Absolute Magnetics
Smart Sensor Systems

AM Evaluation Kit - User manual

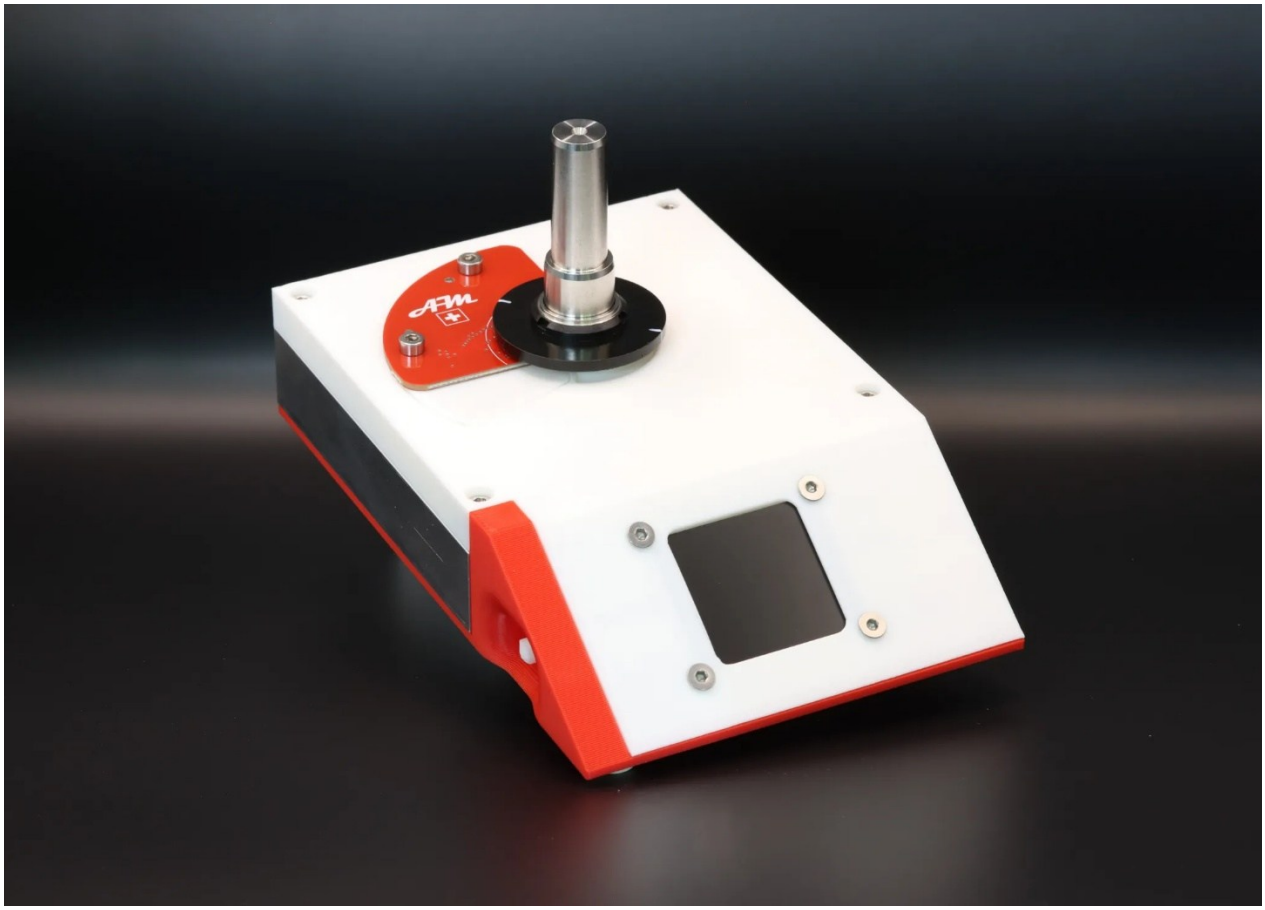

Table of content

1. Product description

General Information

The AM Evaluation Kit is a system, designed to demonstrate the novel magnetic encoder technology of Absolute Magnetics. It can be used in 2 ways:

1) As a stand-alone device for simple visualization of the measured angle

2) In the customers own test setup

Figure 1: The AM Evaluation Kit as a standalone device

Overview of system parts

Figure 2 provides an overview of the AM Evaluation Kit and its components.
Each part is labeled for easy reference throughout this document.
The actual AM Encoder consist of only two parts – the AM magnet with a unique magnetization pattern and the AM electronics board for data processing.

