

MAGNETIC CARD READER DESIGN KIT TECHNICAL SPECIFICATION

Part Number: D99821002 Rev 212

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MAGTEK[®]

REGISTERED TO ISO 9001:2008

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REVISIONS

| Rev Number | Date | Notes |
|------------|----------|---|
| 1 | 4/7/97 | Initial Release |
| 2 | 6/10/97 | Added Tech Support Phone Number on Title Page |
| 3 | 4/1/98 | Added BOM For Doc |
| 4 | 5/1/98 | Fixed Date |
| 5 | 5/7/98 | Revised #4 Washer, para 3.1 |
| 6 | 3/10/99 | Incorporated all documents and drawings into basic document and formatted for PDF files |
| 7 | 11/30/99 | Changed 99821066 to reflect PCB layout. Changed 99875063 UART to USART. Dwg 21062320 and Dwg 21062321 added substitute terminal. |
| 8 | 01/19/00 | Section 3.1 and Appendix 1: For Insertion Readers, deleted drawing numbers 21062320 and 21062321 and replaced with 21062342, 21062343, 21062344, 21062334, 21062336; Deleted drawing numbers 21053904 and 21053907 and replaced with 21053909, 21053910, and 21053911. Added drawings 16037701, 48190004 and Spec 85800004. |
| 9 | 10/2/00 | Updated and added document 99875065-3. Updated and added document 99821066-9 |
| 10 | 01/08/01 | Updated Dwg 21062336 from Rev 2 to Rev A |
| 11 | 02/20/01 | Reformatted pagination |
| 12 | 06/06/02 | Updated with revised 99821066 drawing |
| 13 | 08/06/02 | To Design Requirements, added 5 Molex mating connectors |
| 14 | 04/08/03 | Front Matter: added ISO line to logo |
| 15 | 04/23/03 | Sec 2: parts required, changed drawing 21052051 to 21052071. In Drawings, replaced Drawing 21052051 with 21052071, 99821066-10 with -11, 99875063-3 with -4, 99875064-2 with -3, 99875065-3 with -4 |
| 16 | 07/01/03 | Section 1: Editorial throughout to match drawing changes. Drawing Section: added drawings: 21052169, 21052170, 21052176, 21052177, 21062358, 21062360, 68110110, 68110111; deleted drawings: 21052168, 21052178, 21052179, 21052183, 21053909, 21062334, 21062336, 21062342, 21062343, 21062344. |
| 17 | 10/31/05 | Updated to include 5mm (ULP) head family and Delta ASIC |
| 18 | 2/17/06 | Replaced head and pivot pins with shorter versions |
| 19 | 5/19/06 | Added 2-track beam head (21062300 & 21062309) |
| 20 | 3/12/08 | Added 21052207 on Accordion Spring; added Encrypting IntelliHeads to related documents |
| 21.01 | 2/14/11 | Removed 2-track head assemblies for insert readers; added 21030075 |
| 212 | 05/31/17 | Add section 2.3.3 Orientation to provide details on swipe head rotation |

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1. SCOPE

1.1. PURPOSE

The purpose of this document is to provide general information relating to the mechanical design of both swipe and insert Magnetic Stripe Readers.

1.2. READ HEADS

The suggestions and guidelines contained in this document can be used to design magnetic stripe readers using conventional heads which are listed in the **Parts Required** tables below. Alternatively, the MagTek IntelliHead family of products can be used in these same readers. Information about the IntelliHead products can be found in some of the documents listed in the table in Appendix A.

1.3. ELECTRONIC DESIGN

This kit does not address the design of the electronics or the firmware required to extract information from the magnetic stripes. However, MagTek offers a triple-track ASIC (Delta ASIC, p/n 21006540/21006541) which can be used to simplify the reading of the magnetic data. Refer to the table in Appendix A to locate the related documentation.

2. DESIGN REQUIREMENTS FOR SWIPE READERS

2.1. PARTS REQUIRED

Butterfly Spring Assembly

| Qty | Description | MagTek Part Number |
|-----|---|--------------------|
| 1 | Swipe Reader Design Criteria | 21053902 |
| 1 | 2-track Head Assembly (TK 1, 2 or 2, 3); 7-pin connector* | 21052198 |
| | 3-track Head Assembly; 7-pin connector* | 21052199 |
| 2 | Pivot Plates | 21053503 |
| 2 | #4 x 0.25 long Self Tapping Screw Type B | N/A |

Accordion Spring Assembly

| Qty | Description | MagTek Part Number |
|-----|---|--------------------|
| 1 | Swipe Reader Design Criteria | 21053914 |
| 1 | 3 Track Head Assembly; 7-pin connector* | 21052207 |

* Mates with any Molex series: 53398, straight, SMT; 53261, Right Angle, SMT; 53047, Straight, Thru Hole; 53048, Right Angle, Thru Hole; and 51047, to Wires.

2.2. READER BODY DESIGN

The critical areas and dimensions of the swipe reader body are shown in drawing D21053902 (for butterfly spring designs) and D21053914 (for accordion spring designs); both are located in Appendix A.

2.3. HEAD POSITION AND LOCATION

The Head Assembly consists of a thin, flexible head mount spring that doubles as a locator and supplies the force for the head-to-card contact.

2.3.1. Horizontal Position

The gap is located longitudinally, midway between the pivot pins of the pivot plates, centered in the opening of the reader body.

2.3.2. Vertical Position

The centerline of the gap (width) is mounted on the line connecting the centers of the pivot plate mounting holes, Datum B in drawing D21053902. Datum B is also the centerline of Track 2 which is located 0.408 inch (10.4mm) from the top edge of the Magnetic Card, Datum C. Reference Datum B and Reference Datum C must be parallel within 0.003 inch (0.076mm) in order to minimize the rotational displacement between the read head and the recorded bit on the card.

2.3.3. Orientation

When planning the process for assembling the head with its rail, it is important to make sure the head is oriented correctly (not rotated 180 degrees), or the assembled device will improperly attempt to read track 3 data from the track 1 area of the card and vice-versa. In cases where the head design appears symmetrical about the axis that would reverse track 1 and track 3, MagTek recommends doing the following to ensure proper orientation in final assemblies:

1. Obtain the latest drawing of the head from MagTek.
2. Find the ground tab shown in the drawing and note its position relative to Track 1 and Track 3.
3. Install the head in a prototype rail using the ground tab as a reference.
4. Swipe a test card in the prototype rail to make sure Track 1 and Track 3 are not reversed. If they are, rotate the head in the rail and test again.

If the head design has already been finalized and Track 1 and Track 3 are reversed, see the Programmer's Reference of the head you are using to find information about configuring the head to swap the Track 1 and Track 3 outputs.

2.3.4. Perpendicularity of Head to Card

The force exerted on the card is dependent on the assembly of the head into the spring, the spring rate, and the subsequent location of the head/card contact point (crown) to the mounting surface of pivot plates. The controlling dimension is 0.278 inches (7.061mm) with a tolerance of 0.003 inch (0.076mm). The head rests against the far wall with the flexed spring exerting a very light force. The insertion of the card raises the force to the level required for reliable head performance.

2.4. CARD SLOT DESIGN

2.4.1. Width

The card slot is configured to operate with card thickness of 0.010 to 0.033 inch (0.254 to 0.838mm). The slot width is 0.034 to 0.038 inches (0.864 to 0.965mm). Draft angles used in the making of this part (injected molding) must be within the 0.004 inch (0.102mm) allowance. The slot width of 0.038 to 0.042 inch (0.965 to 1.067mm) must be maintained to minimize the tilt of the card in the slot. The card travels through the slot at the whim of the operator with a great deal of tilting within the slot axis. The read head must follow the tilts in order to work correctly. Excessive slot width will allow the card to lean to the limit of the compliance in the head spring system as well as displacing the track vertically.

2.4.2. Height

The height of the slot should be no less than 0.75 inch (19.05mm) and no more than 1.25 inches (31.75mm). The low limit is to prevent excessive tilt of the card in the slot and the upper limit prevents the embossing on the card from entering the slot.

2.4.3. Length

The minimum length should not be less than 1.75 inches (44.45mm) from the centerline of the head to either end. Two inches (50.8mm) is the minimum distance required to insure the edge of the card is fully in contact with reference Datum C. Shorter distances will allow the card to assume a nose up slant and enter the read head too high, or nose down prematurely on leaving, resulting in misreads. The longer the slot, the better.

2.5. SPRING CONTROL

The pivot pins enter 0.090 inch (2.286mm) diameter holes that have a raised hub of 0.150 inch (3.81mm) diameter and a dimension from the far wall of 0.118 inch (2.997mm). Operators have a tendency, at times, to test their ability to traverse the card through the slot at a high rate of speed. The resulting card to head impact slides the head sideways off the pivot pin. The hole and hub arrangement prevents the disengagement. Neither head nor spring suffers from impact, but the system is disabled by a displaced head.

2.6. MATERIALS

2.6.1. Reader Body

Recommended materials for the reader body are ABS or Polycarbonate (PC) + 15% Glass (or other suitable material). Both should have the UL 94 V0 rating.

2.6.2. Wear Strip

Wear strips are optional depending on application requirements.

3. DESIGN REQUIREMENTS FOR INSERT READERS

3.1. PARTS REQUIRED

| Qty | Description | MagTek Part Number |
|-----|---|--------------------|
| 1 | 3-track Low Profile Head Assembly; 7-pin connector* | 21062368 |
| 1 | Pin – Head (Low Profile) | 16035003 |
| 1 | Pin – Pivot (Low Profile) | 16035004 |
| 1 | Head Spring | 16037701 |
| 1 | Retaining Ring (E Type 3/32 Shaft, e.g. Waldes Truarc 5133-9) | 85800004 |
| 1 | Flat Washer | 48190004 |

* Mates with any Molex series: 53398, straight, SMT; 53261, Right Angle, SMT; 53047, Straight, Thru Hole; 53048, Right Angle, Thru Hole; and 51047, to Wires.

3.2. READER BODY DESIGN

The critical areas and dimensions of the insert reader body are shown in drawing D21053906 located in Appendix A.

3.3. HEAD POSITION AND LOCATION

The Head Assembly consists of a ridged beam head mount. A spring supplies the force for the head-to-card contact.

3.3.1. Horizontal Position

See drawing D21053906 in Appendix A for position.

3.3.2. Vertical Position

The centerline of the gap (width) is mounted on the line connecting the centers of the pins (head and pivot) mounting holes, Datum A in drawing D21053906. Reference Datum A and Reference Datum C must be parallel within 0.003 inch (0.076mm) in order to minimize the rotational displacement between the read head and the recorded bit on the card.

