

# **3V & 5V SHIFT-OUT INTELLIHEAD USER MANUAL**

**Specification Part Number 99875258-9**

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## REVISIONS

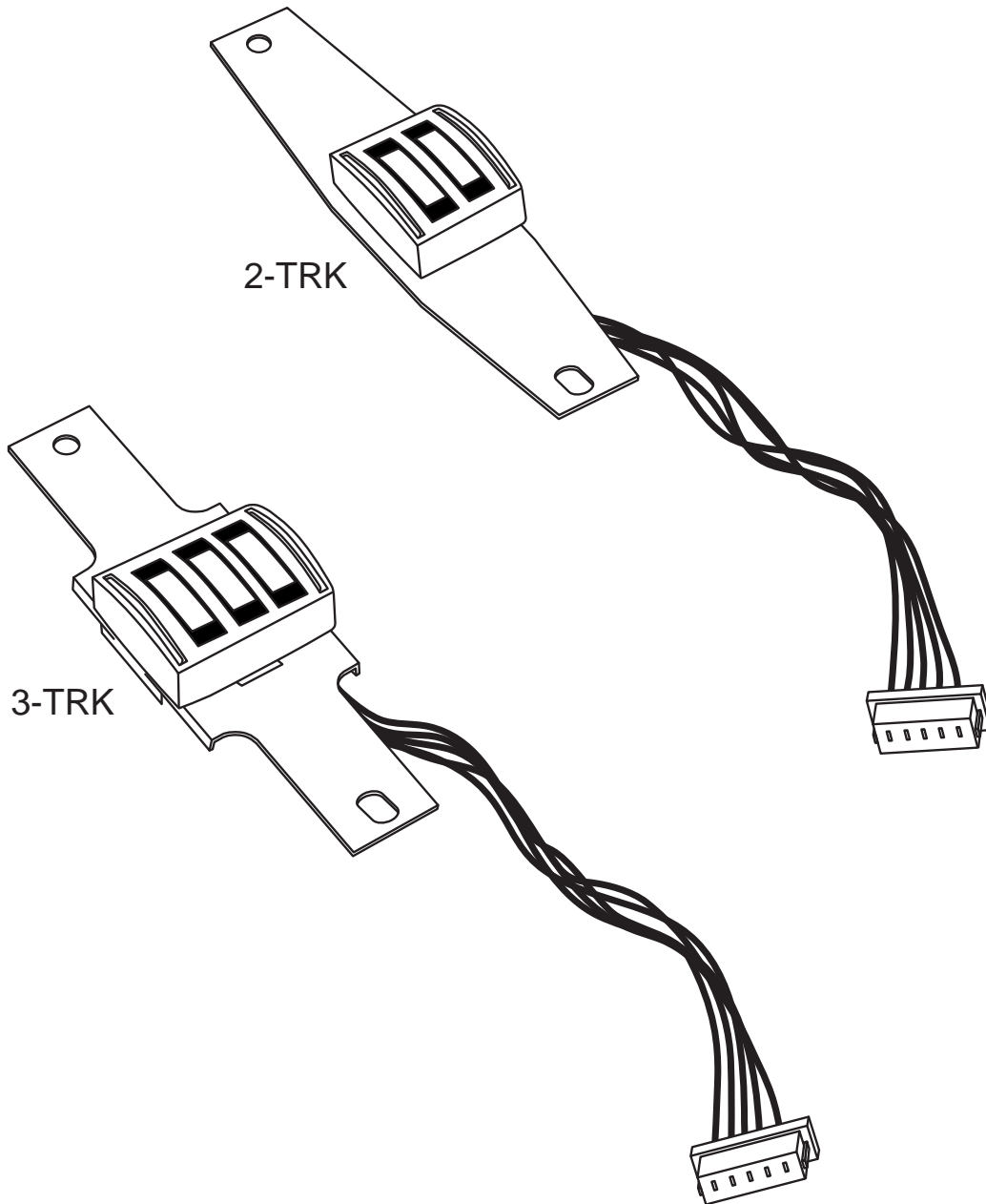
Rev Number	Date	Notes
1	17 Mar 03	Initial Release
2	13 Jun 03	Front Matter: added ISO line to logo, changed Tech Support phone number.
3	04 Oct 03	Editorial updates to match 99875259-5. Added clarification to handshake sequence. Reduced max operating voltage.
4	4 May 04	Front Matter: Added Frontispiece drawing; Added new Figures 2 and 3. Configurations: Changed part numbers and descriptions of both entries. Removed bulk of spec while referencing ASIC spec.
5	01 Aug 05	Added 21030012 & 21030013 to Sec 1, configuration list and to drawings in Packaging, Wiring, and Mounting.
6	17 Apr 06	Converted to 3V Delta 3-track ASIC. Sec 1, Features: corrected Low voltage operation, Low operating current, and Ultra-low Sleep current. Added drawing, Figure 7, 21030019.
7	30 Aug 06	Added 5V IntelliHead models: 21030021, -22, -27 & -28
8	19 Jan 06	Added reference to low power and 5V-to-3V models: 21030027& 21030028
9	3 Jul 07	Added 21030030; removed 21030019