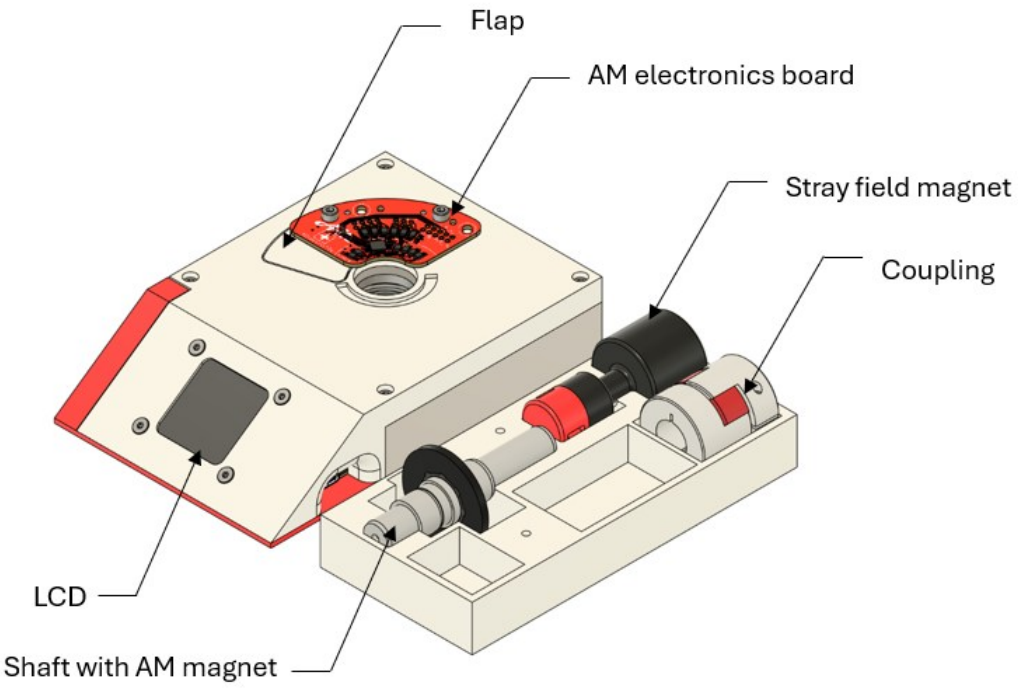

Figure 2: System overview

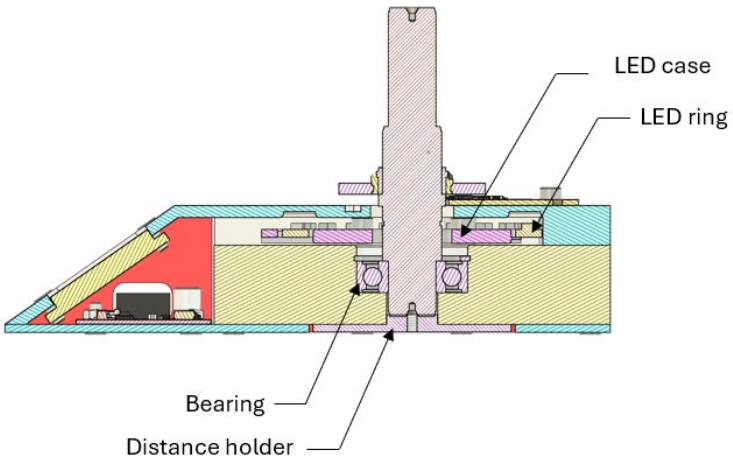

Figure 3: Side view cut

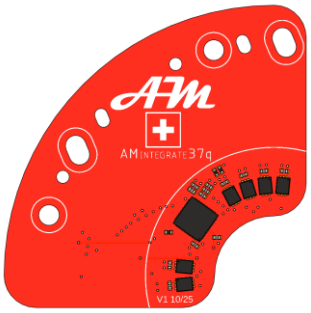

Figure 4: AM electronics board top view

2. Safety information

Safe operation is guaranteed only when used according to specifications defined in the data sheet of the AM Integrate 37q.

Warnings and cautions

- Handle magnets with care, as they can be fragile under impact.
- Exposure to strong external magnetic fields may weaken or demagnetize the magnet.
- Exposure to high temperatures may weaken or demagnetize the magnet.
- Parts made of PLA may soften or melt if exposed to high temperatures.

Handling precautions

- Please follow ESD safety procedures when handling this product.
- The magnet may be strongly attracted to nearby metal objects, which can cause damage. When not in use, store the shaft with magnet in its designated box to prevent damage to the magnet.

3. Installation

1) Unpack the shipping box.
2) Open the 3D-printed box carefully by lifting the top part.

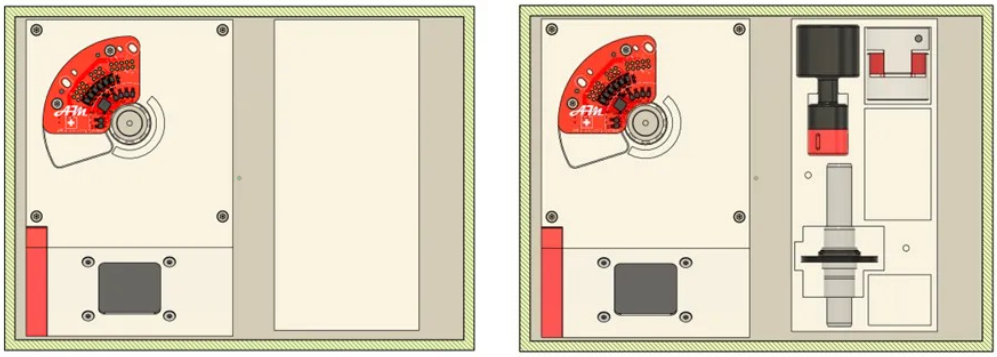

Figure 5: Evaluation Kit in shipping box

3) Take out the shaft with the magnet.
4) Push the shaft straight into the bearing until it touches the bottom (see figure 6).

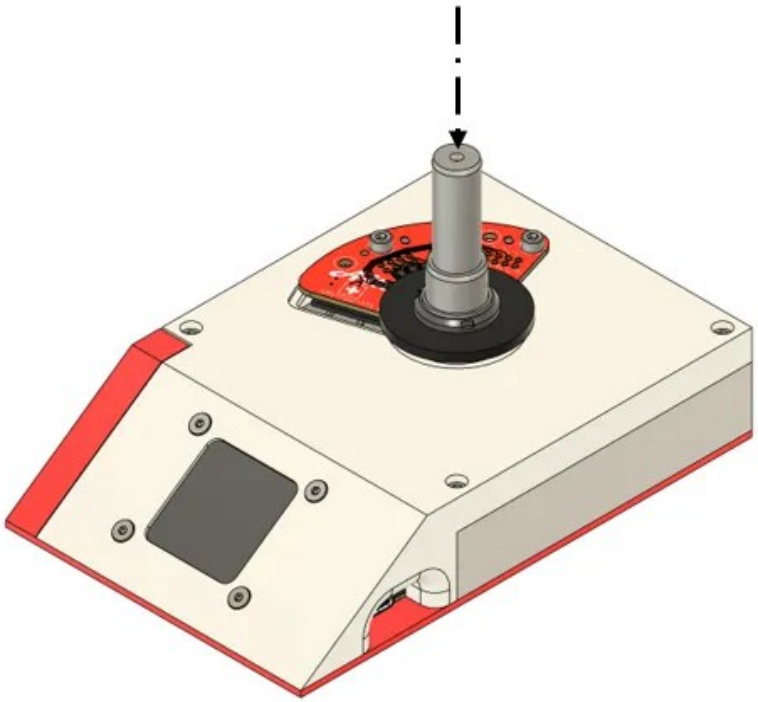

Figure 6: Assembly of the shaft with magnet

5) Connect the USB-C cable to the USB-C port on the Evaluation Kit (figure 7) and power it with a standard phone charger (5V) or a laptop.