3.4. CARD PATH

3.4.1. Width

The width of the Card Path should be 2.134 inches $+0.004 / -0.000$ (54.20mm $+0.102 / -0.000$).

3.4.2. Height

The Card Path is configured to operate with card thickness of 0.010 to 0.033 inch (0.254 to 0.838mm). The Card Path height is 0.038 to 0.042 inch (0.965 to 1.067mm).

3.4.3. Length

The length of the Card Path should accommodate card reading requirements. In order to read a full ISO-encoded track, the slot must accommodate the full length

of the card with the edge of the card just past the crown of the head when the card is fully inserted.

3.5. SPRING CONTROL

The recommended force of the spring is 5 to 8 ounces (142 to 227 grams) with the card inserted.

3.6. MATERIALS

Recommended materials for the reader body are ABS or Polycarbonate (PC) + 15% Glass (or other suitable material). Both should have the UL 94 V0 rating.

Appendix A. Documents and Drawings List

Table A-1. List of Drawings

| Part Number | Description | Page # |
|-------------|--|--------|
| 16035003 | Figure A-1. Head Pin (Used for Low Profile Beam Style Head Mounting) | 7 |
| 16035004 | Figure A-2. Pivot Pin (Used for Low Profile Beam Style Head Mounting) | 8 |
| 16037701 | Figure A-3. Head Spring (Used for Beam Style Head Mounting) | 9 |
| 21052194 | Figure A-4. 2-Track Read Head on Butterfly Spring | 10 |
| 21052195 | Figure A-5. 3-Track Read Head on Butterfly Spring | 11 |
| 21052198 | Figure A-6. 2-Track Read Head Assembly with Cable and 7-Pin Connector | 12 |
| 21052199 | Figure A-7. 3-Track Read Head Assembly with Cable and 7-Pin Connector | 13 |
| 21052207 | Figure A-8. 3 Track Read Head 5mm Accordion Spring | 14 |
| 21053503 | Figure A-9. Pivot Plate | 15 |
| 21053902 | Figure A-10. Swipe Reader Design Criteria | 16 |
| 21053906 | Figure A-11. Insert Reader Design Criteria | 17 |
| 21053914 | Figure A-12. Accordion Spring Swipe Reader Design Criteria | 18 |
| 21062366 | Figure A-13. 3-Track Read Head on Low Profile Beam Arm | 19 |
| 21062368 | Figure A-14. 3-Track Read Head on Beam Assembly with Cable and 7-Pin Connector | 20 |
| 48190004 | Figure A-15. Washer-Flat SS 0.101 ID x 0.183 OD x 0.020 Thick | 21 |
| 68100115 | Figure A-16. Magnetic Head, 2-Track Read, ULP | 22 |
| 68100116 | Figure A-17. Magnetic Head, 3-Track Read, Low Profile | 23 |
| 85800004 | Retaining Ring, E Type, 3/32 Shaft | n/a |
| D99875065 | Figure A-18. Application Note: Character Conversion | 24 |

Table A-2. Related Documents

| Part Number | Description | Use Figure on page | Related Document |
|-------------|--|--------------------|------------------|
| 21006540 | 3-volt Triple Track Decoder with Shift-Out Interface (tube) | n/a | D99875337 |
| 21006541 | 3-volt Triple Track Decoder with Shift-Out Interface (tape & reel) | n/a | D99875337 |
| 21030001 | 3-Track Shift-Out IntelliHead on Butterfly Spring | 13 | D99875258 |
| 21030002 | 2-Track Shift-Out IntelliHead on Butterfly Spring | 12 | D99875258 |
| 21030005 | 3-Track RS-232 IntelliHead on Butterfly Spring | 13 | D99875293 |
| 21030006 | 3-Track USB HID IntelliHead on Butterfly Spring | 13 | D99875320 |
| 21030007 | 3-Track USB KB IntelliHead on Butterfly Spring | 13 | D99875321 |
| 21030013 | 3-Track Shift-Out IntelliHead on Accordion Spring | 14 | D99875258 |
| 21030015 | 3-Track USB HID IntelliHead on Accordion Spring | 14 | D99875320 |
| 21030016 | 3-Track USB KB IntelliHead on Accordion Spring | 14 | D99875321 |
| 21030017 | 3-Track RS-232 IntelliHead on Accordion Spring | 14 | D99875293 |
| 21030018 | 3-Track Shift-Out IntelliHead on Beam Arm | 20 | D99875258 |
| 21030033 | 3-Track Encrypting SPI IntelliHead on Butterfly Spring | 13 | D99875352 |
| 21030035 | 3-Track Encrypting SPI IntelliHead on Beam Arm; 125mm/8P | 20 | D99875352 |
| 21030038 | 3-Track Encrypting SPI IntelliHead on Accordion Spring | 14 | D99875352 |
| 21030075 | 3-Track Encrypting SPI IntelliHead on Beam Arm; 50mm/10P | 20 | D99875352 |

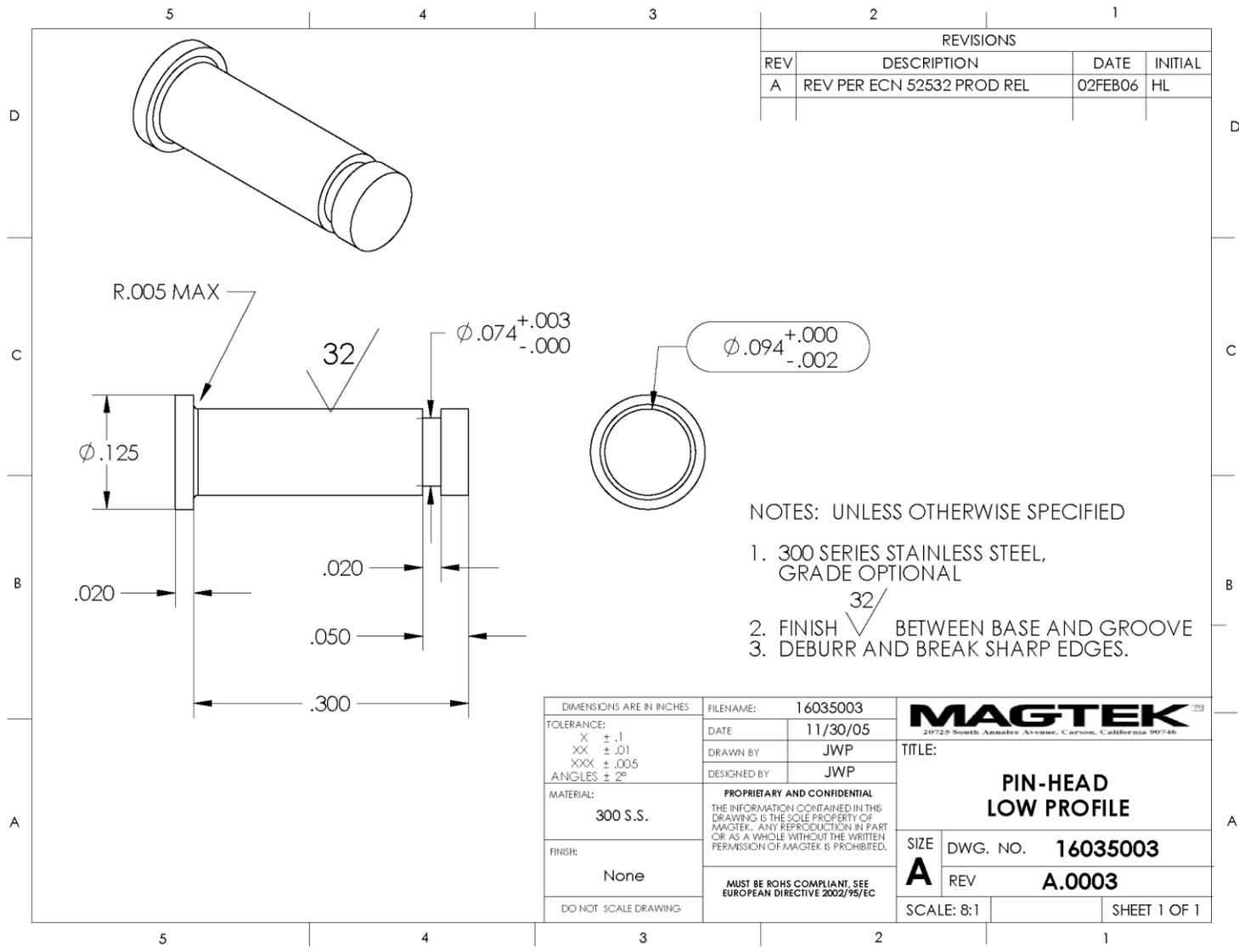


Figure A-1. Head Pin (Used for Beam Style Head Mounting)

