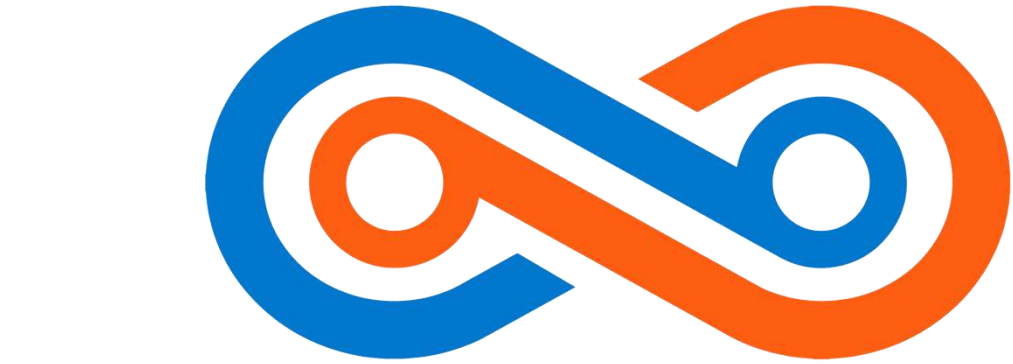

IMSystems

Drive Innovation

Development Kit (DFB)

Product Manual

Foreword

This document gives a complete overview of the Archimedes Drive Development Kit (DFB). This document includes the drive's technical data and explains the mechanical and electrical interfaces.

Disclaimer:

We reserve the right to revise and change the documentation at any time and without prior announcement. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

Contents

1. Development Kit Overview

The high-level overview of the Archimedes Drive Development Kit is explained in this section. The part list is given in section 1.1 and the technical data is given in section 1.2.

1.1. Part List

This Development Kit (DFB) shown in Figure 1 consists out of the following components:

- The Archimedes Drive Development Kit (DFB)
- Cable lead with connector

Figure 1: Archimedes Drive Development Kit (DFB)

1.2. Technical Data

The high-level specifications of the drive are given in Table 1.

Table 1: DFB Performance Specifications

Performance Metric	Unit	Value
Limit Average Torque	Nm	7.5
Limit for Repeated Torque	Nm	15
Slip Torque	Nm	19
Starting Torque	Ncm	4.0
Average Input Speed	Rpm	3,500
Max Efficiency	%	90
Mechanical Output Rotation	deg.	290
Reduction Ratio	[-]	25
Mass	kg	1.14

2. Development Kit Interfaces

The development kit interfaces are explained in this section. These are the key interfaces required to install the Development Kit in a test set-up. The mechanical interface is given in section 2.1 and the electrical interface is given in section 2.2.

2.1. Mechanical Interface

An illustration of the DFB with all key interfaces is given in Figure 2. A detailed technical drawing including all the tightening torques is given in section 5. Please use those tightening torques illustrated in the drawing to properly fasten the drive.