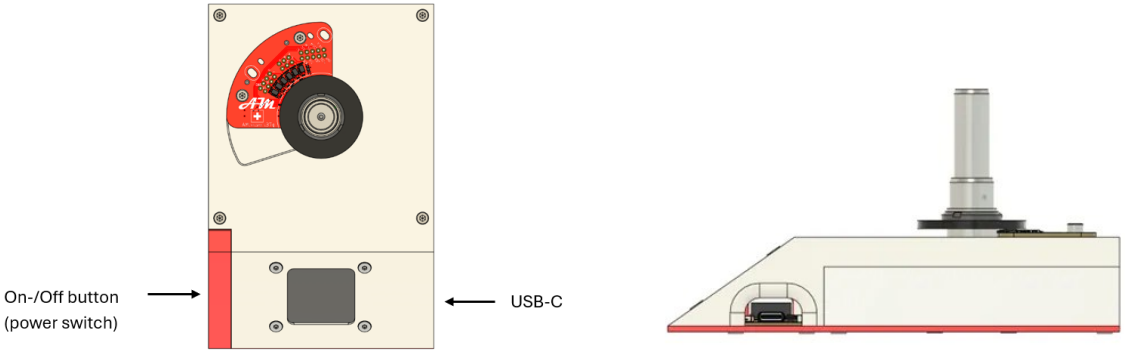

Figure 7: Top view for USB-C Port and On-/Off switch (power switch)

6) Turn on the power switch.

Once the startup process is complete and an angle is displayed, the system can be tested by turning the shaft manually.

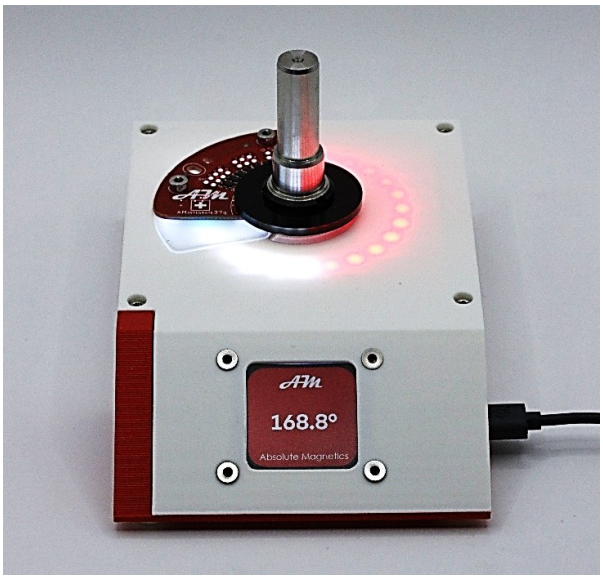

Figure 8: Evaluation Kit in use

Test with customer setup

For accuracy tests with the AM Encoder, the shaft with the magnet and the electronics board can be easily incorporated into the customer's own test setup.
Examples of 2 simple arrangements for accuracy measurements are illustrated in figures 9 and 10:

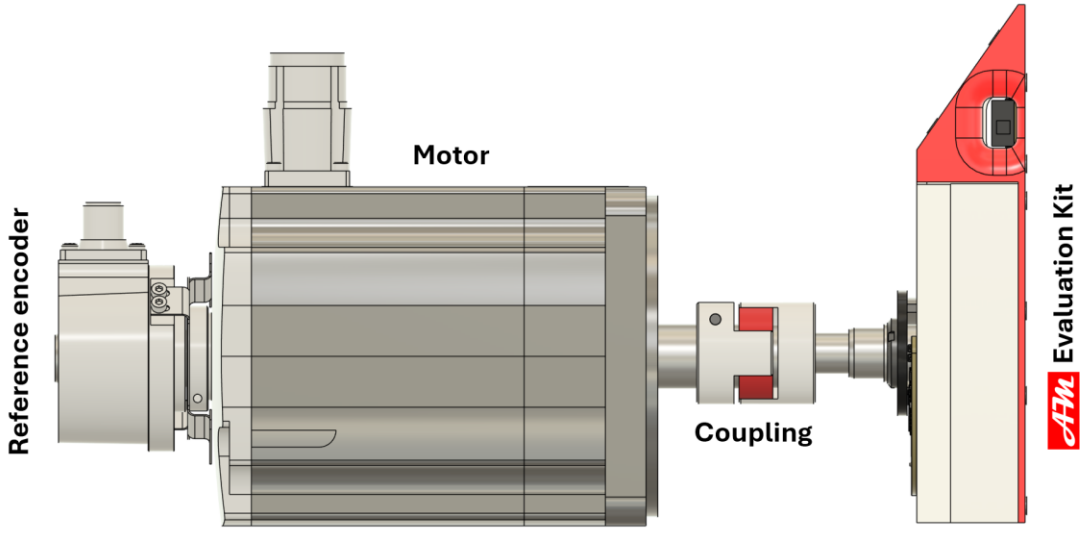

Figure 9: Example setup with reference encoder

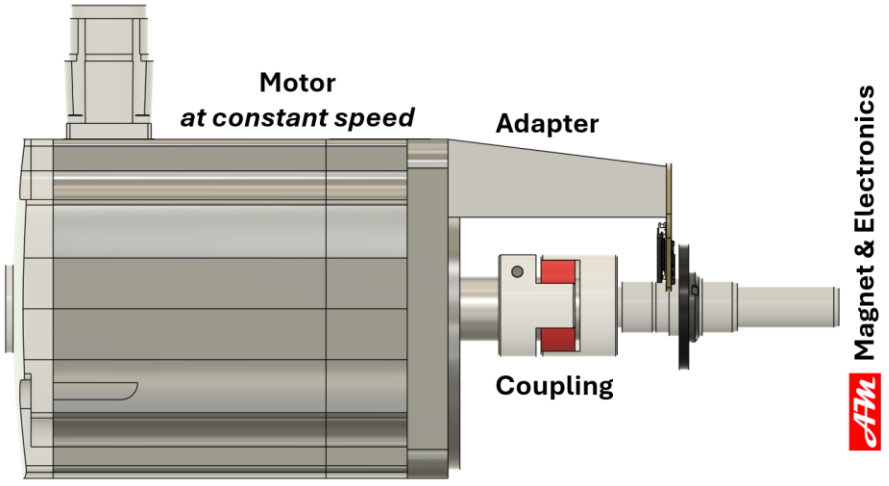

Figure 10: Example setup for constant speed measurement

The Evaluation Kit is supplied with a coupling to facilitate testing.
Technical drawings and a simplified list of purchased components (coupling, bearings etc.) with relevant dimensions for attachment are provided in the appendix.

