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### INTRODUCTION

The iC-PZ Series is capable of handling a wide range of code disc diameters with one and the same chip thanks to **FlexCode®**. This application note explains how to set up the iC-PZ with any FlexCode® disc. In this particular example, iC-PZ2656 X is configured for a PZ08SM 44-446 code disc via GUI version C2.

**Note:** This application note is meant to point out the specific configurations needed to use FlexCode® discs. For a general guide on setting up the iC-PZ in the lab refer to iC-PZ AN1 available for download at [www.ichaus.de/PZ\\_AN1\\_appnote\\_en](http://www.ichaus.de/PZ_AN1_appnote_en).

### ADJUSTMENT PROCEDURE OVERVIEW

The complete sequence for setting up the iC-PZ in the lab is shown in the flowchart below. However, this application note is focusing on the specific settings needed

to configure a system using FlexCode® discs. Procedures highlighted in a lighter blue are described in iC-PZ AN1.

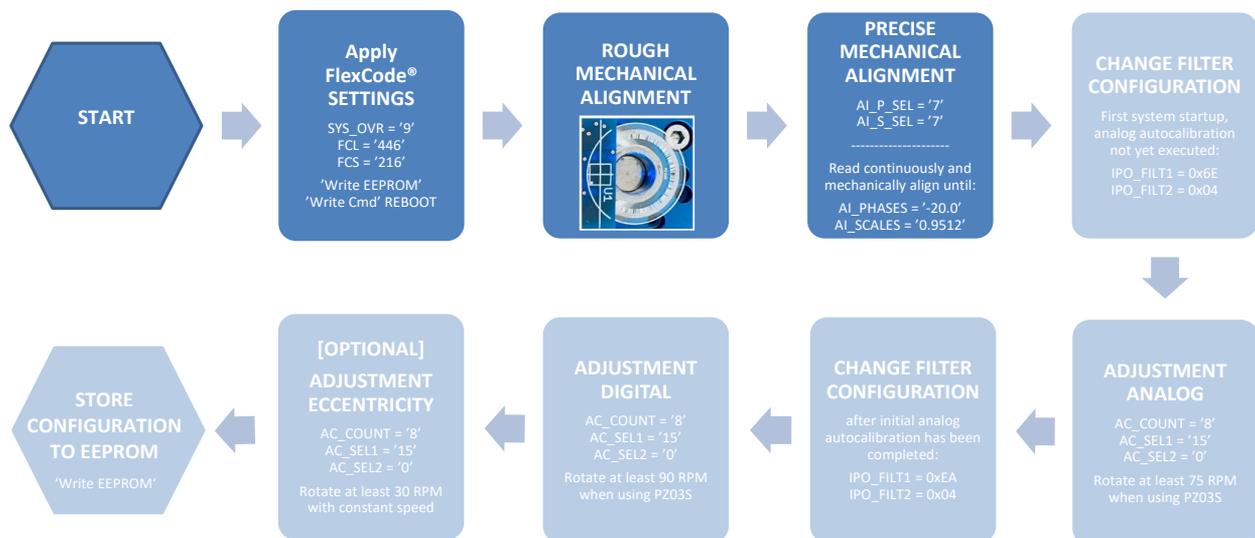


Figure 1: Sequence of adjustment procedures in the lab for code disc design PZ08S

### FLEXCODE® PARAMETERS

The range of disc diameters covered by the different iC-PZ types is shown in Figure 2. Any disc diameters from 16 mm up to linear scales can be handled by

iC-PZ2656 and iC-PZ205. iC-PZ0974 works with discs of 9 mm diameter.

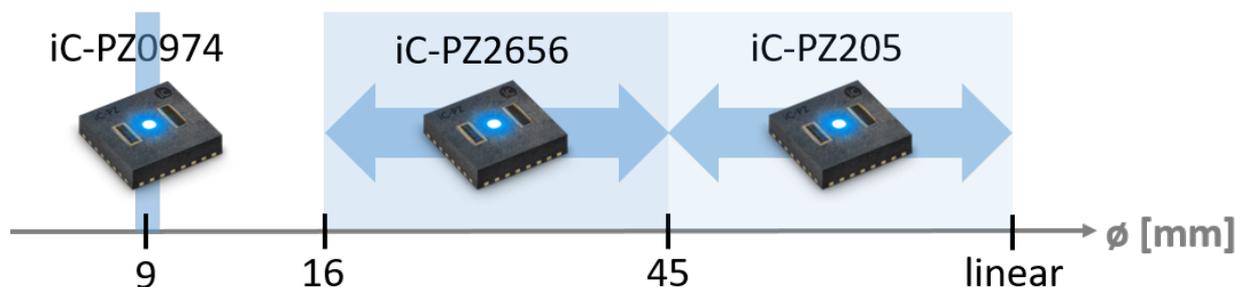


Figure 2: iC-PZ FlexCode® range per type

For every FlexCode® disc an *Encoder Disc and Code Description* document is supplied that contains its individual characteristics. On the second page of each document the parameters that are mandatory to configure

the iC-PZ are given in the table 'Register Assignment'. Without those parameters it is not possible to set up the system. An example for the disc design PZ08S 44-446 is shown in Figure 3.