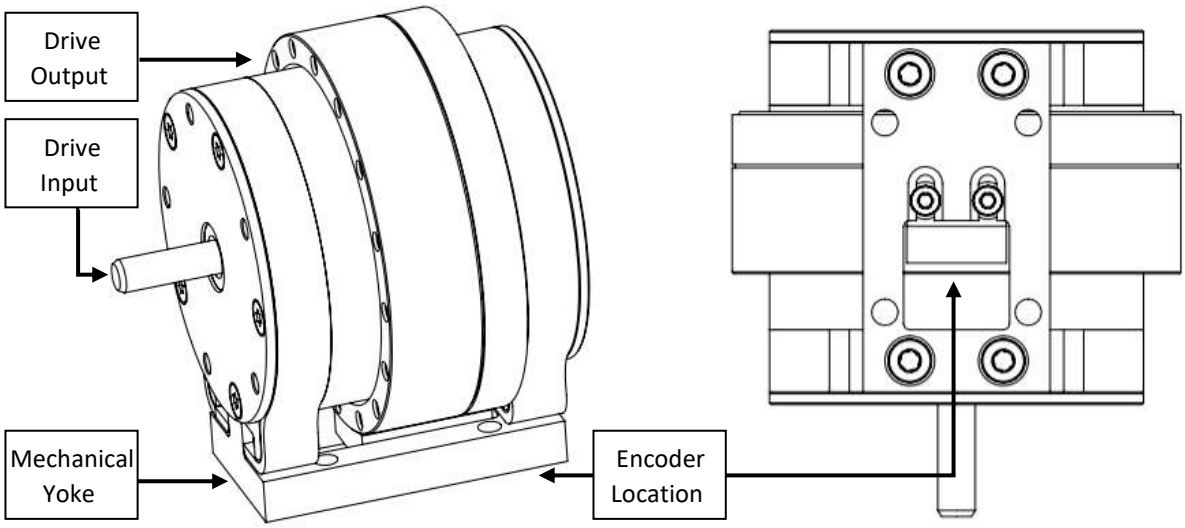

Figure 2: DFB Illustration with Encoder Location

The location of drive's input, output, mechanical yoke, and encoder is shown in the figure. A description of each of these components is given below:

Drive Input: The drive's input is a 6mm solid shaft that can be directly connected to a motor using a coupling. At the front of the drive there are additional bolt holes to fasten a motor mount.

Drive Output: The drive's output is located on the circumference of the drive and positioned axially in the center. There are multiple bolt hole connections to fasten on an output coupling/adapter to the drive.

Mechanical Yoke: The yoke attaches both sides of the drive to each other, on the bottom of the yoke there are bolt holes to fasten the drive**. Do not remove the yoke** as the sensors will need to be recalibrated.

Encoder Location: The encoder read head is in the mechanical yoke, located at the bottom of the drive. The cable lead when run through the cavity shown on the right of Figure 2.

Cable Routing Note:

The cable routing of the drive will go through the bottom of the drive as shown in Figure 2 (right figure). This needs to be taken into consideration for the test bench. The test bench needs to include a cavity for the cables to go through.

2.2. Electrical Interface

The Archimedes drive development kit uses a "Bogen AKS16 Absolute Magnetic Encoder". The DFB is equipped with an encoder, a cable lead of 300mm, and two 12-pin female connectors. The connector pin assignment is shown in Table 2 and an illustration is shown in Figure 3.

Table 2: Pin Assignment

Pin No.	Output Signal
1	NC
2	NC
3	NC
4	DATA-
5	DATA+
6	V-
7	V+
8	CLOCK -
9	CLOCK +
10	NC
11	NC
12	NC

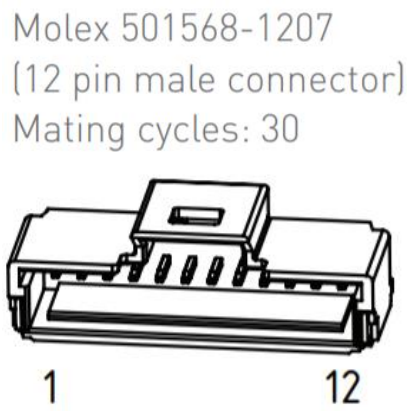

Figure 3: Encoder Connector

Table 3: Encoder Features

Supply Voltage	5V ± 5%
Maximum Output Load	50 mA per Channel
Energy Consumption [without load]	<60 mA ± 5% [UB=5.0 V]
Resolution	1610078 / 4258787351 degrees / increment
Accuracy	75 arcsec
Measurement range	315 deg.

The encoder for the development kit uses the BISS-C protocol. Information regarding this protocol can be found in Table 4 and Figure 4. The BISS-C data frame is given in Table 5.

Table 4: Signals BISS

Signals	Clock
	Data
Signal Amplitude (Without Load)	RS422 (± 5 V)
Protocol	BISS-C BP3 encoder profile
Timeout [ttos]	150-380 ns
Permissible Clock Period [tMAS]	100 ns up to 2* timeout
Clock Signal hi Level Duration [tMASh]	50 ns up to timeout
Clock Signal lo Level Duration [tMASl]	50 ns