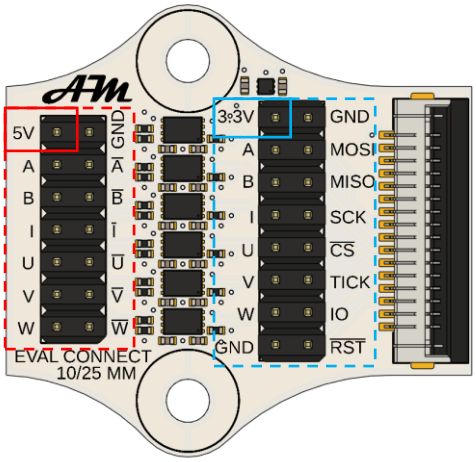

Figure 11: AM Connector Board

To access the output signals of the AM Encoder, the Evaluation Kit includes a dedicated Connector Board (see Figure 11). When a 3.3V power supply is connected to the 3.3V pin, the right-side pin header in Figure 11 becomes active (highlighted in blue). In this mode, the available signals are ABI, UVW, and SPI.
For full functionality, connect a 3.3V - 5V power supply to the 5V pin. This provides access to the ABI, inverted ABI, UVW, and inverted UVW signal sets (highlighted in red). It also powers the 3.3V section (highlighted in blue) through an LDO regulator. Please refer the schematics for detailed information (see Figure 25).
To connect the AM Connector Board, use Figure 12 as a reference for the proper setup. The Connector Board and the red AM electronics board are linked using the supplied flat ribbon cable. Ensure that the blue side of the cable is oriented as shown Figure 12.

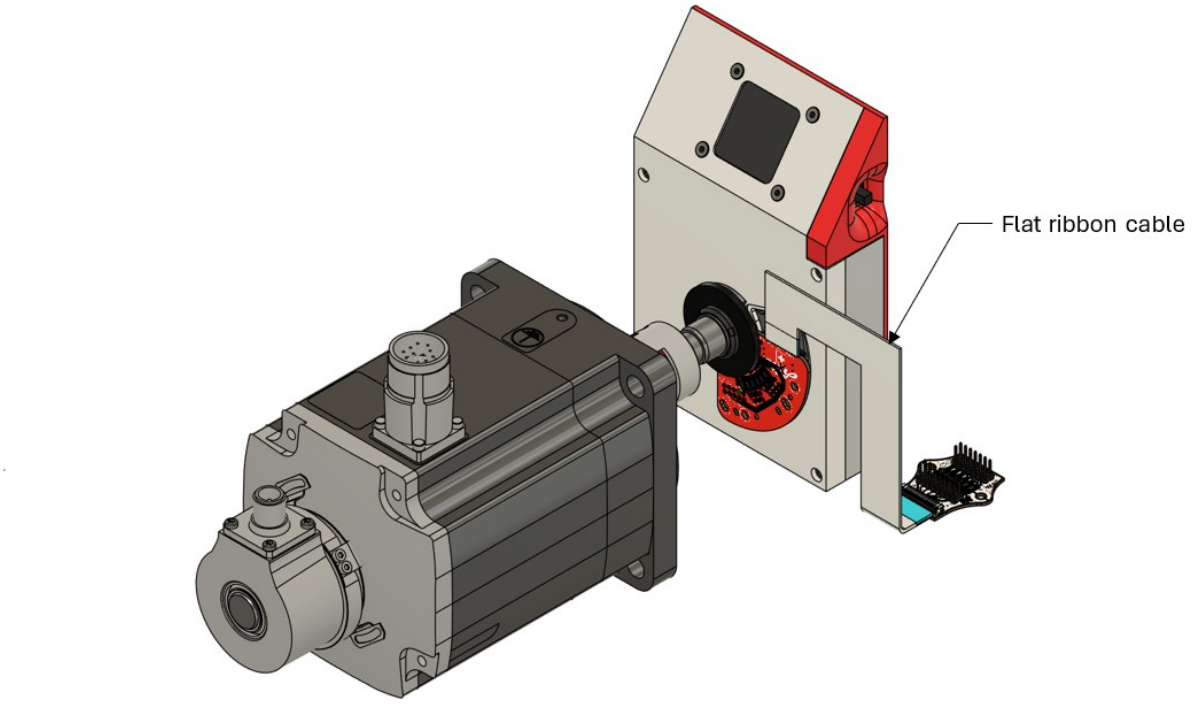

Figure 12: Overview connector PCB set-up

4. Operation and testing

Nominal position

Testing:

- Turn the shaft by hand.
- The angle is displayed on the screen, while the LED ring provides a visual representation of the rotation.

Figure 13: The AM Evaluation Kit - ready for testing at nominal position

Air gap variation

Absolute Magnetics Technology can be operated with big air gaps and cope with significant air gap changes during operation. To show this advantage, the height of the magnet can be adapted with the AM Evaluation Kit.

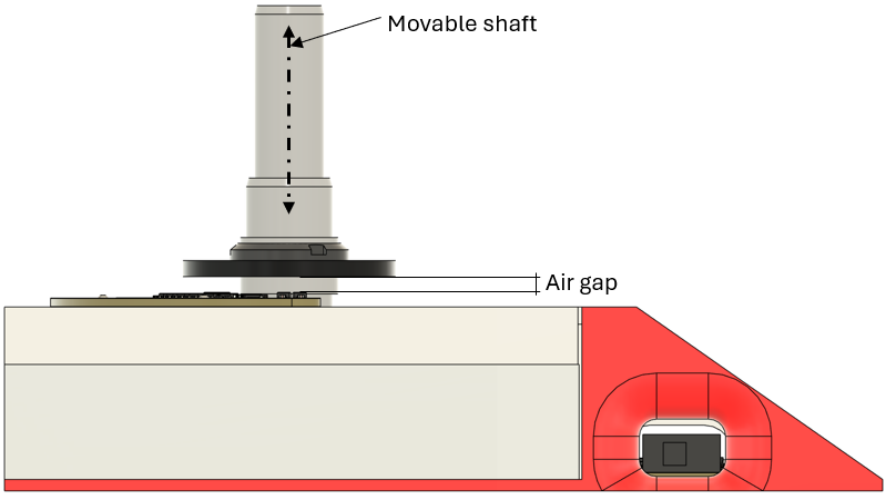

Figure 14: Air gap definition

Testing:

- Lift the shaft by hand and rotate.

  OR

- Use the different prepared air gaps (nominal, minimal, maximal).

Set the prepared air gaps:

Nominal air gap:
Use the Evaluation Kit as delivered (distance holder in place). See figure 13.

Minimal air gap:
Remove the distance holder from the bottom of the kit. See figure 14.