## TABLE OF CONTENTS

INTRODUCTION.....	1
FEATURES .....	1
CONFIGURATIONS.....	2
REFERENCE DOCUMENTS.....	2
SHIFT-OUT PROTOCOL.....	3
SHIFT-OUT TIMING .....	3
TECHNICAL SPECIFICATIONS.....	4
PACKAGING, WIRING, AND MOUNTING .....	5
Packaging and Pin Assignments .....	5
Wiring.....	5
Mounting.....	5

## FIGURES & TABLES

Figure 1. Two- and Three-Track Shift-Out IntelliHead.....	iv
Table 1. Signal and Pin Assignments – IntelliHead .....	5
Figure 2. IntelliHead Wiring.....	5
Figure 3. Three-Track 3V Shift-Out IntelliHead, Butterfly Spring.....	6
Figure 4. Two-Track 3V Shift-Out IntelliHead, Butterfly Spring .....	7
Figure 5. Three-Track 3V Shift-Out IntelliHead, 43mm Spring .....	8
Figure 6. Three-Track 3V Shift-Out IntelliHead, Accordion Spring .....	9
Figure 7. Three-Track 3V Shift-Out IntelliHead, 4.05mm Beam Head .....	10
Figure 8. Three-Track 5V Shift-Out IntelliHead, 125mm, Wire 5PMLX, Butterfly Spring .....	11
Figure 9. Two-Track 5V Shift-Out IntelliHead, 125mm, Wire 5PMLX, Butterfly Spring.....	12
Figure 10. Three-Track 3V Shift-Out IntelliHead, 5.08mm Beam Head .....	13



**Figure 1. Two- and Three-Track Shift-Out IntelliHead**

# INTRODUCTION

MagTek's **Shift-Out IntelliHead** consists of a high-performance multi-channel fully integrated magnetic stripe decoder chip *encapsulated within* a low-profile magnetic read-head. This innovative, yet low-cost card reading solution offers many important advantages over the conventional less-integrated approach. The fully integrated Shift-Out IntelliHead is recommended for optimal performance; however, the Triple Track Delta ASIC (Application Specific Integrated Circuit) embedded in MagTek's Shift-Out IntelliHead is available separately in a 14 pin MLF<sup>TM</sup> (*MicroLeadFrame*<sup>TM</sup>) package for those applications dictating the use of a particular separate magnetic head. Refer to MagTek specification 99875337 (for the 3V part) or 99875336 (for the old 5V unit).

Two other variations on the Shift-Out IntelliHead are also offered:

- The **Low-Power Shift-Out IntelliHead** (21030028 & 21030036) is designed for battery operated devices that need to “wake from swipe.” It features a typical quiescent current when armed to accept a swipe of only 1.5  $\mu$ A. See MagTek specification 99875349 for details.
- The **5V-to-3V Shift-Out IntelliHead** (21030027) is designed to allow the customer to take advantage of some of the cost savings of the newer 3V Delta ASIC in most 5V systems. It features a built-in regulator that accepts a supply voltage of 5V  $\pm$ 5%. See MagTek specification 99875350 for details.