Number of AB-increments	446
SYS_OVR	9
FCL	446
FCS	216
AI_SCALE	0.95119
AI_PHASE	-20°

Figure 3: Excerpt from PZ08S 44-446 Encoder Disc and Code Description

- **Number of AB-increments** is equal to the line count of the disc.
- **SYS\_OVR** is the native resolution of the system. This corresponds to the number of bits needed to cover the line count.
- **FCL** is the length of the FlexCode® that is equal to the *Number of AB-increments*.
- **FCS** defines the FlexCode® the system is related to.
- **AI\_SCALE** Adjustment scale error (static+dynamic) for nominal position due to radial alignment.
- **AI\_PHASE** Adjustment phase error (static+dynamic) for nominal position due to tangential alignment.

**Note:** Parameters and settings for specific code disc diameters are provided at support@ichaus.de.

### SYSTEM CONFIGURATION AND ALIGNMENT

After connecting successfully, apply the following steps with respect to the parameters given by the *Encoder Disc and Code Description* in Figure 3.

- 1 Go to the 'System Config.' tab in the GUI.
- 2 Set 'Chip System Override' to **SYS\_OVR**.
- 3 Set 'FlexCode© Length' to **FCL**.
- 4 Set 'FlexCode© Identifier' to **FCS**.
- 5 Click 'Write EEPROM'.
- 6 Select 'REBOOT' and click 'Write Cmd'.

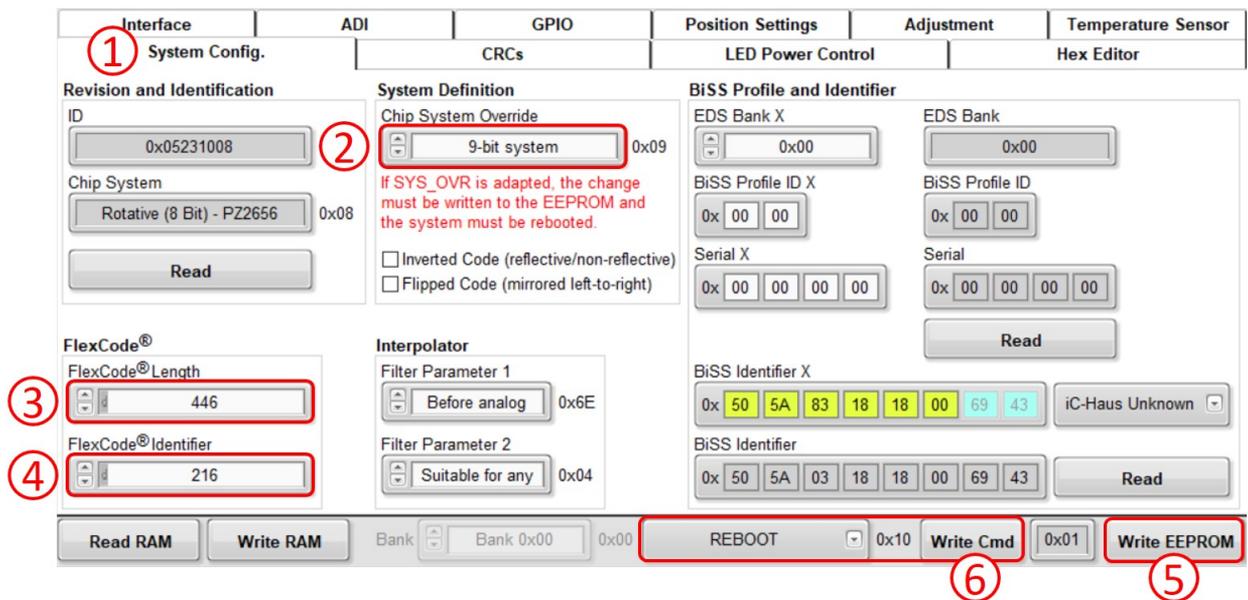


Figure 4: System configuration for FlexCode© disc

After configuring the system according to the characteristics of the FlexCode© disc, the system can be adjusted. The procedure described in iC-PZ AN1 can be used for any disc. However, the mechanical alignment

is slightly different if not using standard disc design PZ03S. The 'Adjustment scale error' for the nominal position in *radial* direction is corresponding to **AI\_SCALE** in the *Encoder Disc and Code Description* document.