Maximal air gap:
Assemble the “half-moon” distance holder below the magnet. See figure 15.

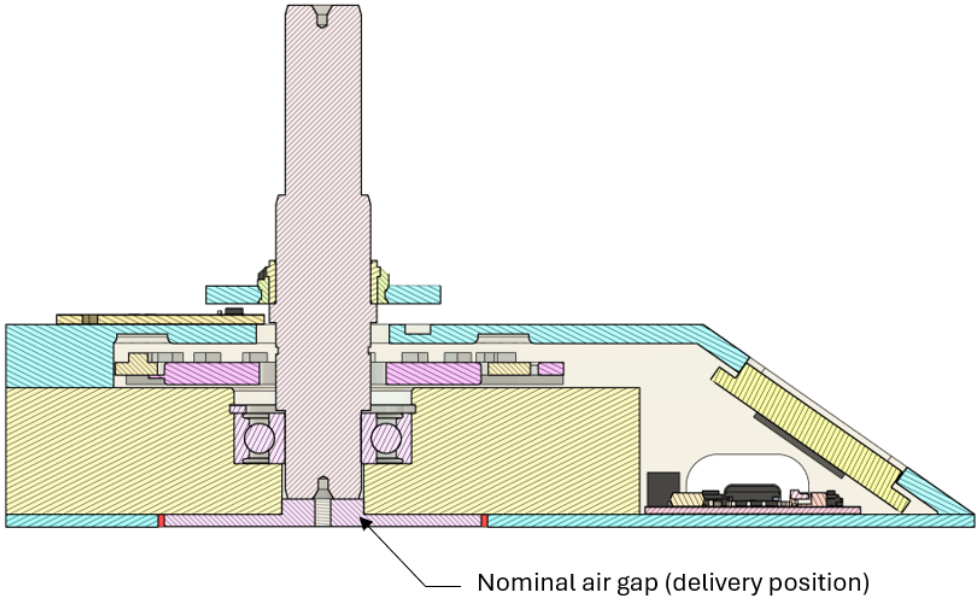

Figure 15: Nominal air gap: Distance holder in place

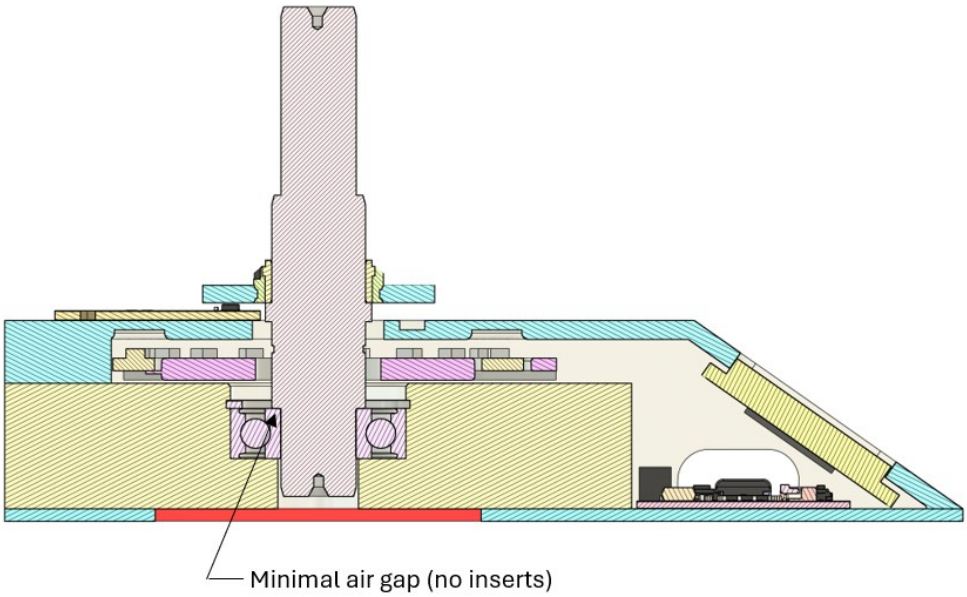

Figure 16: Minimal air gap: Distance holder removed

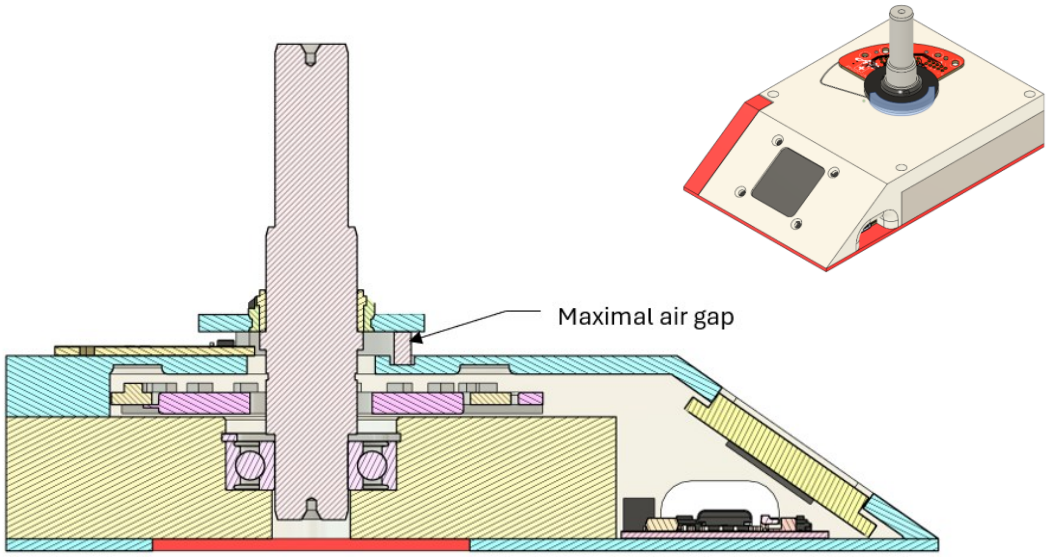

Figure 17: Maximal air gap: "Half-moon" distance holder below the magnet

Stray-field

Absolute Magnetics Technology is robust to external stray-fields. To demonstrate this advantage, the Evaluation Kit is supplied with a neodymium magnet to generate a magnetic stray-field in close proximity to the encoder.

Testing:

- Bring the stray-field magnet close to the AM Encoder (see figure 16).
- Move the stray-field magnet to different positions and observe the influence on the angle shown on the screen.

Attention:

The stray-field magnet is attracted to the AM magnet. Take care to avoid damaging the AM magnet.