# FEATURES

- **Low cost solution for single, dual, or triple track readers** – available in dual and triple-track models
- **Ultra-compact design** – low-profile read head contains all needed circuits. Save PCB space!
- **No external components** – even the decoupling capacitor is integrated. Only 4 signals, VDD, VSS, DATA, and STROBE to connect to your micro-controller for up to 3 tracks
- **Data buffer with Shift-Out** – allows full card data to be locally stored on ASIC. Use a low-cost controller with no interrupts, limited memory, low-speed, low pin-count, etc.
- **High noise immunity** – no analog signals leave the shielded magnetic head! Withstands noisy PC monitors, cell phones, switching power supplies, etc.
- **High performance decoding** – new design reads badly damaged cards; compensates for poor head mounting
- **Low voltage operation** – 2.7 V to 3.6 V (2.8 V to 5.5 V for 5V units)\*
- **Low operating current** – less than 1 mA maximum total current at 3.3V (for up to 3 tracks) while card is being swiped (less than 4 mA for 5V units)\*
- **Ultra-low Sleep current** – less than 120  $\mu$ A maximum total current when no card is being swiped

- **AGC (Automatic Gain Control)** – reads cards from 30% - 200% of ISO 7811 amplitude standard
- **Simplified firmware** – Shift-Out format makes it easier to write controller code
- **Wide operational temperature range** – -40° C to +85° C
- **Wide range of card swipe speeds** – from 3 ips to 100 ips (7 cm/s to 250 cm/s)

\* See CONFIGURATIONS section below for the definition of 5V unit.

## CONFIGURATIONS

Part Number	Transition Revision*	Description
21030001	G	IntelliHead 3V, 3 Track, butterfly spring, 125mm wire, 5-pin Molex connector
21030002	F	IntelliHead 3V, 2 Track, butterfly spring, 125mm wire, 5-pin Molex connector
21030012	B	IntelliHead 3V, 3 Track, 43mm spring, 125mm wire, 5-pin Molex connector
21030013	C	IntelliHead 3V, 3 Track, Accordion spring, 125mm wire, 5-pin Molex connector
21030018	2	IntelliHead 3V, 3 Track, 4.05mm beam head, 125mm wire, 5-pin Molex connector
21030021	n/a**	IntelliHead 5V, 3 Track, butterfly spring, 125mm wire, 5-pin Molex connector
21030022	n/a**	IntelliHead 5V, 2 Track, butterfly spring, 125mm wire, 5-pin Molex connector
21030030	A	IntelliHead 3V, 3 Track, 5.08mm beam head, 125mm wire, 5-pin Molex connector

\* The "Transition Revision" represents the first Revision for which the 3V Delta ASIC (21006540/41) was used instead of the older 5V Delta ASIC. The 5V Delta ASIC (21006529/39 or 21006536/37) is detailed in 99875336 or 99875259.

\*\* Not Applicable. This version will always use the 5V Delta ASIC and can be used if the application cannot use the 3V model.

## REFERENCE DOCUMENTS

*Magnetic Card Reader Design Kit Technical Specification, P/N 99821002*

*Triple Track ASIC With Shift-Out, 3V, Specifications, P/N 99875337*

*Triple Track ASIC With Shift-Out, 5V RoHS Compliant, Specifications, P/N 99875336*

*Triple Track ASIC With Shift-Out, 5V, Specifications, P/N 99875259*

*Low Power Shift-Out IntelliHead User Manual, P/N 99875349*

*5V-to-3V Shift-Out IntelliHead User Manual, P/N 99875350*

## SHIFT-OUT PROTOCOL

Refer to MagTek specification 99875337 (99875336 or 99875259 for 5V units) for details of the Shift-Out Protocol. The additional information below is needed for the firmware designer to assign the memory-tracks of the ASIC (A, B, and C) to the physical magnetic head tracks (1, 2, and 3).

The on-chip memory tracks of the Shift-Out IntelliHead are permanently assigned to particular tracks of the magnetic head via internal wires connecting the head coil wires to particular inputs of the built-in ASIC. Tracks 'A' and 'B' of the internal ASIC correspond to tracks '1/3' and '2' of the reader respectively as it is shown in Figure 2. When the 2-track IntelliHead/spring is mounted as intended, with the centerline of the spring mounting holes running through the center of track 2, it may be used as either a track 1 & 2 reader or a track 2 & 3 reader. Typically the dual-track IntelliHead serves as a track 1 & 2 reader. For the less common track 2 & 3 reader, this IntelliHead/spring assembly may be used in an inverted configuration on the same chassis used by a track 1 & 2 reader. In this case, on-chip memory track 'A' corresponds to physical magnetic stripe track 3 and on-chip memory track 'B' corresponds to physical magnetic stripe track 2. This is important since it affects the arrangement of the data upon extraction from the chip (see below).

