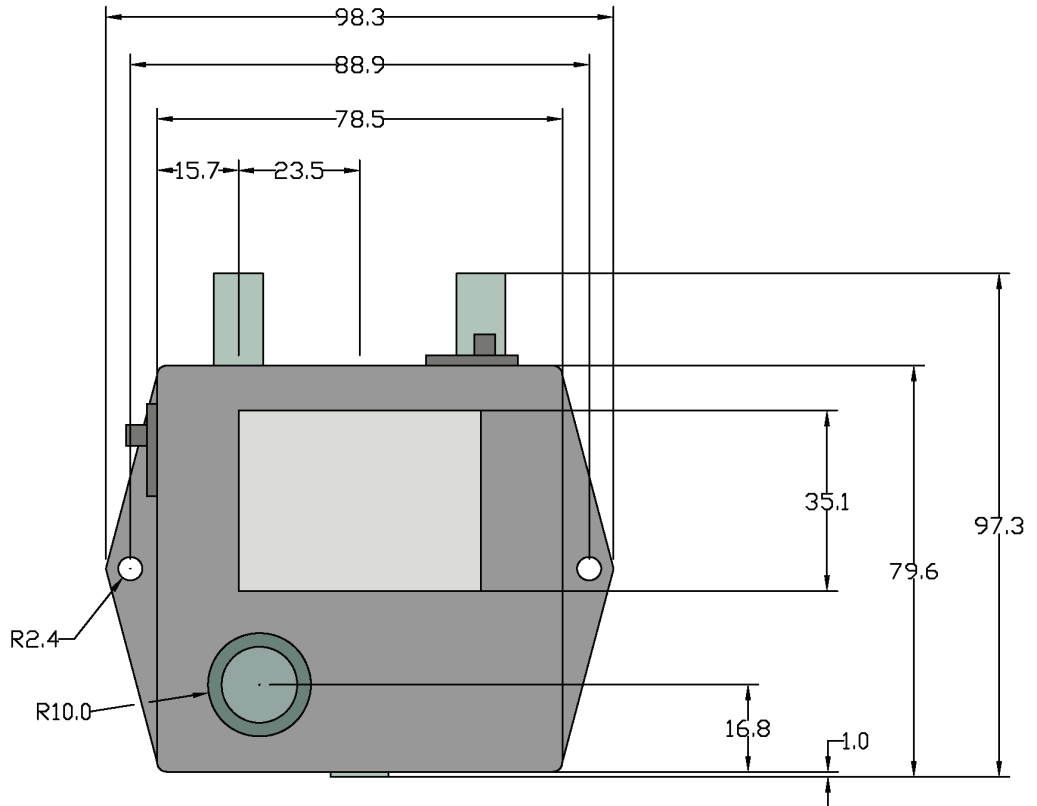


AL-05 – Product Photograph



AL-05 – Physical Dimensions



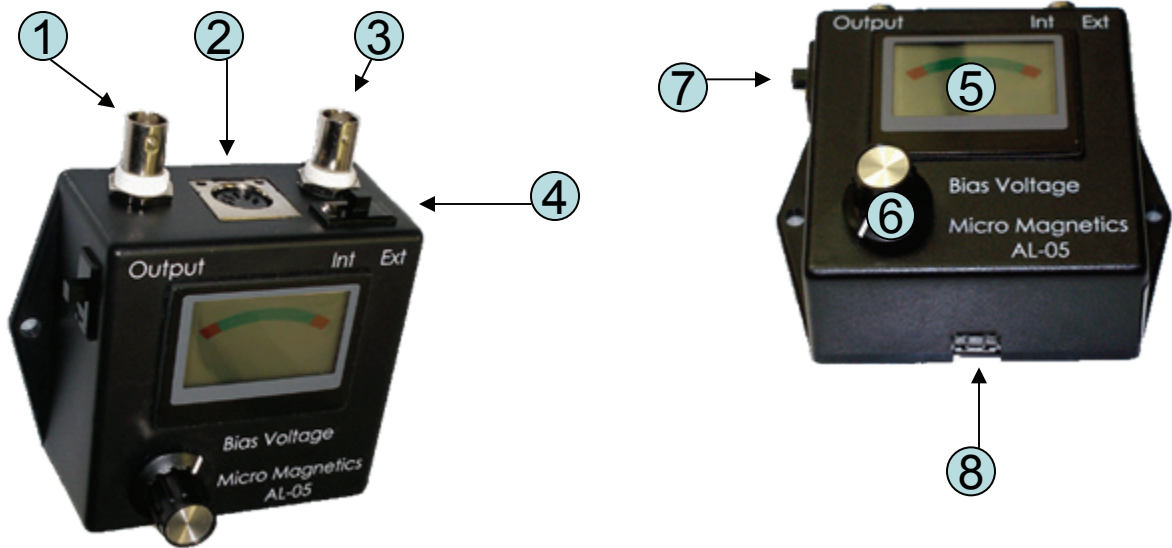
All dimensions in millimeters.

Total height of the AL-05, including the height of the null potentiometer knob is 56.6 mm (2.23").

Thickness of the mounting flanges is 3.2 mm (0.125").

Height of the AL-05 housing only is 38.1 mm (1.5").