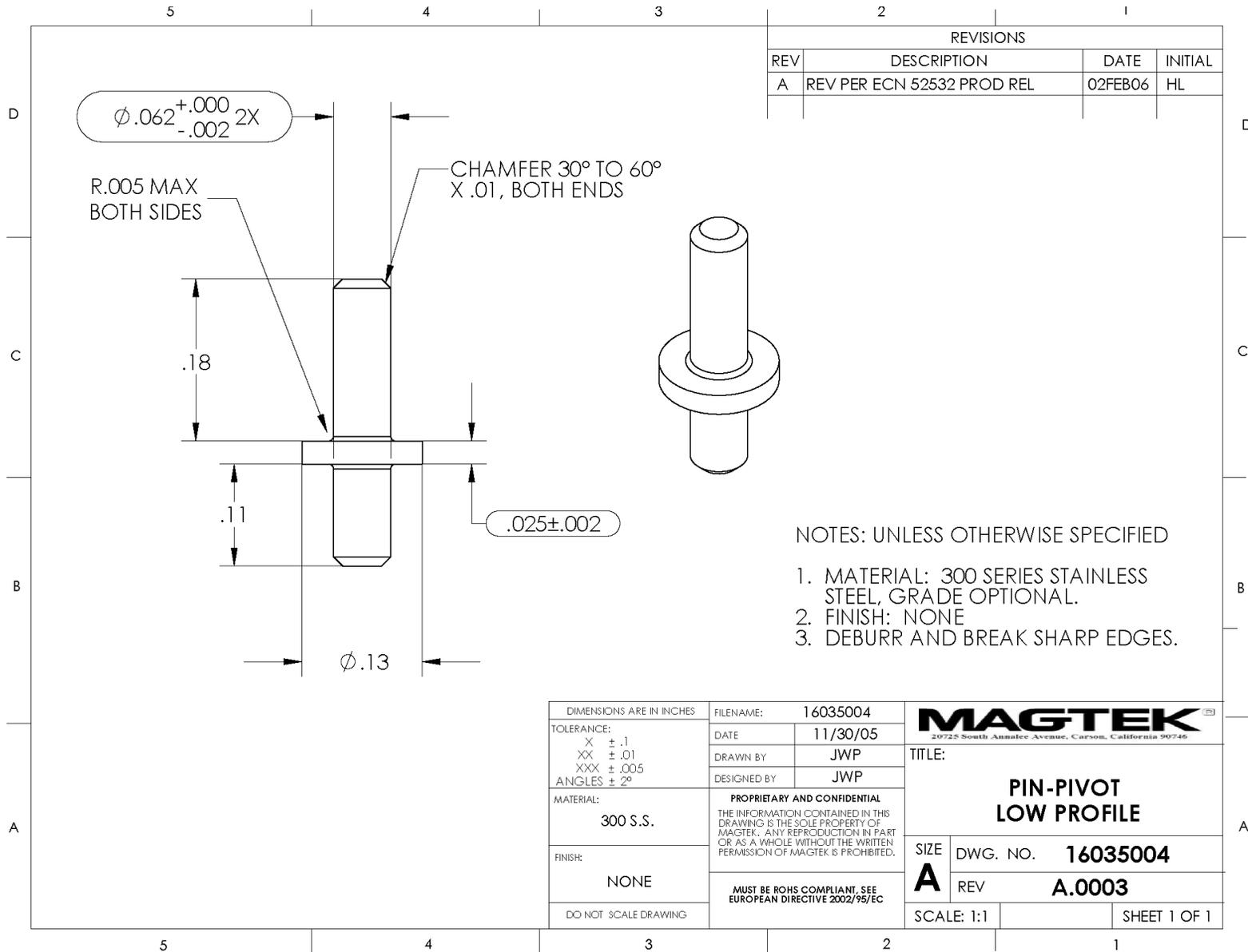


Figure A-2. Pin – Pivot (Used for Beam Style Head Mounting)

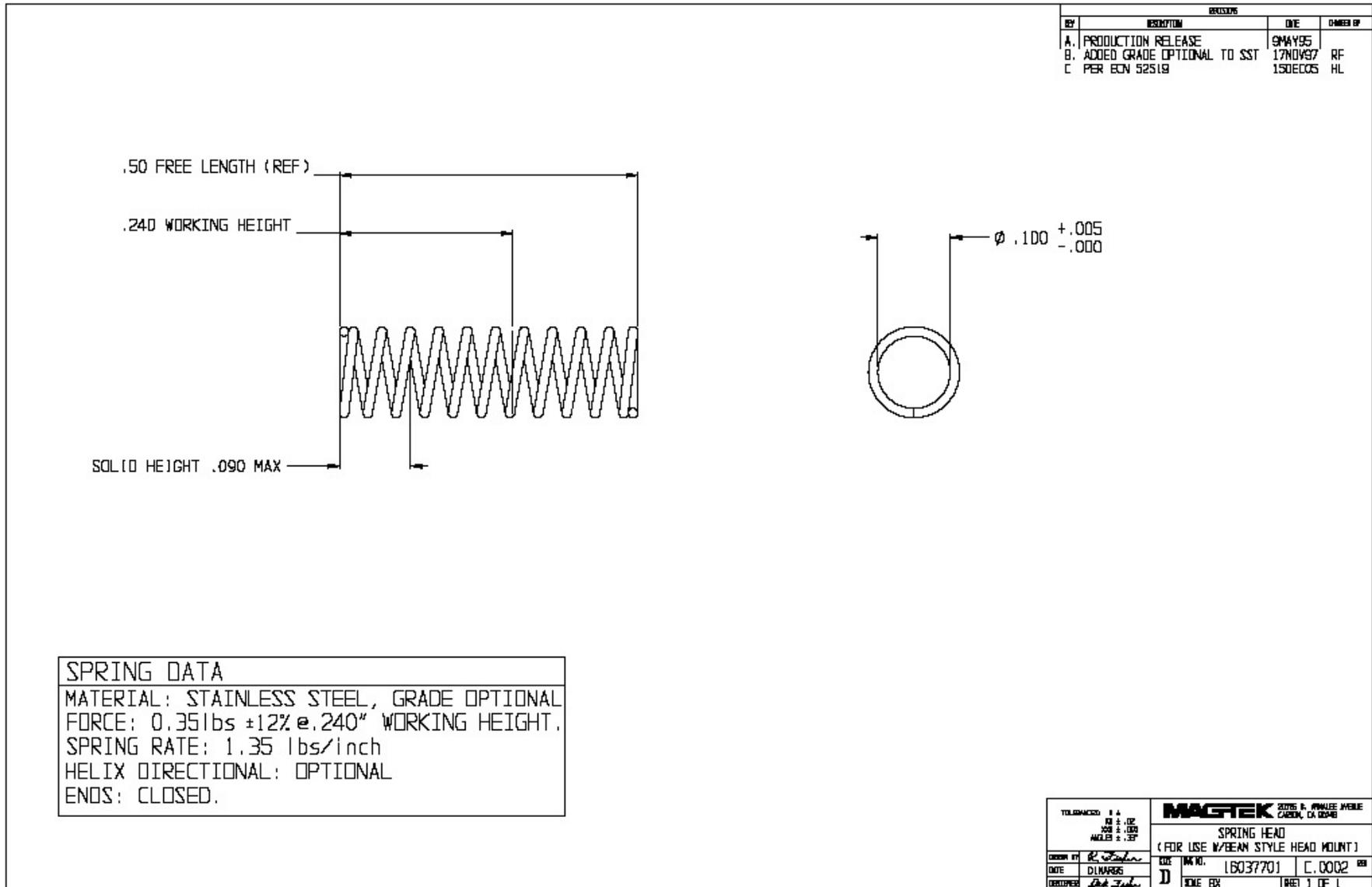


Figure A-3. Head Spring (Used for Beam Style Head Mounting)

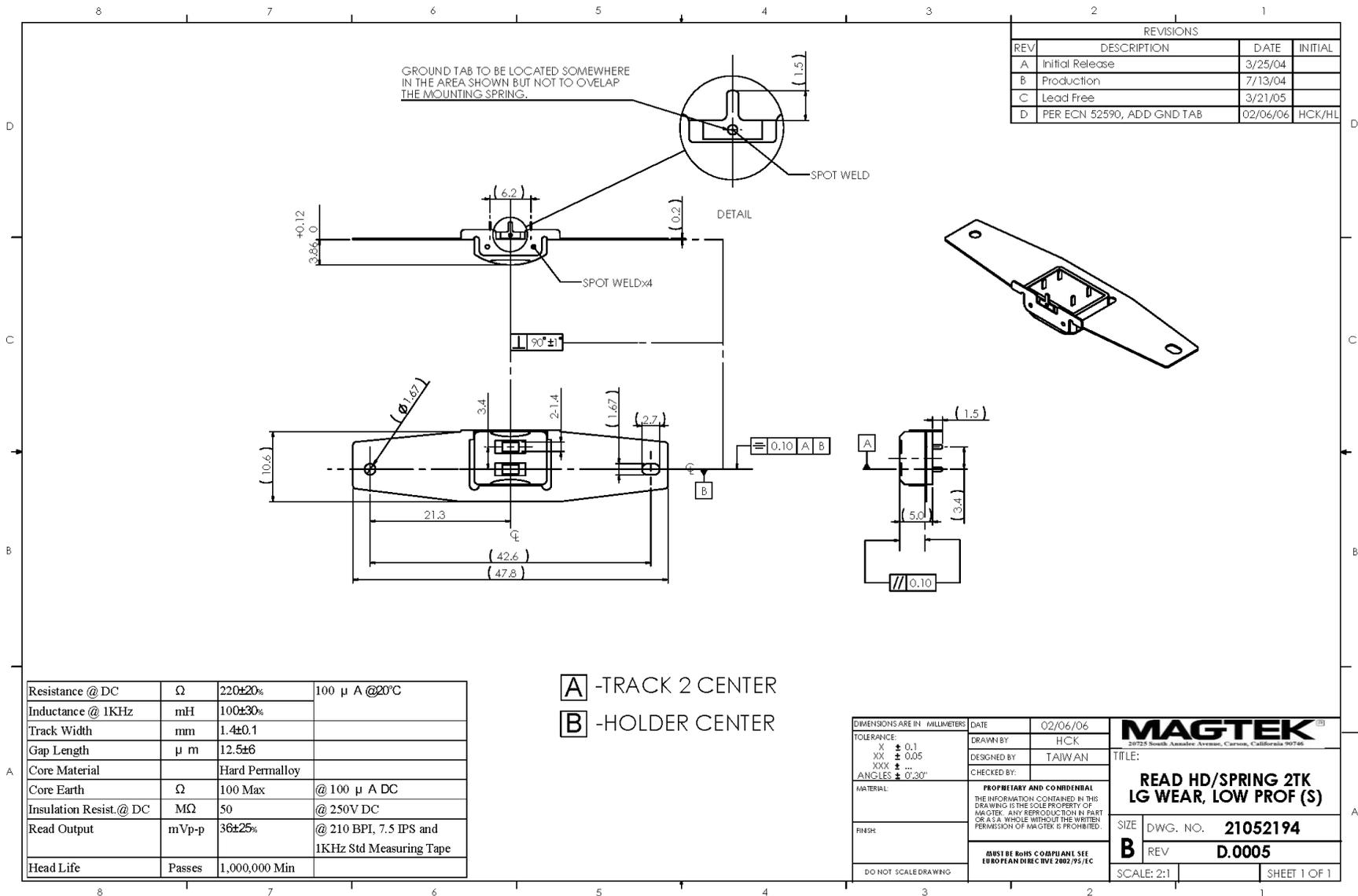


Figure A-4. Head Spring (Used for Beam Style Head Mounting)