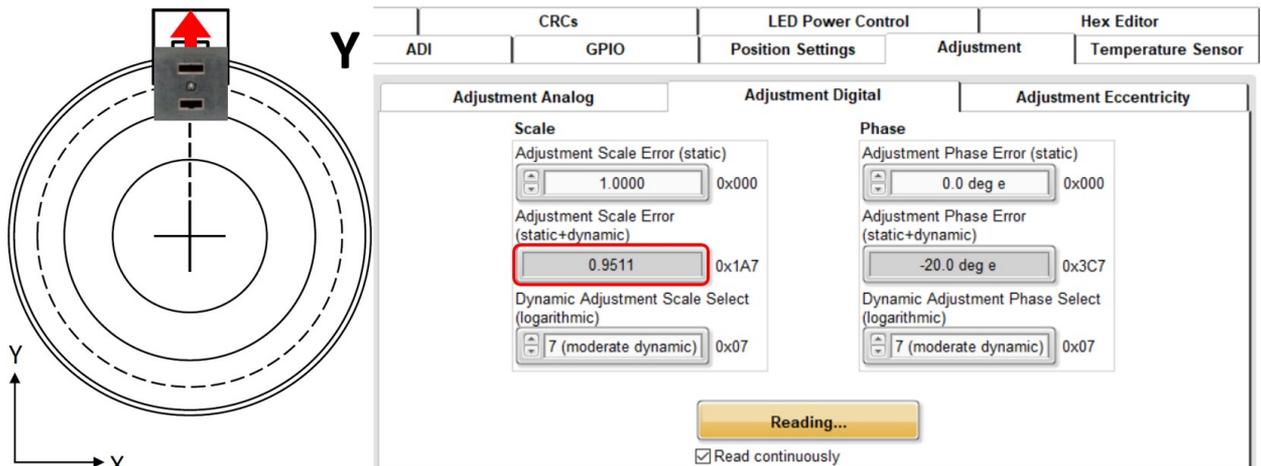


Figure 5: Radial alignment with FlexCode© disc

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For the nominal position the *tangential* alignment shown in the 'Adjustment phase value' should match **AI\_PHASE** from the *Encoder Disc and Code Description* document.

The figure illustrates the tangential alignment of a FlexCode disc. On the left, a diagram shows a circular disc with concentric tracks and a central crosshair. A sensor is positioned above the disc, with a red arrow indicating its alignment. A coordinate system with X and Y axes is shown. A large 'X' is placed over the diagram. On the right, a software interface for adjustment is shown. The interface has a top navigation bar with tabs: ADI, CRCs, GPIO, LED Power Control, Position Settings, Adjustment, Hex Editor, and Temperature Sensor. The 'Adjustment' tab is active, showing three sub-sections: Adjustment Analog, Adjustment Digital, and Adjustment Eccentricity. The 'Adjustment Digital' section is expanded, showing 'Scale' and 'Phase' settings. The 'Phase' section has a red box around the 'Adjustment Phase Error (static+dynamic)' value, which is set to -20.0 deg e. A 'Reading...' button and a 'Read continuously' checkbox are also visible.

CRCs		LED Power Control		Hex Editor	
ADI	GPIO	Position Settings	Adjustment	Temperature Sensor	

Adjustment Analog		Adjustment Digital		Adjustment Eccentricity	
<b>Scale</b>		<b>Phase</b>			
Adjustment Scale Error (static)	1.0000 0x000	Adjustment Phase Error (static)	0.0 deg e 0x000		
Adjustment Scale Error (static+dynamic)	0.9511 0x1A7	Adjustment Phase Error (static+dynamic)	-20.0 deg e 0x3C7		
Dynamic Adjustment Scale Select (logarithmic)	7 (moderate dynamic) 0x07	Dynamic Adjustment Phase Select (logarithmic)	7 (moderate dynamic) 0x07		

Reading...  
 Read continuously

Figure 6: Tangential alignment with FlexCode© disc

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### REVISION HISTORY

Rel.	Rel. Date*	Chapter	Modification	Page
A0.1	2020-01-08	all	Preliminary working copy	

Rel.	Rel. Date*	Chapter	Modification	Page
A1	2020-01-16	all	Initial release	

Rel.	Rel. Date*	Chapter	Modification	Page
A2	2020-06-03	SYSTEM CONFIGURATION	Replaced Figure 5 and Figure 6 due to showing inaccurate value for AI_PHASES	

Rel.	Rel. Date*	Chapter	Modification	Page
B1	2020-08-18	INTRODUCTION	Added chip revision and GUI version	1
	2020-08-18	ADJUSTMENT PROCEDURE OVERVIEW	Renamed chapter (former: PROCEDURE OVERVIEW) Updated sequence according to iC-PZ AN1 B1	1
	2020-08-18	SYSTEM CONFIGURATION AND ALIGNMENT	Renamed chapter (former: SYSTEM CONFIGURATION) Updated figures for GUI C2	3-4

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\* Release Date format: YYYY-MM-DD