Similar concerns apply for the triple-track Shift-Out IntelliHead. As it is oriented in tracks 'A', 'B', and 'C' of the internal ASIC correspond to tracks '1', '2', and '3' of the reader respectively. The IntelliHead may be mounted with the opposite orientation if desired, but firmware must anticipate this re-mapping of ASIC memory tracks to physical magnetic head tracks.

## SHIFT-OUT TIMING

Refer to MagTek specification 99875337 (99875336 or 99875259 for 5V units) for details of the Shift-Out Timing. The following exception exists for the IntelliHead in contrast to the ASIC specification given in 99875337.

*Trst* (Reset) = 10  $\mu$ s minimum (not shown in timing diagram)

VDD off-time to guarantee a reset for the ASIC/Head unit. This is due to an RC power supply filter inside the head.  $R = 10\Omega \pm 5\%$  and  $C = 0.1 \mu\text{F} + 80\%, -20\%$ .

## TECHNICAL SPECIFICATIONS

Technical Specifications are as follows:

### ELECTRICAL

Electrical Details	See MagTek Specification 99875337 (99875336 or 99875259 for 5V units)
Electrostatic Discharge	± 15kV discharge to head-can with head-can grounded

### MECHANICAL

Dimensions	As shown in the Figures at the end of this document
Life	1,000,000 Passes

### ENVIRONMENTAL

Operating Environment Temperature Relative Humidity	-40 °C to +85 °C (-40 °F to +185 °F) 10% to 90% non-condensing
Storage Environment Temperature Relative Humidity	-40°C to +100 °C (-40 °F to +212 °F) 10% to 90% non-condensing

## PACKAGING, WIRING, AND MOUNTING

### Packaging and Pin Assignments

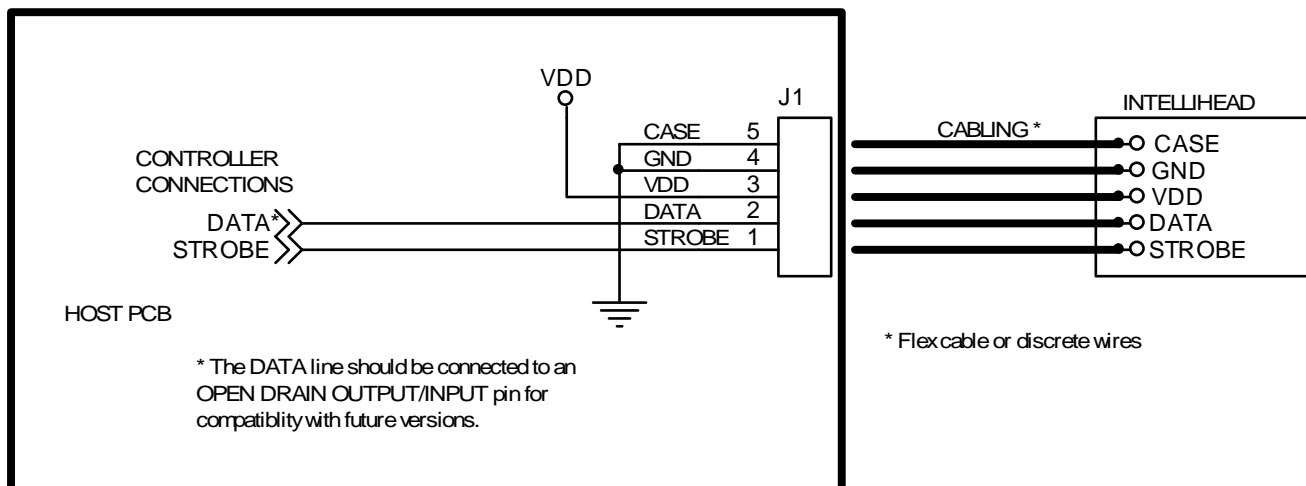
Signal and pin assignments for the Shift-Out IntelliHead are shown in Table 1.

**Table 1. Signal and Pin Assignments – IntelliHead**

Pin Number	Description
1	STROBE
2	DATA
3	VDD
4	GND
5	CASE

### Wiring

The Shift-Out IntelliHead Wiring Diagram is shown in Figure 2. The recommended mating connector is **Molex 53048-0510**.



