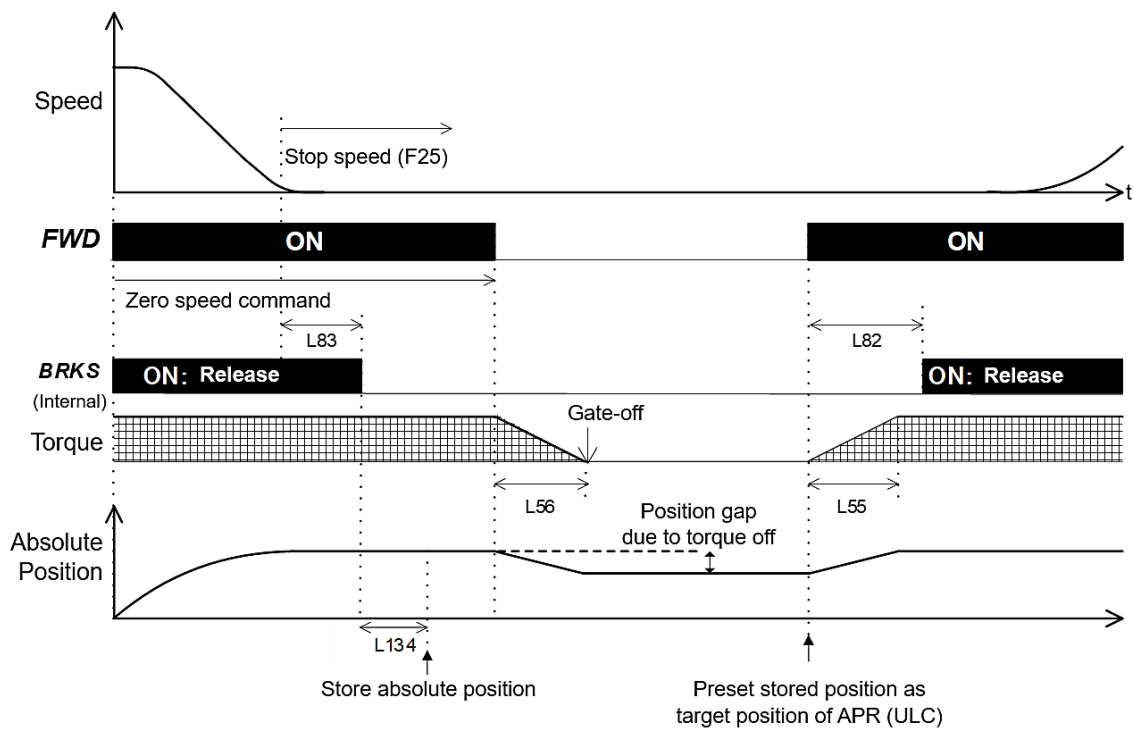


Figure 1. Backlash compensation sequence

5. Document history

Version	Changes applied	Date	Written	Checked	Approved
1.0.0	First version	07/02/2020	C. Arjona	J. Alonso	J. Català