The stray-field magnet is strong enough to rotate the shaft by magnetic force alone. Hold the shaft securely during the stray-field test to prevent unintended rotation.

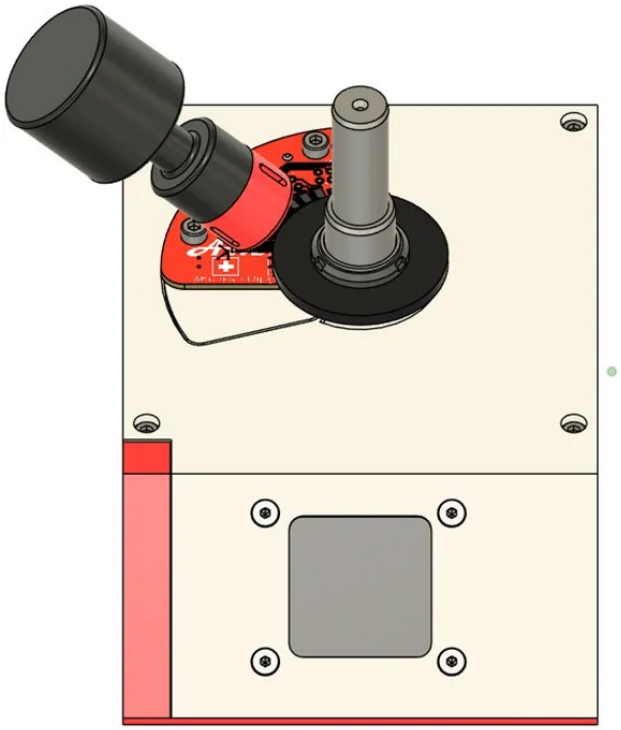

Figure 18: Stray field test

Absolute position / power loss

The AM Encoder provides an absolute position output, meaning that each magnet position is unique and the angle is determined independently of previous readings. Unlike incremental encoders, which require movement to establish a reference after power-up, this encoder immediately reports the correct position even after a complete power-down — no movement is needed for re-initialization.

Testing:

- Turn off the power by moving the switch to the off-position (see figure 17).
- While the encoder is turned off, rotate the shaft to a new position.
- Turn on the power by moving the switch to the on-position. The new angle can be indicated immediately without any kind of movement.

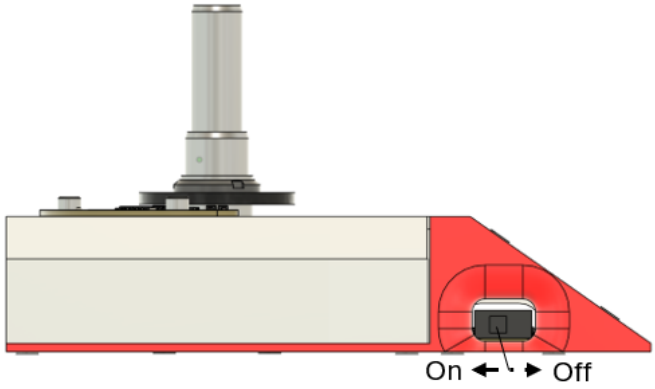

Figure 19: On-Off switch

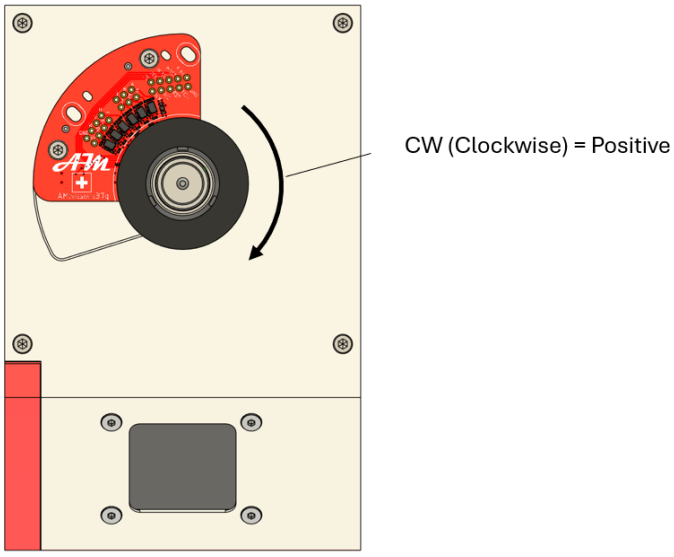

Figure 20: Direction of rotation

Misalignment

AM Technology offers a unique advantage: Reliable position output even under misalignment.
The AM Encoder continues to deliver high accuracy even with 0.5 mm displacement between the magnet and the electronics board.
To demonstrate this benefit, the electronics board can be moved to a misaligned position on the Evaluation Kit.

Preparation:

1) Pull out the shaft with the magnet.
2) Remove the two screws which fix the AM electronics board.
3) Remove the plastic flap.
4) Move the AM electronics board to the misaligned position (turn about 20°, see figure 19).
5) Place the two screws in the slotted holes and tighten the screws slightly (movement should still be possible).
6) Insert the shaft with the magnet again.

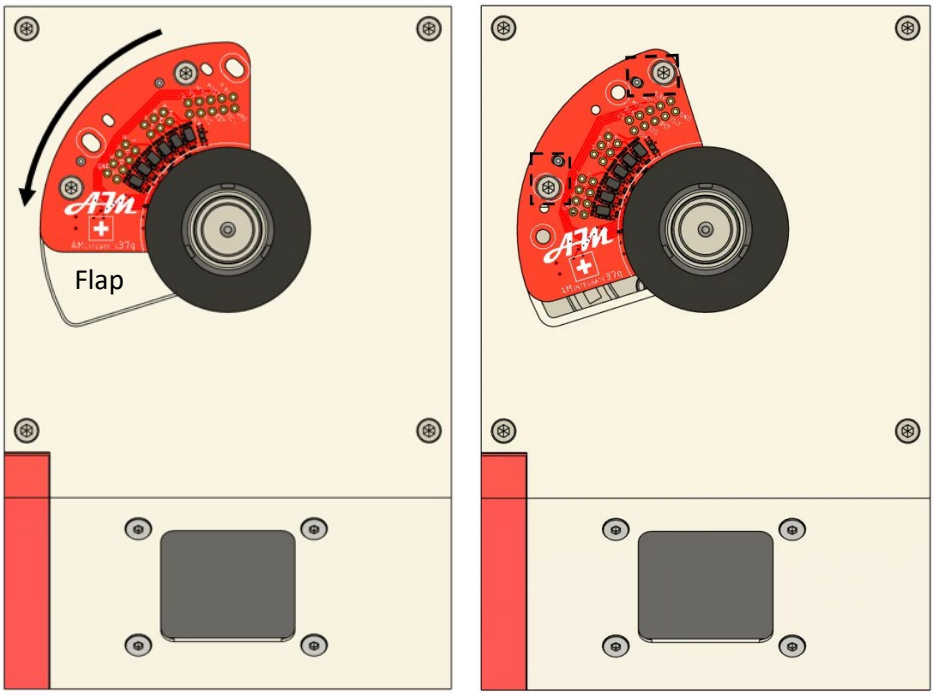

Figure 21: Setup for nominal position measurement (left) and for misalignment test (right)