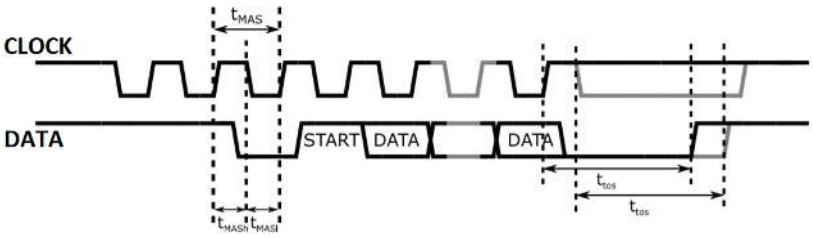

Figure 4: Timing Diagram BISS

Table 5: BISS-C Data frame

Bit	31 (MSB)	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0 (LSB)
Data	Position																				Zero Padding				Error	Warning	CRC (Cyclic Redundancy Check)						

3. Development Kit Operation

To properly operate the drive, the below stated guidelines must be followed:

- The reliable operation limit of the encoder is between the arrow marked with '0' and '+'
  - Outside this range, (marked with 'X', see Figure 5) no reliable reading is guaranteed.
- At the '0'-mark the output value of the encoder is 0 increments.
- Crossing the `0`-mark should be avoided.
  - Crossing the '0'-mark will cause a bit overflow to 2^{20}. This is because the encoder resolution is not equal to 2^20 pulses per revolution, this cause a discontinuity in the position signal.
  - This might lead to unexpected behaviour of the connected motor controller.

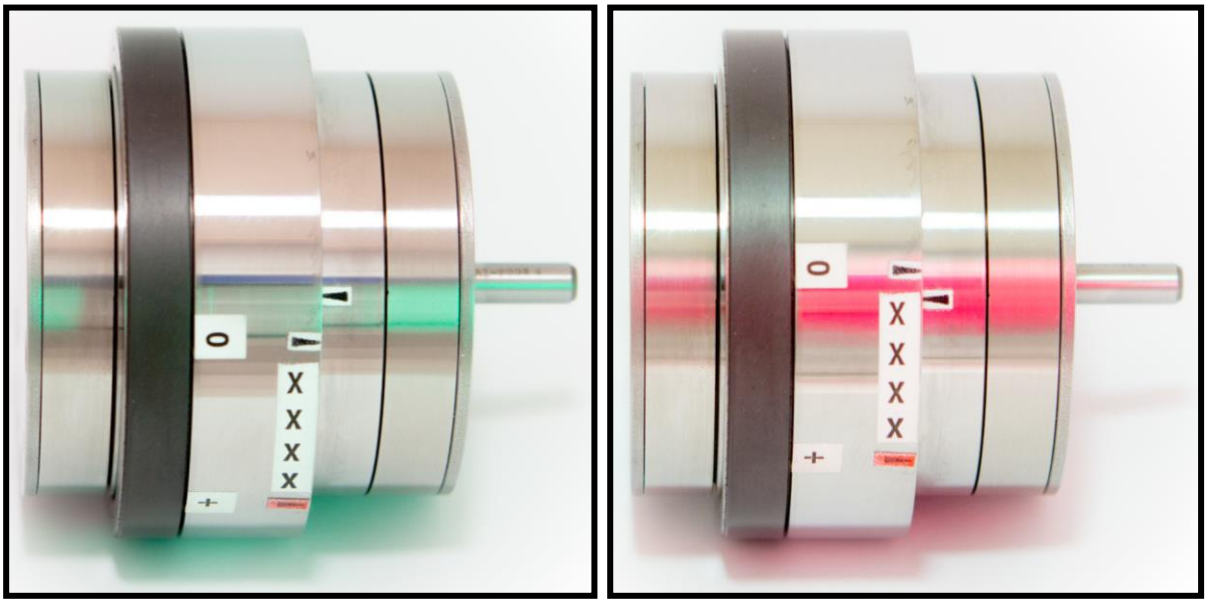

Figure 5: Location of the Operation Limit for the DFB (Left is Good & Right is Bad)

4. Contact Details

If there are any issues with starting the encoder or if there are further questions, please contact us directly.

Innovative Mechatronic Systems B.V.
Delftweg 66
2289 BA Rijswijk
The Netherlands
Web: www.imsystems.nl
Email: info@imsystems.nl
Tel: +31 (0)152 024 111
Chamber of Commerce: 66174848

5. Attachment: Technical Drawing of Mechanical Interface