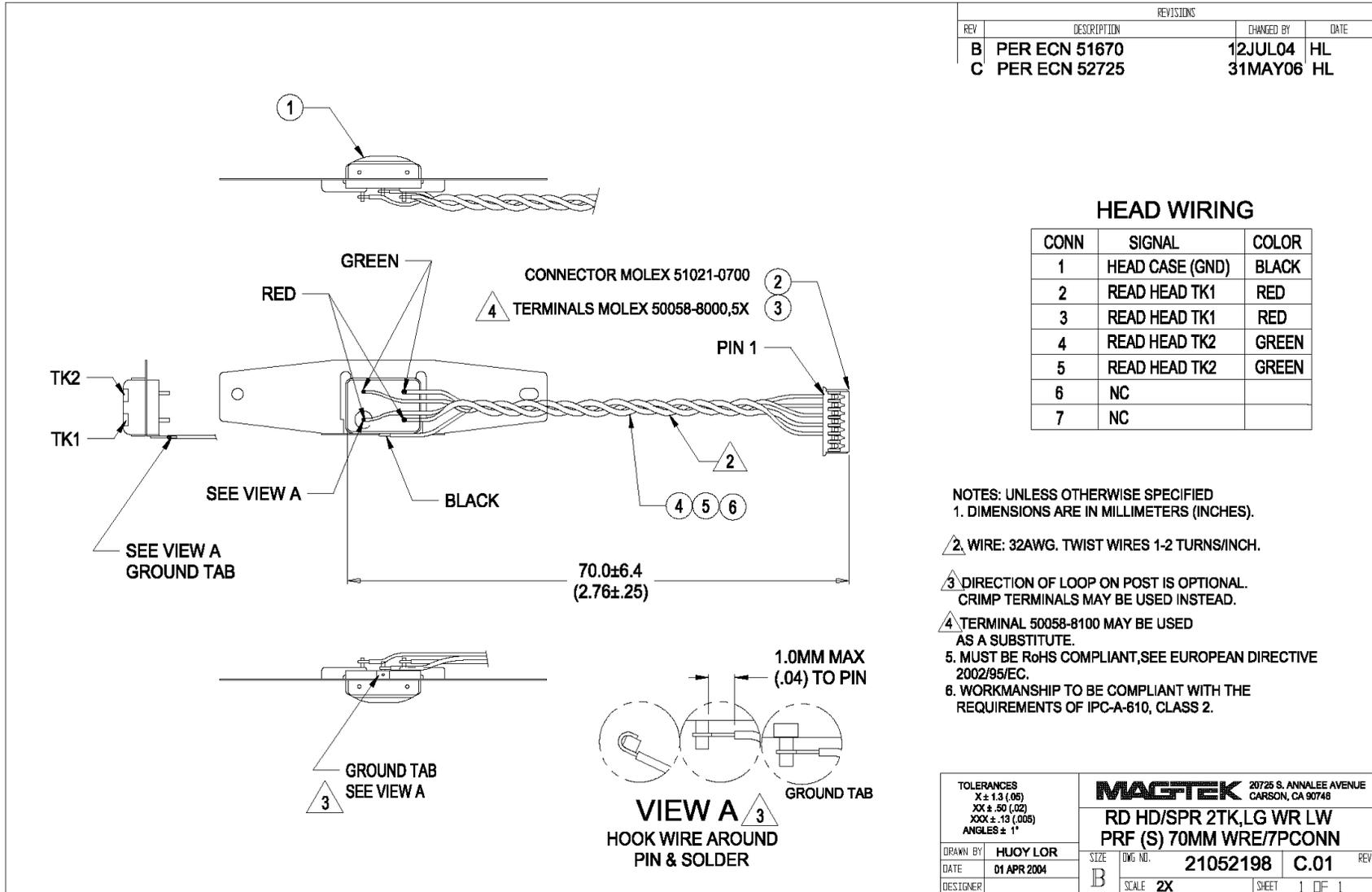


Figure A-6. 2-Track Read Head Assembly with Cable and 7-Pin Connector

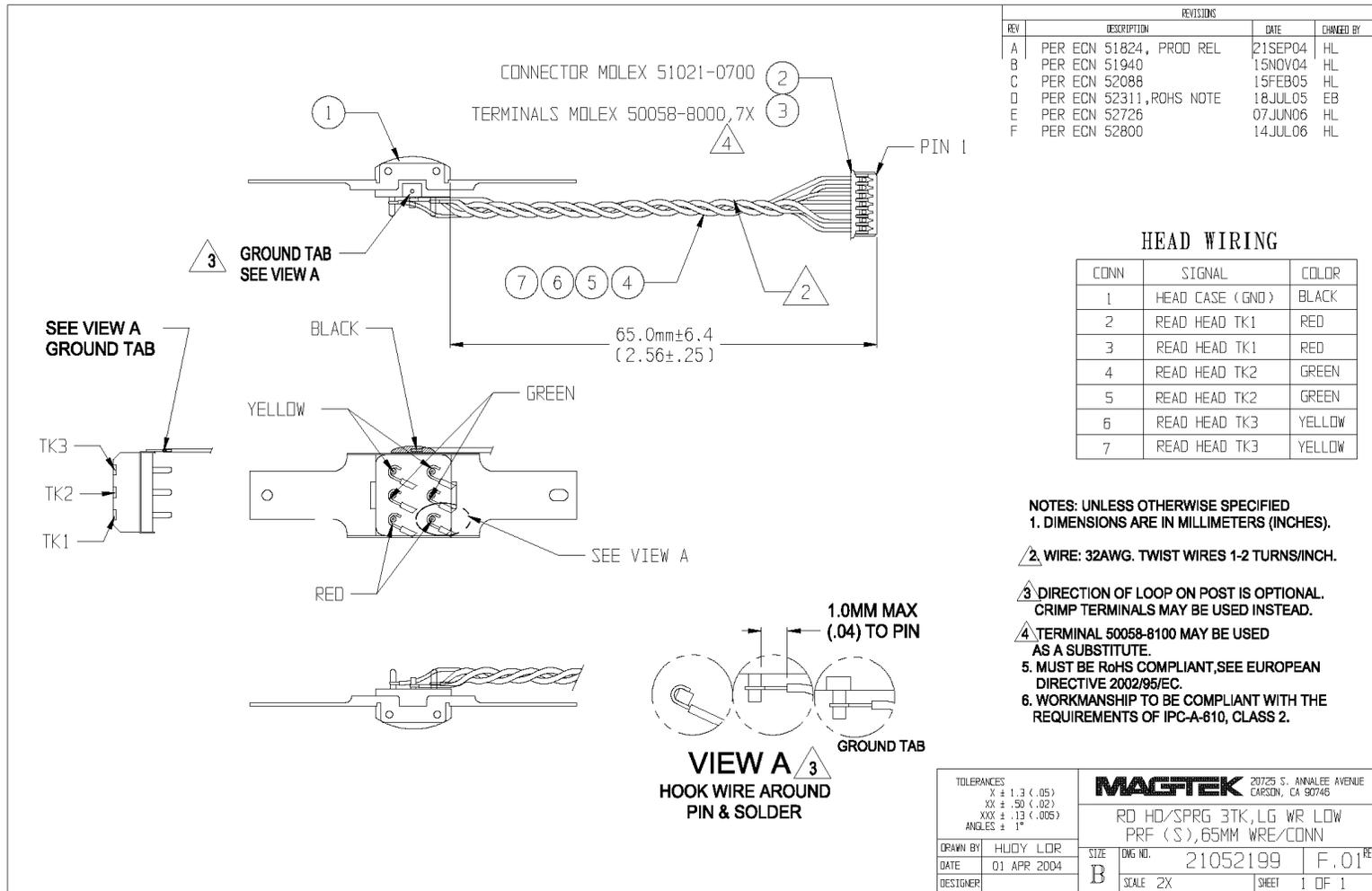


Figure A-7. 3-Track Read Head Assembly with Cable and 7-Pin Connector

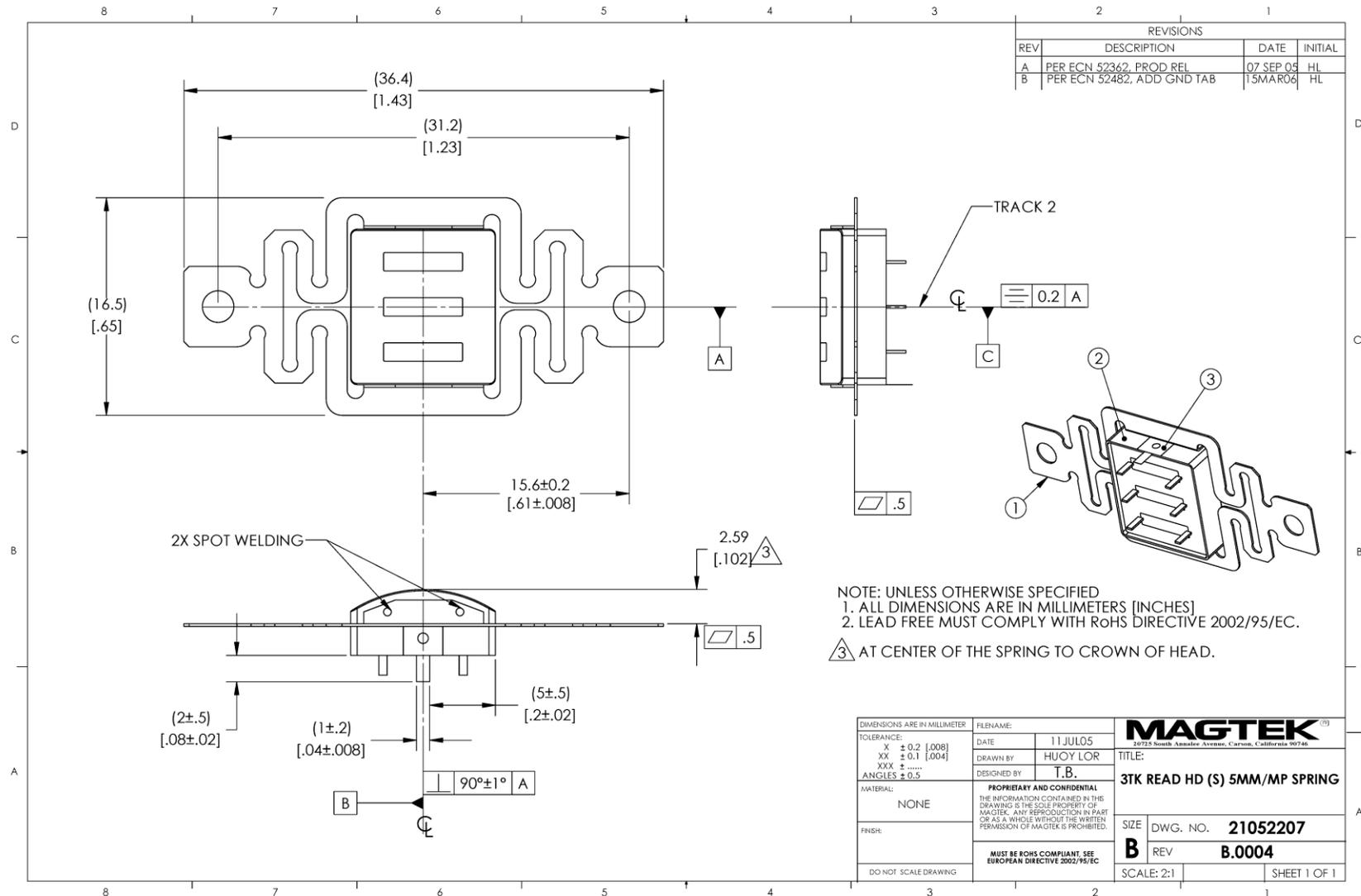


Figure A-8. 3 Track Read Head 5mm Accordion Spring

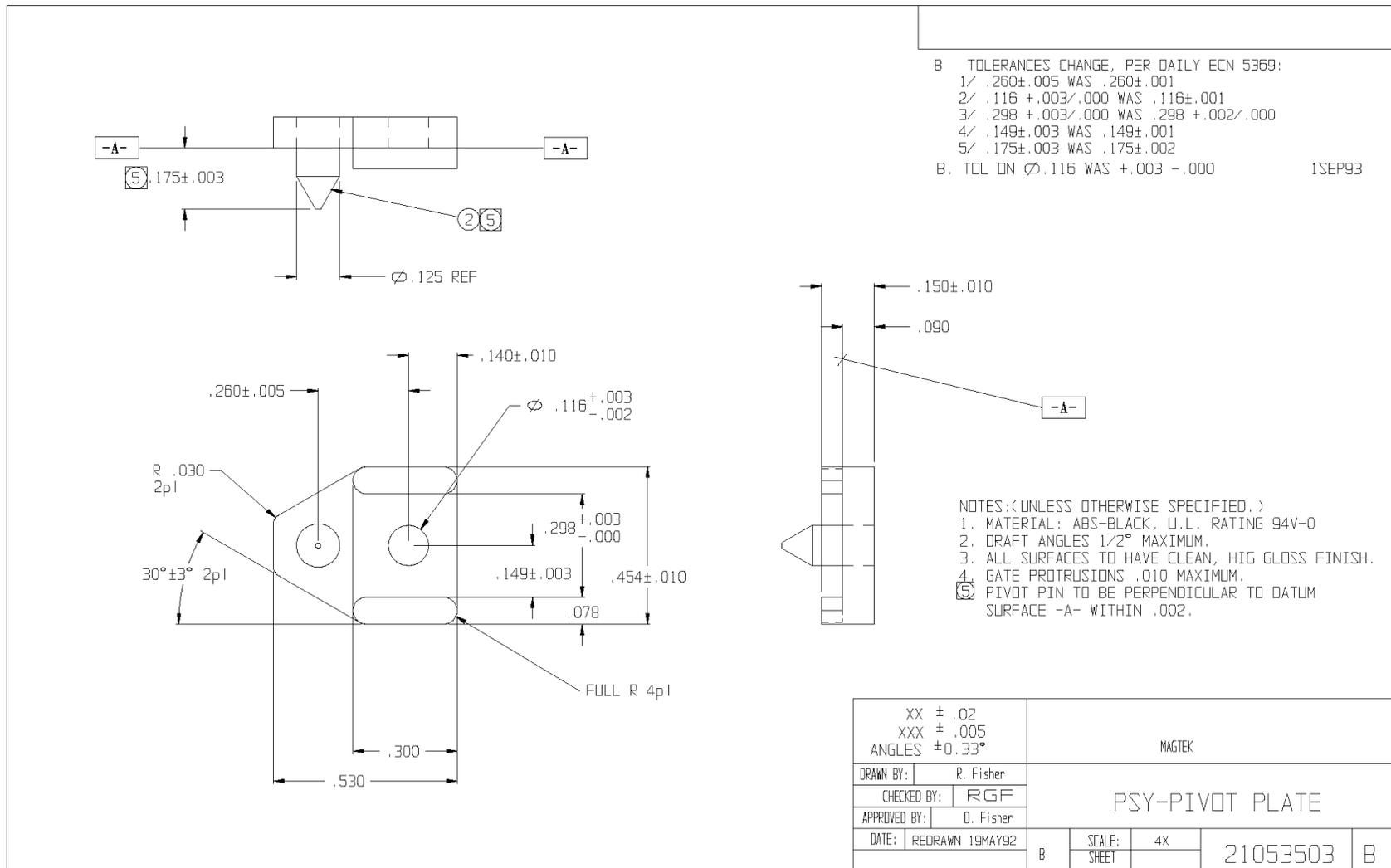


Figure A-9. Pivot Plate

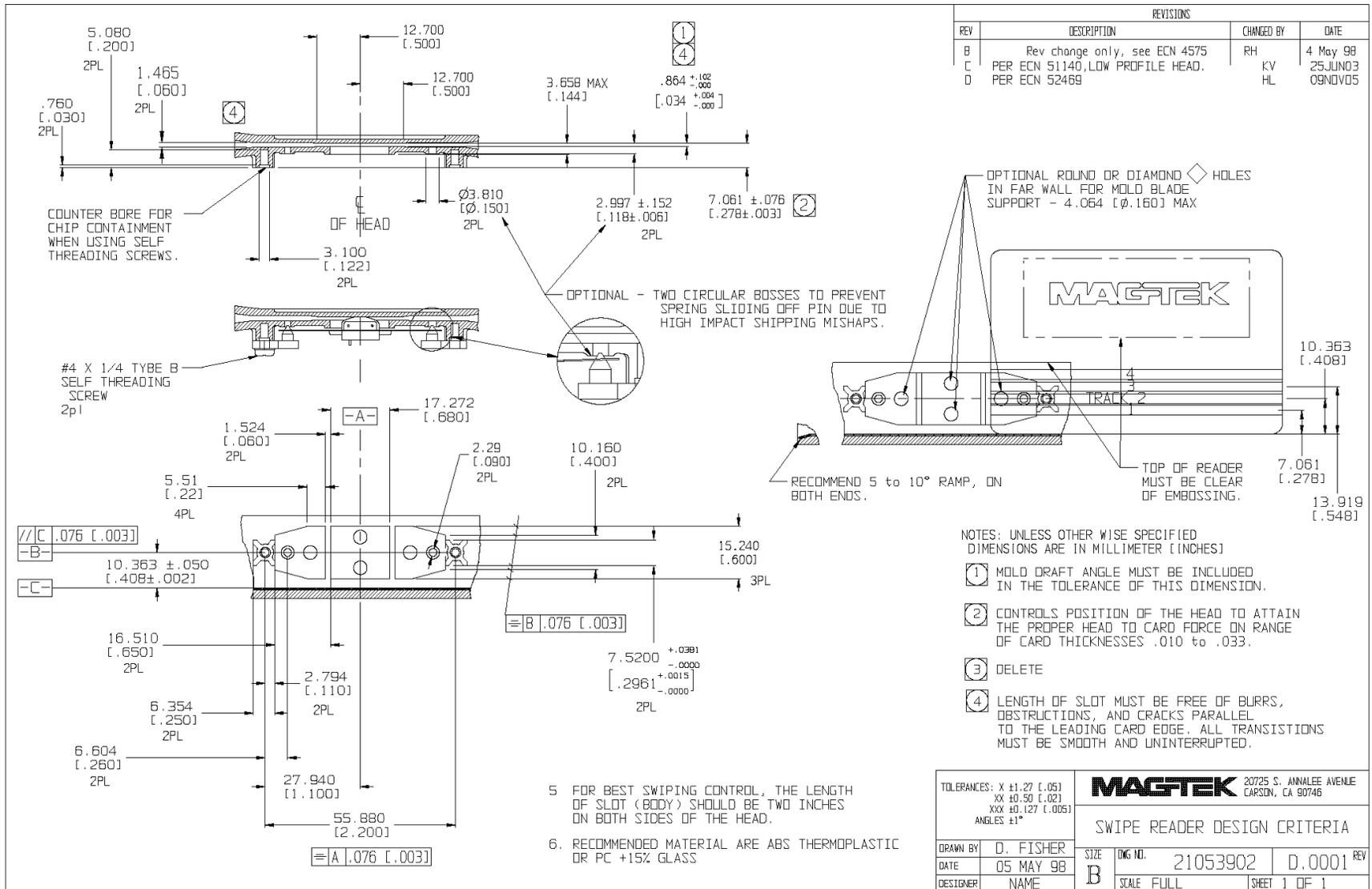


Figure A-10. Swipe Reader Design Criteria

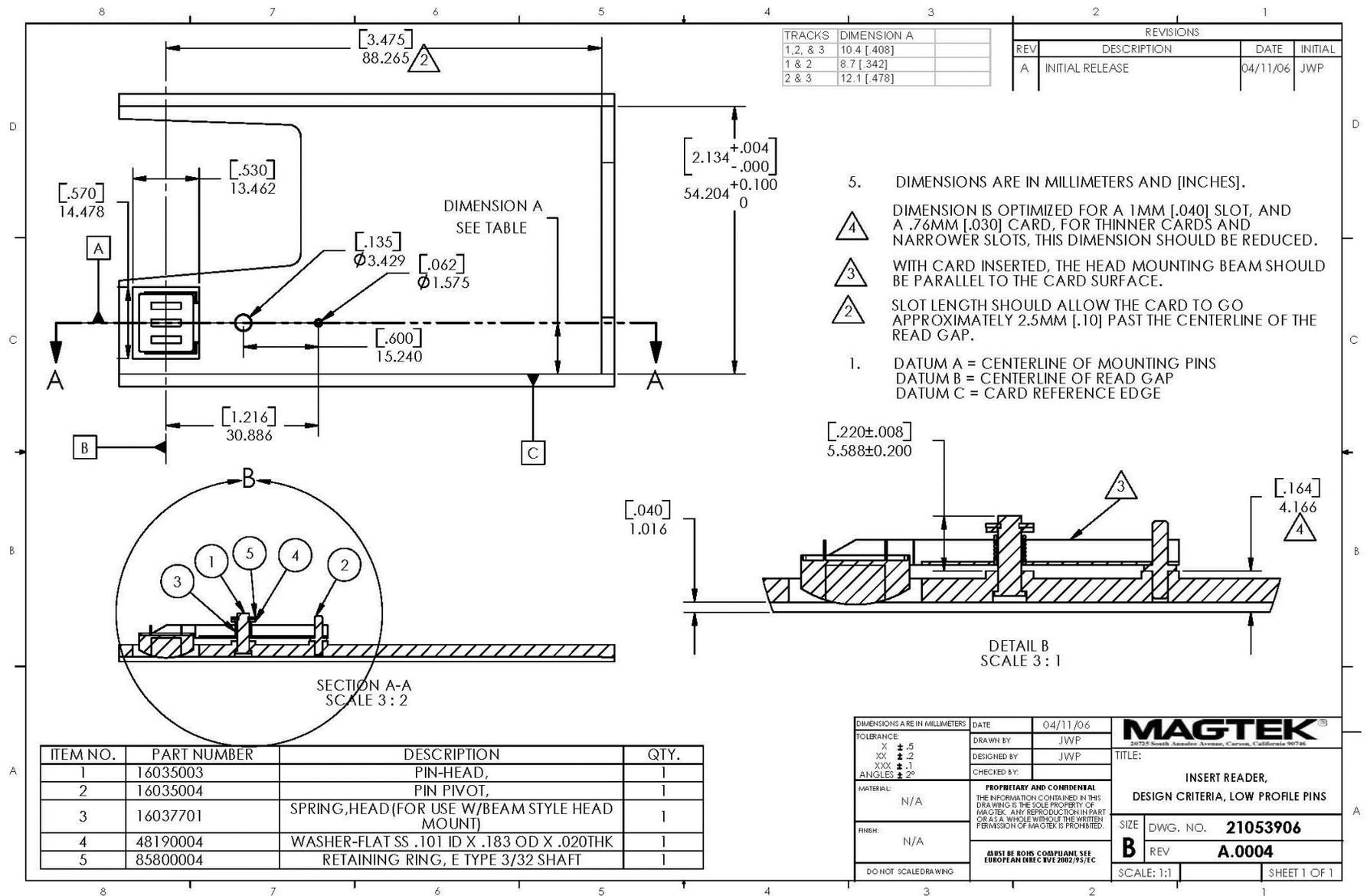


Figure A-11. Insert Reader Design Criteria

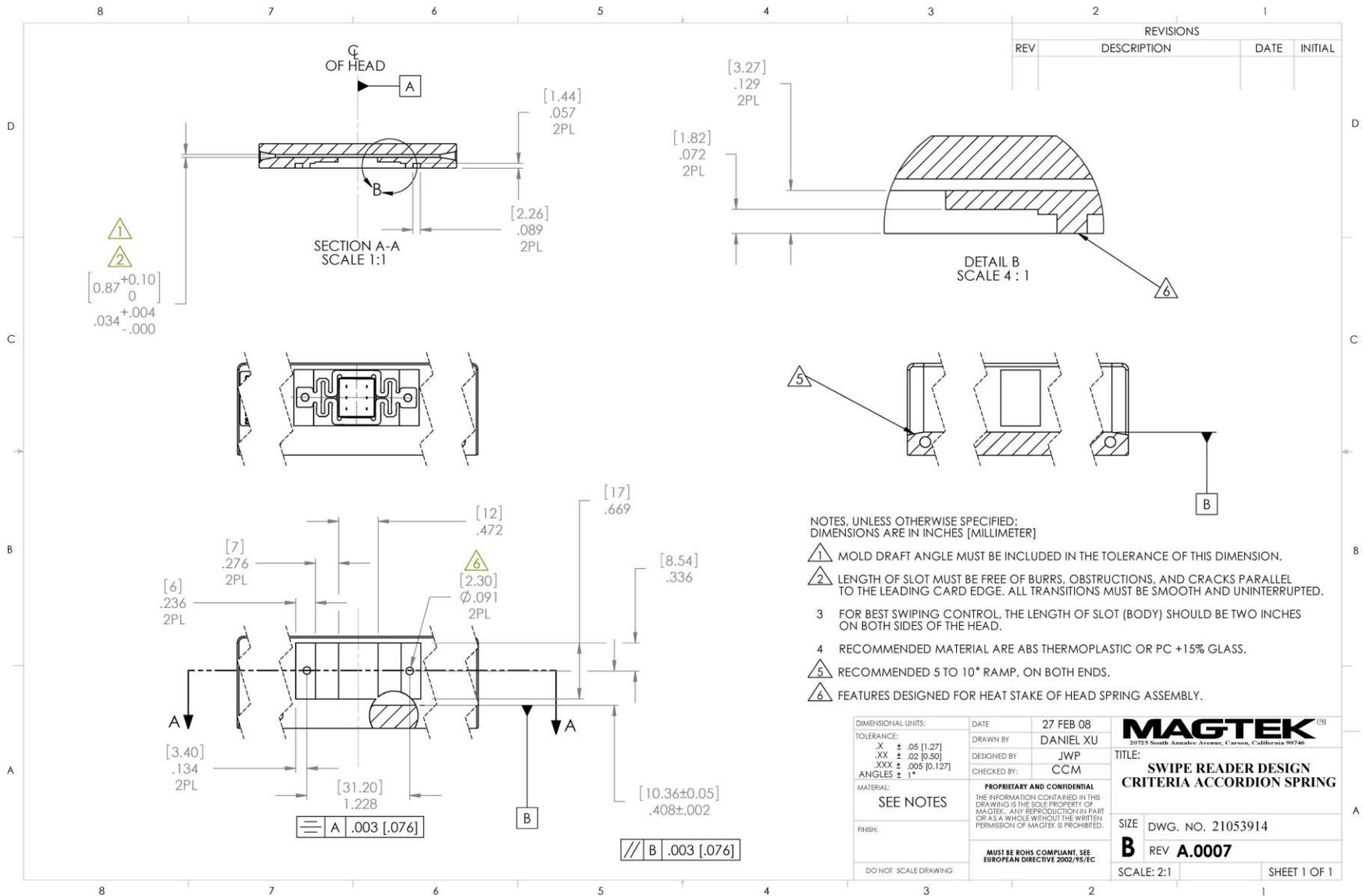


Figure A-12. Swipe Reader Design Criteria for Accordion Spring

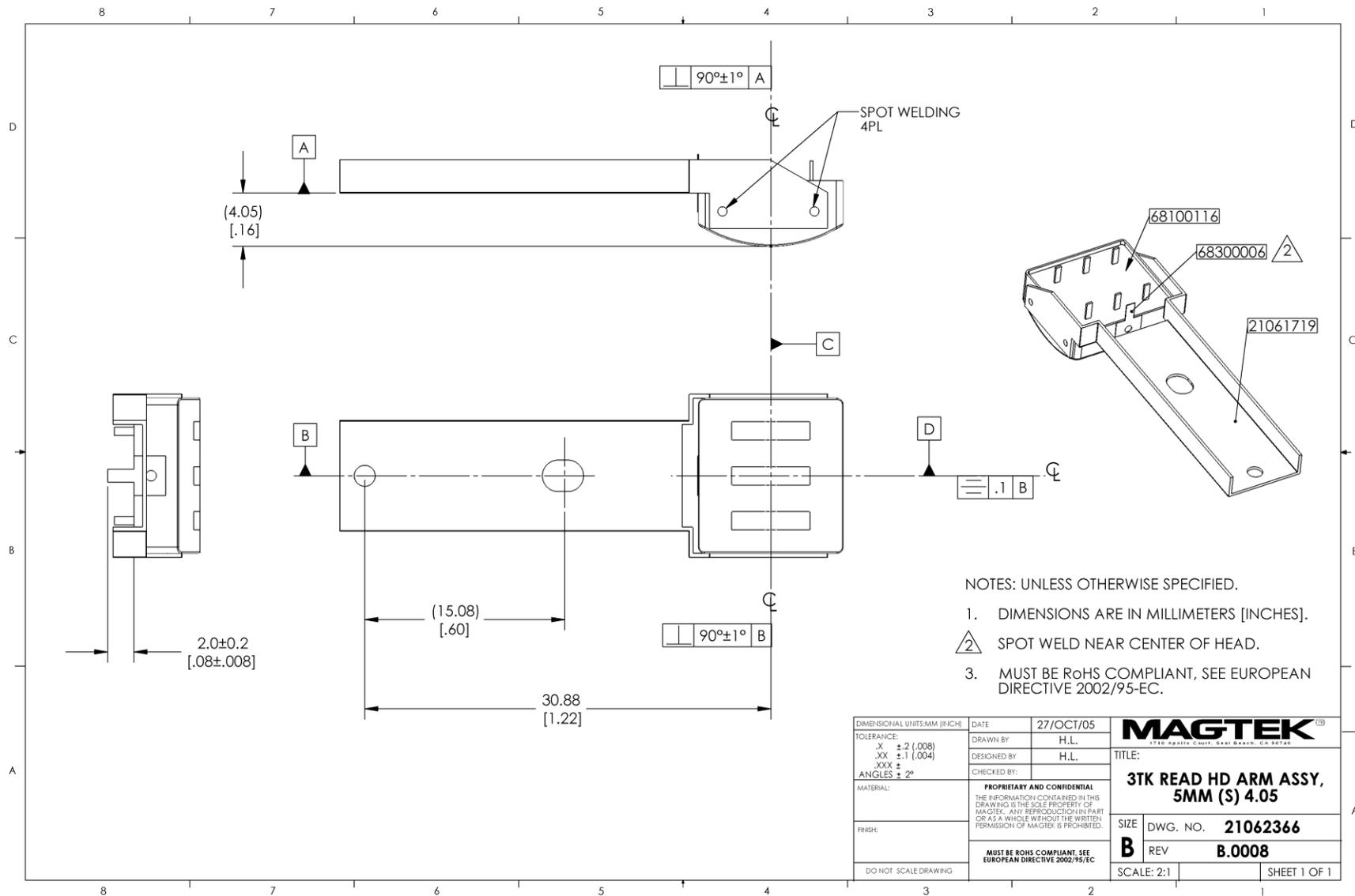


Figure A-13. 3-Track Read Head on Low Profile Beam Arm

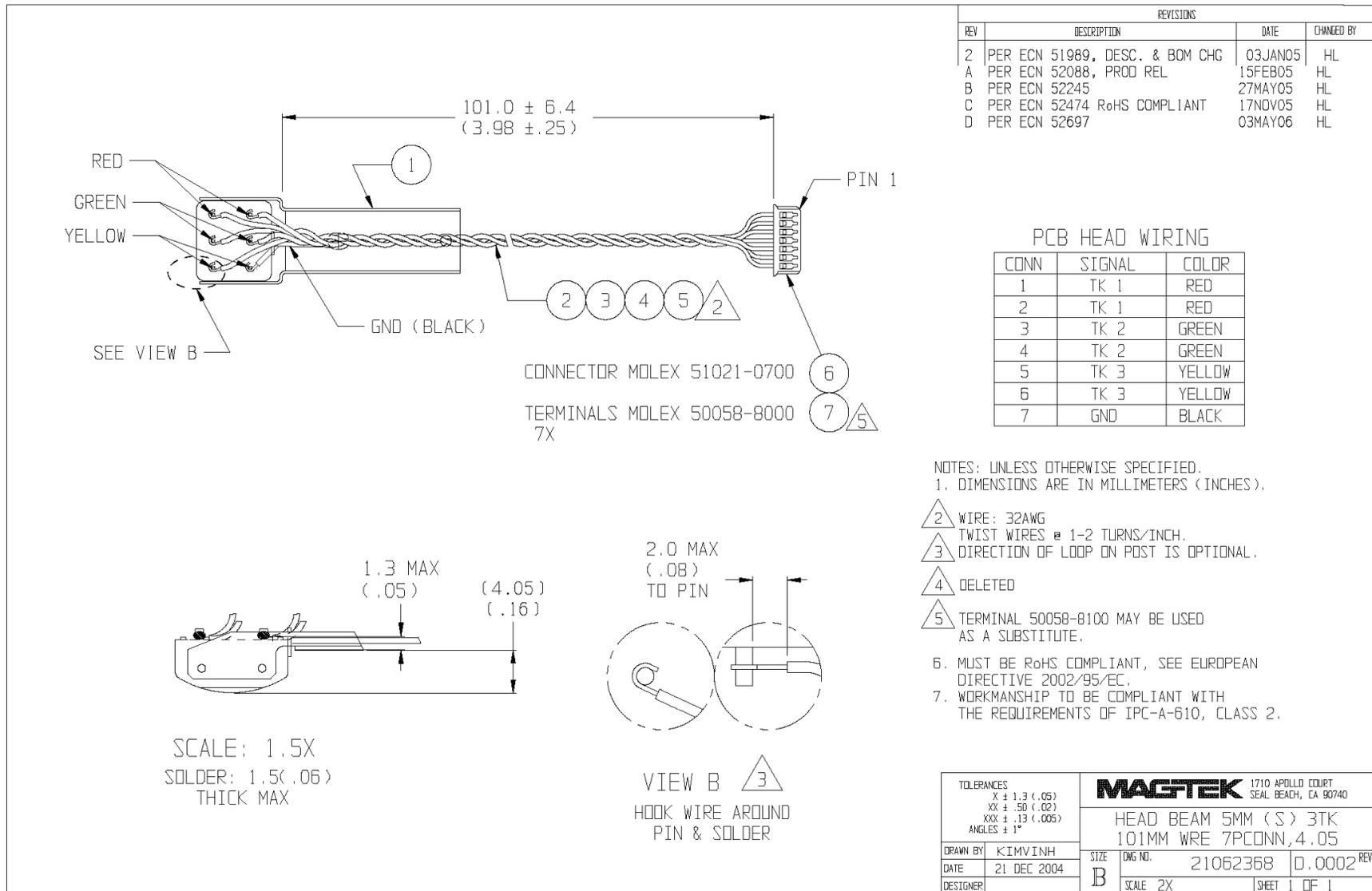


Figure A-14. 3-Track Read Head on Beam Assembly with Cable and 7-Pin Connector

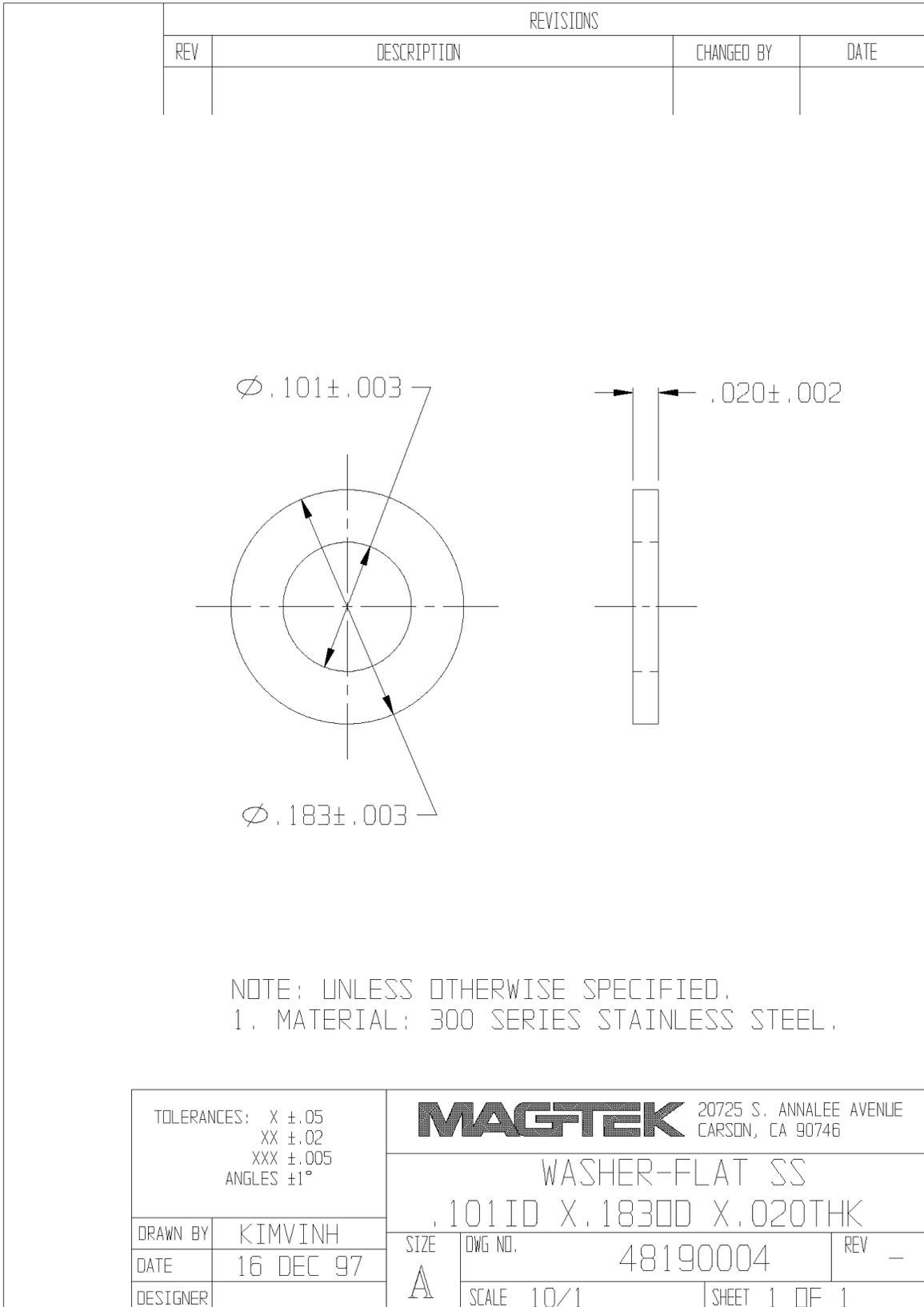


Figure A-15. Washer-Flat SS 0.101 ID x 0.183 OD x 0.020 Thick

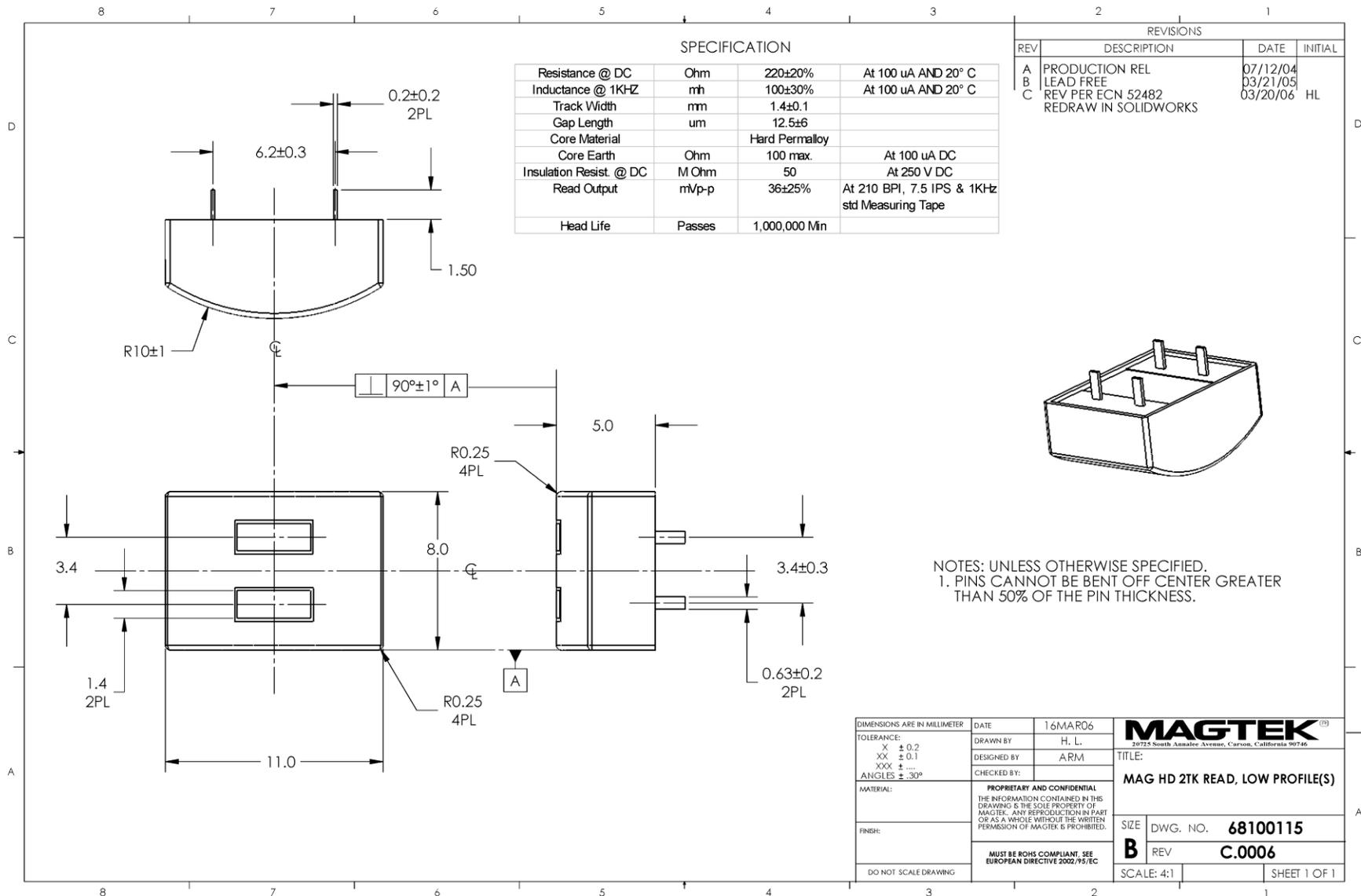


Figure A-16. Magnetic Head, 2-Track Read, Ultra Low Profile

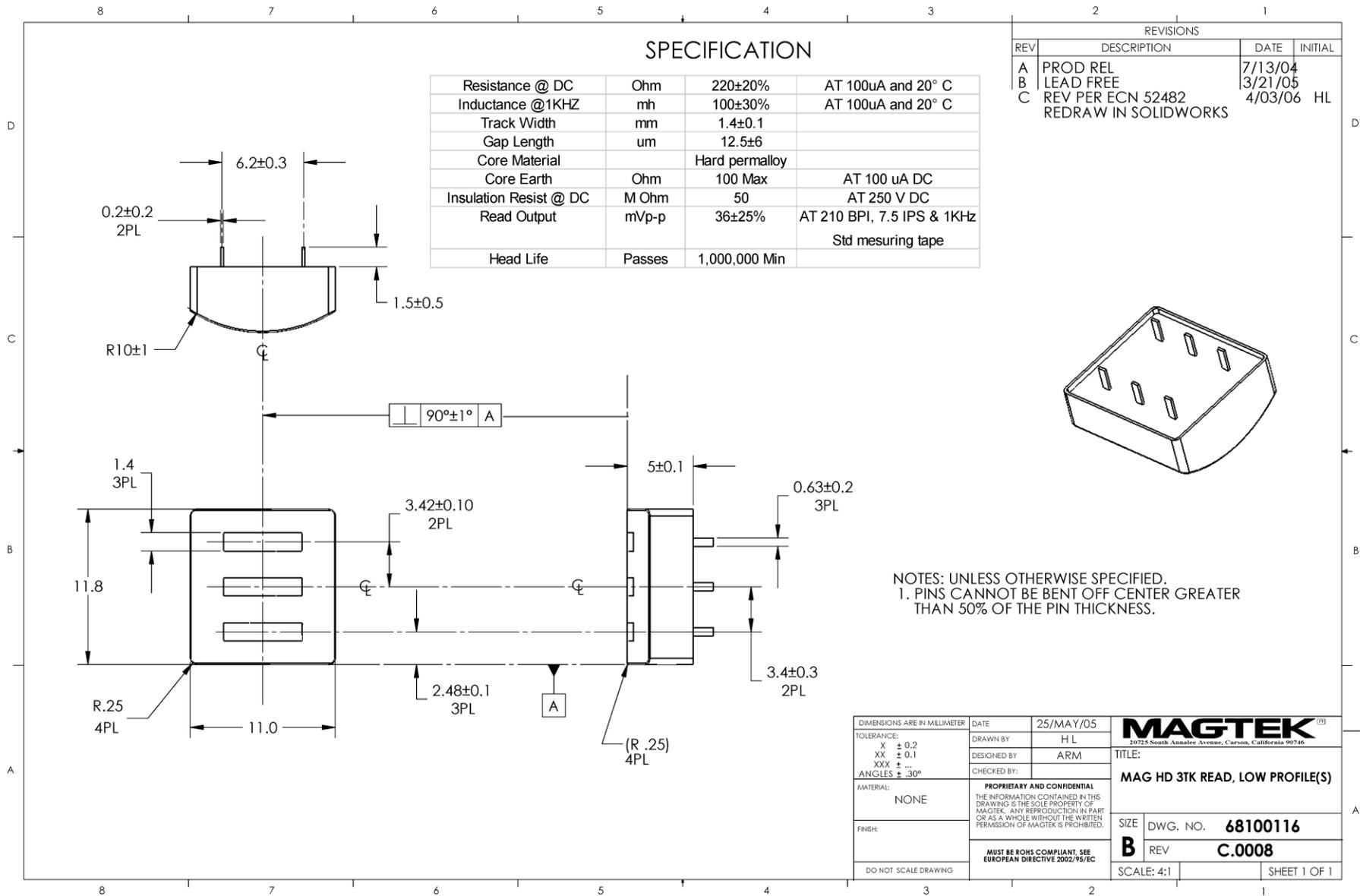


Figure A-17. Magnetic Head, 3-Track Read, Ultra Low Profile



Application Note - Character Conversion

Track 1 Character Set

| Character | Card Data | | | | | | | ASCII | | | |
|-----------|-----------|----------------|----------------|----------------|----------------|----------------|----------------|-------|----|----|----|
| | P | B ₆ | B ₅ | B ₄ | B ₃ | B ₂ | B ₁ | P0 | P1 | EP | OP |
| Space | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | A0 | A0 | 20 |
| ! (ND) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 21 | A1 | 21 | A1 |