AL-05 – Physical Schematic



1. Signal Output BNC
2. Power Input Connector
3. External Bias Input BNC
4. Bias Selection Switch
5. Balance Display
6. Null Potentiometer
7. Display Power Switch
8. STJ-020 Sensor Connector

AL-05 – Specifications

PHYSICAL	Min.	Typical	Max.	Unit
Total Length		98.3		mm
Total Width		97.3		mm
Total Height		56.6		mm
Unit Weight (excludes P.S.) ¹		145		gram
Operating Temperature Range	0	20	40	°C
ELECTRICAL				
AC Electrical Power Voltage	90		264	V
AC Electrical Power Frequency	47		63	Hz
RTI Voltage Noise ($f > 100$ Hz)		12	20	nV/Hz ^{0.5}
Total Effective Gain ²	10	100	2000	
Frequency Response ($G \leq 100$)	0		700	kHz
Frequency Response ($G = 2000$)	0		200	kHz
Output Impedance		50		Ω
Common-Mode Rejection (1 kHz)	80	90		dB
First-Stage Gain (G1)		N/A ³		
Second-Stage Gain (G2)		N/A ³		
EXTERNAL BIAS				
External Bias Input Voltage Range	-5		5	V
Signal Output Operating Range	-10		10	V

NOTES

1. The included power supply is connected by a 1.5-meter cable. The power supply itself weighs approximately 1 kg (2.2 lbs.).
2. The gain is set by Micro Magnetics prior to shipping.
3. These parameters are set separately for each unit, based on customer requirements.

AL-05 – Detailed Description and Operating Instructions

Introduction:

The AL-05 is a low-noise preamplifier circuit meant for use with Micro Magnetics' STJ-020 magnetic microsensors only. The AL-05 supplies electrical power to the microsensor (#8), and outputs an analog voltage which is linear in the magnetic field strength at the sensor. The bipolar output voltage V_{OUT} at the signal out BNC (#1) has a range of +/- 10 V and has a value given by

$$V_{OUT} = V_0 + H \left(\frac{S \cdot V_{IN} \cdot G_1 \cdot G_2}{100(G_1 + 1)} \right)$$

where H is the magnetic field in the sensing direction, in Gauss, S is the sensor sensitivity (in units of %/G, as specified in the sensor datasheet), and V_0 is an offset which can be adjusted using the null potentiometer (#6). The parameters G_1 and G_2 are the gain parameters of the AL-05 which are set individually for each unit and are given in the AL-05 specifications datasheet. The parameter V_{IN} is the voltage which is used to power the sensor. When the bias selection switch (#7) is set for internal biasing, $V_{IN} = 2.0$ V. When the bias selection switch (#7) is set for external biasing, V_{IN} is equal to the voltage which is supplied through the external bias input jack (#3).

Nulling the Output and Using the Balance Display:

The balance display (#5) on the front of the AL-05 displays a 17-segment analog LCD output which corresponds to the DC voltage which is present at the signal out BNC jack (#1). The full-scale voltage range of this display is approximately -10 to +10 V. If the balance display is flashing, this indicates a voltage which is out of the normal operating range of the AL-05, which also indicates that the voltage reading at the signal out jack is not meaningful. In this case, the null potentiometer (#6) should be used to re-adjust the DC voltage value so that it falls within the normal operating range. In general, during normal operation of the AL-05, the balance display should not be flashing.

The display power switch (#7) is used to power the balance display on and off. Once the AL-05 is properly functioning, the display should be turned off for optimum performance of the STJ-020 sensor (the display can add a small amount of electrical noise in some cases).

AL-05 – Detailed Description and Operating Instructions (2)

Sensor Biasing:

The voltage which is supplied to the MTJ sensor circuit is referred to as the *bias voltage*. The user has the option of either using an external voltage to power the sensor, or using an internal 2 V bias. This option is set using the bias selection switch (#4). When this switch is set for external biasing (“Ext”), the user may supply a bias voltage of his/her choosing directly to the sensor using the external bias input BNC jack (#3). **The external bias voltage should not be set outside the safe range given in the AL-05 specifications sheet.** When the switch is set for internal biasing (“Int”), the 2.0 V internal bias voltage is used and the external bias BNC plug is isolated from the preamplification electronics.

Installing and removing SpinTJ sensors:

To install an STJ-020 sensor, follow these steps:

1. Power the AL-05 with the included power supply. Make sure that the balance display (#5) is turned on, using the display power switch (#7). The positive line segments of the display should flash.
2. Install the sensor in the proper orientation (label up). The STJ-020 will snap into the connector.
3. Adjust the balance display to zero (vertical) by turning the null potentiometer (#6) in the counterclockwise (CCW) direction for a negative display reading or clockwise (CW) for a positive display reading.

When removing or replacing the STJ-020 sensor, be sure to remove any external bias voltage, before disconnecting the device.

AL-05 – Detailed Description and Operating Instructions (3)

Notes on Sensor Operation:

To check if a sensor is responding properly, the user can monitor the DC voltage using the balance display (#5). Using internal bias, a noticeable change in the reading on the balance display should be observed if a small refrigerator magnet is brought within 1-2” of the sensor’s active area.

The AL-05 produces an output voltage which is linearly proportional to the magnetic field in the sensing direction, as long as the output voltage at the signal output jack (#1) is within its operating range. At sufficiently large magnetic fields, the response becomes increasingly non-linear. In addition, the sensor sensitivity can be slightly altered by large static magnetic fields in the perpendicular in-plane direction.

If you require technical support please contact Micro Magnetics at support@micromagnetics.com or (508) 672-4665.