Testing:

- Move the AM electronics board to a misaligned position. The slotted holes allow a movement range of 1.0 mm.
- Turn the shaft by hand while observing the angle on the screen.

- ***Tilt test:*** Lift AM electronics board on one side to introduce tilt to the measurement system.

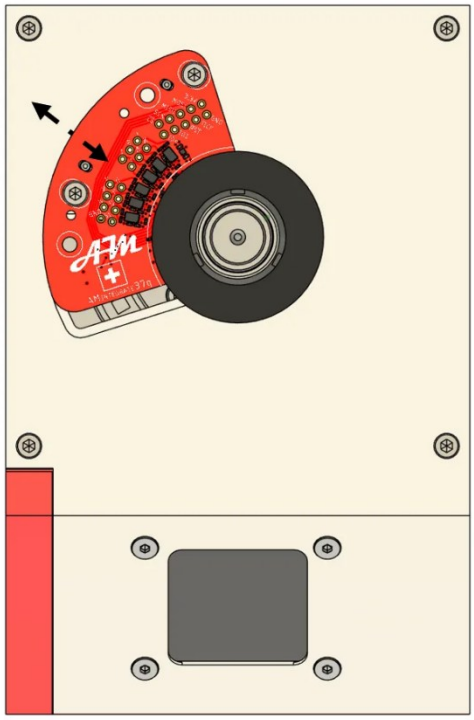

Figure 22: Misalignment test - movement of AM electronics board

5. Technical specifications

For detailed technical specifications, please refer to the **AM Integrate 37q – Eval Kit data sheet**.

Should you experience any problems or have questions, please reach out to us at: contact@absolute-magnetics.com

6. Appendices

Shaft manufacturing drawing

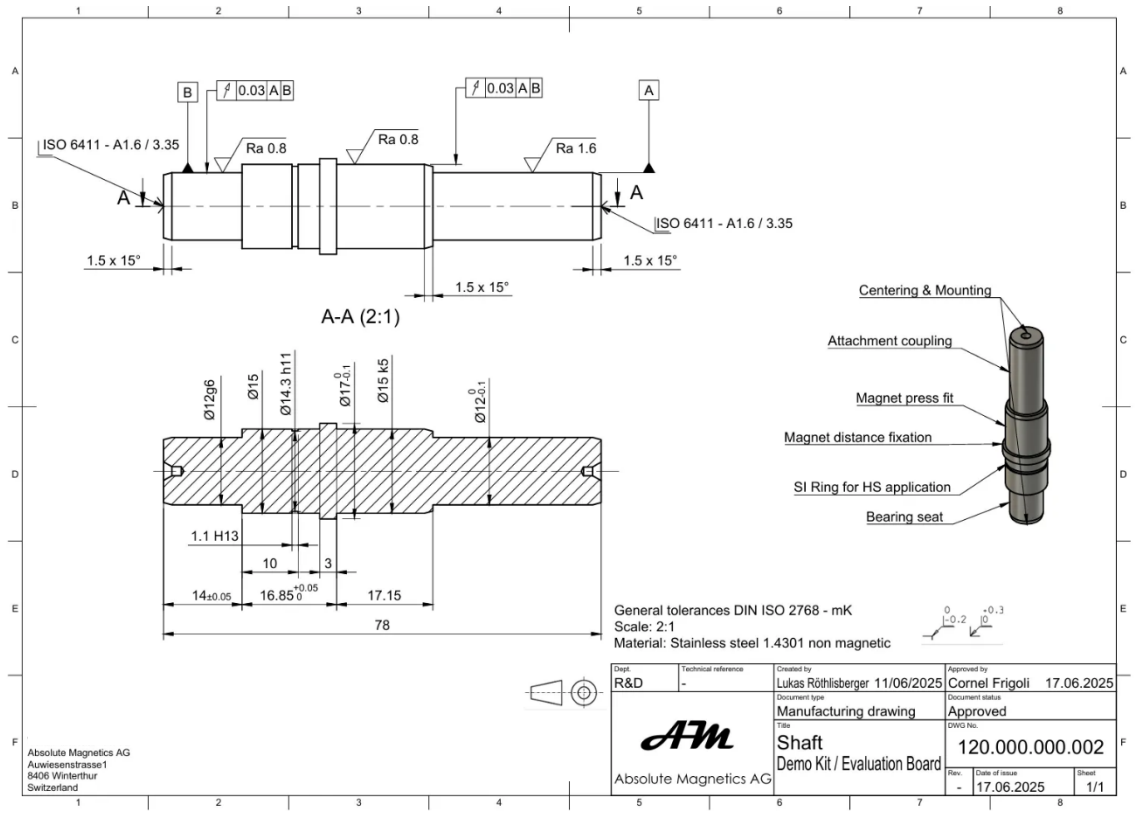

Figure 23: Manufacturing drawing of the shaft

Base plate of Evaluation Kit:

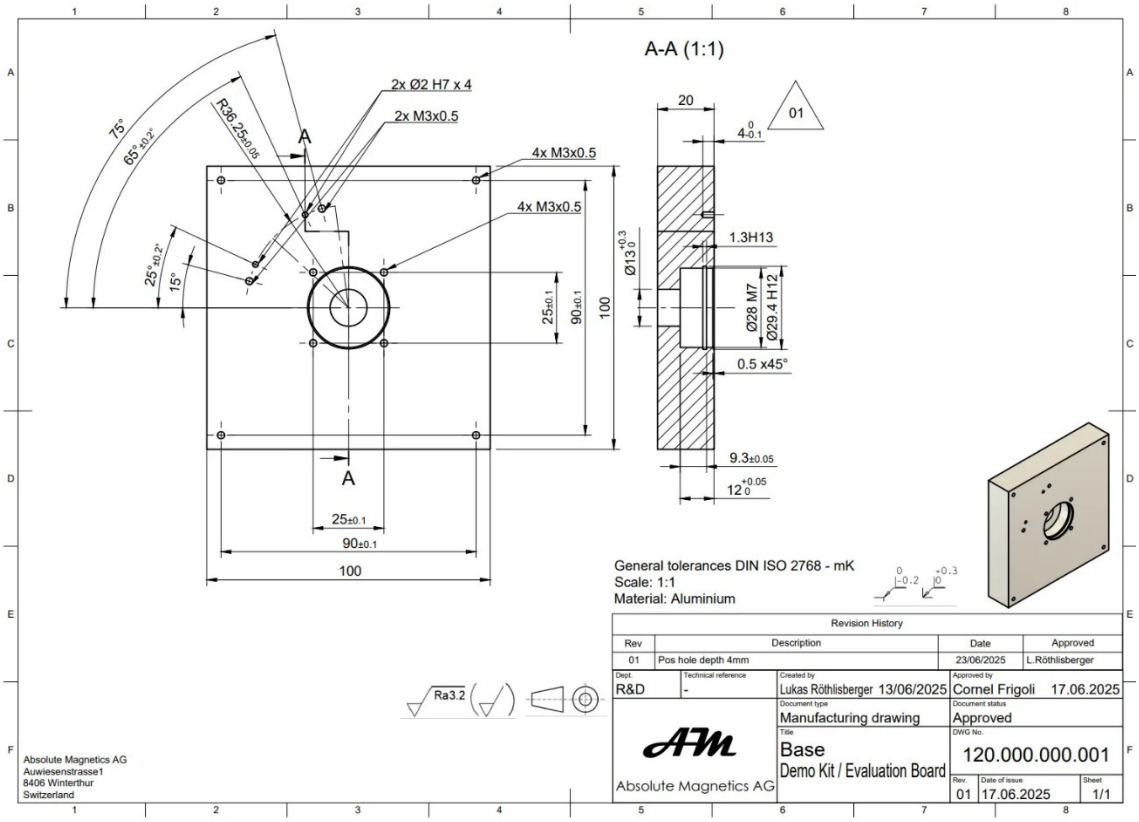

Figure 24: Attachment for the AM electronics board / Manufacturing drawing base plate

Connector board schematics

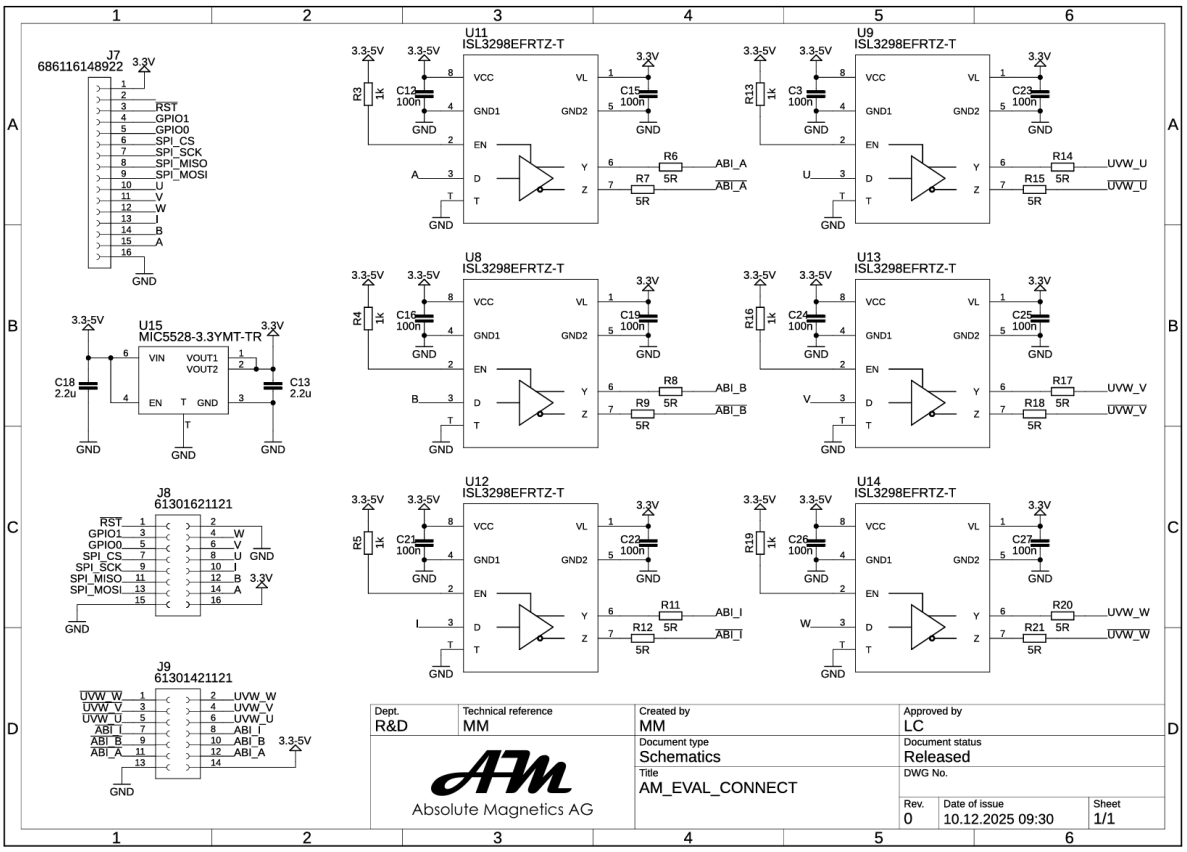

Figure 25: Connector board schematics.

Parts list (BOM shortened)

- AM Connector Board
- Flat ribbon cable (long version for Connector board)
- Coupling: For diameter 12 and 14 mm / Size: 30x35 / max RPM: 15’000 / mass: 50g
- Bearing: SKF 6001 / OD: 28mm, ID 12mm, thickness: 8mm
- Wave spring: 20x15x19mm
- Positioning pin: DIN 6325 - Tol m6 / 2 x 16mm
- SI ring: DIN 471 / D15mm (outer; on shaft)
- SI ring: DIN 471 / D28mm (inner; on base)
- USB C cable

3D Files / STEP files

Request a STEP file via email contact@absolute-magnetics.com

7. Contact

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