| " (ND) | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 22 | A2 | 22 | A2 |
| # (OG) | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 23 | A3 | A3 | 23 |
| \$ | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 24 | A4 | 24 | A4 |
| % (SS) | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 25 | A5 | A5 | 25 |
| & (ND) | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 26 | A6 | A6 | 26 |
| ' (ND) | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 27 | A7 | 27 | A7 |
| (| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 28 | A8 | 28 | A8 |
|) | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 29 | A9 | A9 | 29 |
| * (ND) | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 2A | AA | AA | 2A |
| + (ND) | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 2B | AB | 2B | AB |
| , (ND) | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 2C | AC | AC | 2C |
| - | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 2D | AD | 2D | AD |
| . | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 2E | AE | 2E | AE |
| / | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 2F | AF | AF | 2F |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 30 | B0 | 30 | B0 |
| 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 31 | B1 | B1 | 31 |
| 2 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 32 | B2 | B2 | 32 |
| 3 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 33 | B3 | 33 | B3 |
| 4 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 34 | B4 | B4 | 34 |
| 5 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 35 | B5 | 35 | B5 |
| 6 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 36 | B6 | 36 | B6 |
| 7 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 37 | B7 | B7 | 37 |
| 8 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 38 | B8 | B8 | 38 |
| 9 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 39 | B9 | 39 | B9 |
| : (ND) | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 3A | BA | 3A | BA |
| ; (ND) | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 3B | BB | BB | 3B |
| < (ND) | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 3C | BC | 3C | BC |
| = (ND) | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 3D | BD | BD | 3D |
| > (ND) | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 3E | BE | BE | 3E |
| ? (ES) | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 3F | BF | 3F | BF |

| Character | Card Data | | | | | | | ASCII | | | |
|-----------|-----------|----------------|----------------|----------------|----------------|----------------|----------------|-------|----|----|----|
| | P | B ₆ | B ₅ | B ₄ | B ₃ | B ₂ | B ₁ | P0 | P1 | EP | OP |
| @ (ND) | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 40 | C0 | C0 | 40 |
| A | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 41 | C1 | 41 | C1 |
| B | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 42 | C2 | 42 | C2 |
| C | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 43 | C3 | C3 | 43 |
| D | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 44 | C4 | 44 | C4 |
| E | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 45 | C5 | C5 | 45 |
| F | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 46 | C6 | C6 | 46 |
| G | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 47 | C7 | 47 | C7 |
| H | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 48 | C8 | 48 | C8 |
| I | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 49 | C9 | C9 | 49 |
| J | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 4A | CA | CA | 4A |
| K | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 4B | CB | 4B | CB |
| L | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 4C | CC | CC | 4C |
| M | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 4D | CD | 4D | CD |
| N | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 4E | CE | 4E | CE |
| O | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 4F | CF | CF | 4F |
| P | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 50 | D0 | 50 | D0 |
| Q | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 51 | D1 | D1 | 51 |
| R | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 52 | D2 | D2 | 52 |
| S | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 53 | D3 | 53 | D3 |
| T | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 54 | D4 | D4 | 54 |
| U | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 55 | D5 | 55 | D5 |
| V | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 56 | D6 | 56 | D6 |
| W | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 57 | D7 | D7 | 57 |
| X | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 58 | D8 | D8 | 58 |
| Y | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 59 | D9 | 59 | D9 |
| Z | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 5A | DA | 5A | DA |
| [(ND) | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 5B | DB | DB | 5B |
| \ (ND) | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 5C | DC | 5C | DC |
|] (ND) | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 5D | DD | DD | 5D |
| ^ (FS) | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 5E | DE | DE | 5E |
| _ (ND) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 5F | DF | 5F | DF |

Track 2 and 3 Character Set

| Character | Card Data | | | | | ASCII | | | |
|-----------|-----------|----------------|----------------|----------------|----------------|-------|----|----|----|
| | P | B ₄ | B ₃ | B ₂ | B ₁ | P0 | P1 | EP | OP |
| 0 | 1 | 0 | 0 | 0 | 0 | 30 | B0 | 30 | B0 |
| 1 | 0 | 0 | 0 | 0 | 1 | 31 | B1 | B1 | 31 |
| 2 | 0 | 0 | 0 | 1 | 0 | 32 | B2 | B2 | 32 |
| 3 | 1 | 0 | 0 | 1 | 1 | 33 | B3 | 33 | B3 |
| 4 | 0 | 0 | 1 | 0 | 0 | 34 | B4 | B4 | 34 |
| 5 | 1 | 0 | 1 | 0 | 1 | 35 | B5 | 35 | B5 |
| 6 | 1 | 0 | 1 | 1 | 0 | 36 | B6 | 36 | B6 |
| 7 | 0 | 0 | 1 | 1 | 1 | 37 | B7 | B7 | 37 |

| Character | Card Data | | | | | ASCII | | | | Hex Character |
|-----------|-----------|----------------|----------------|----------------|----------------|-------|----|----|----|---------------|
| | P | B ₄ | B ₃ | B ₂ | B ₁ | P0 | P1 | EP | OP | |
| 8 | 0 | 1 | 0 | 0 | 0 | 38 | B8 | B8 | 38 | |
| 9 | 1 | 1 | 0 | 0 | 1 | 39 | B9 | 39 | B9 | |
| : (AS) | 1 | 1 | 0 | 1 | 0 | 3A | BA | 3A | BA | A |
| ; (SS) | 0 | 1 | 0 | 1 | 1 | 3B | BB | BB | 3B | B |
| < (ND) | 1 | 1 | 1 | 0 | 0 | 3C | BC | 3C | BC | C |
| = (FS) | 0 | 1 | 1 | 0 | 1 | 3D | BD | BD | 3D | D |
| > (ND) | 0 | 1 | 1 | 1 | 0 | 3E | BE | BE | 3E | E |
| ? (ES) | 1 | 1 | 1 | 1 | 1 | 3F | BF | 3F | BF | F |

- P = Parity
- EP = Even Parity
- OP = Odd Parity
- P0 = Parity bit set to 0
- P1 = Parity bit set to 1
- SS = Start Sentinel
- ES = End Sentinel
- FS = Field Separator
- AS = Account Separator (Track 3 only)
- ND = Character Not Defined by Credit Card Standards
- OG = Optional Graphic

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Figure A-18. ASCII Character Conversion Chart