**Figure 2. IntelliHead Wiring**

### Mounting

The Two-track Shift-Out IntelliHead drawing is shown in Figure 4. The Three-track Shift-Out IntelliHead (Butterfly Spring) drawing is shown in Figure 3. The Three-track Shift-Out IntelliHead (43mm Spring) drawing is shown in Figure 5. The Three-track Shift-Out IntelliHead (Accordion Spring) drawing is shown in Figure 6.

Refer to the Reader Design Kit Specification, P/N 99821002, for complete mechanical mounting information.

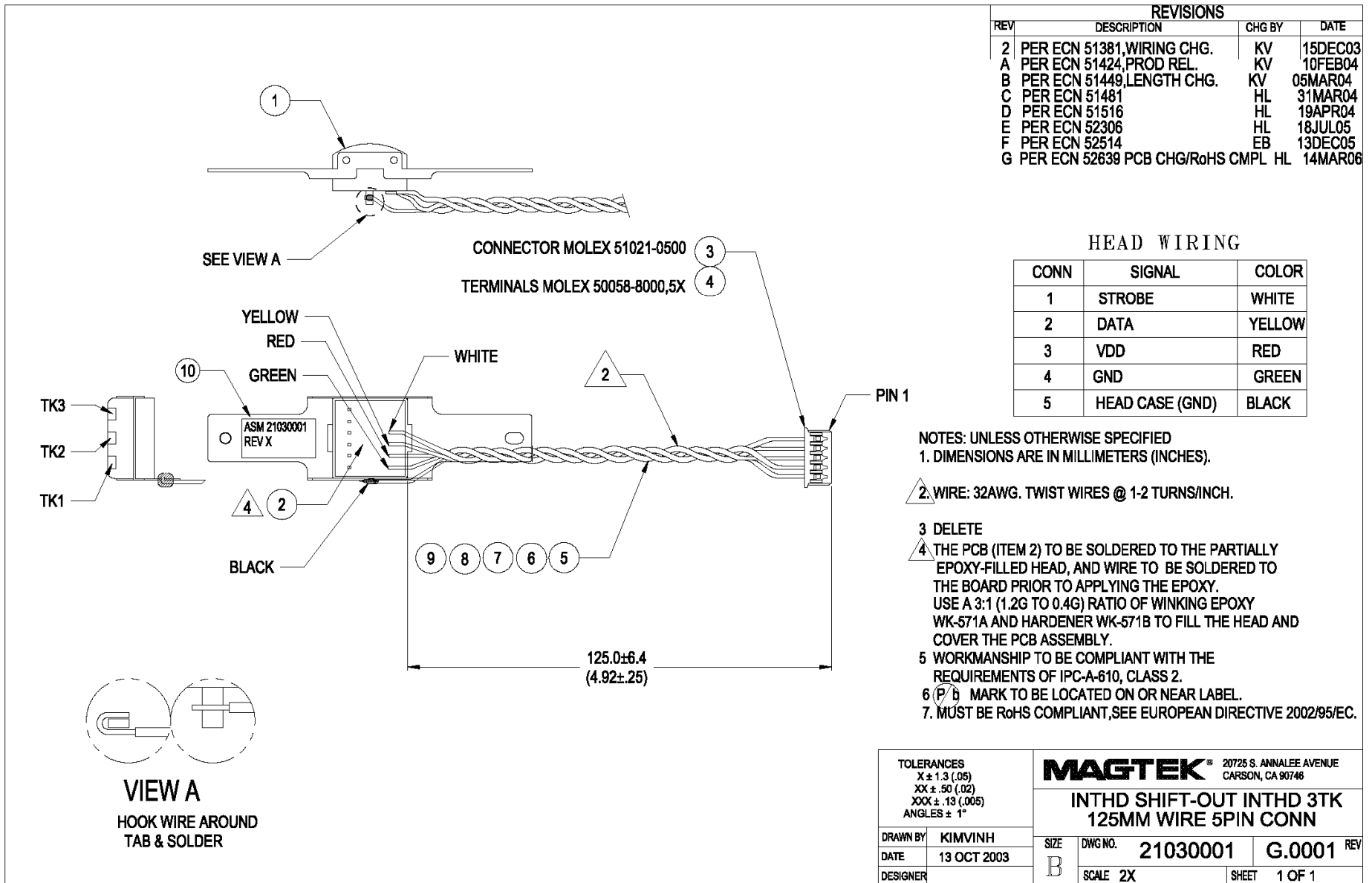


Figure 3. Three-Track 3V Shift-Out IntelliHead, Butterfly Spring

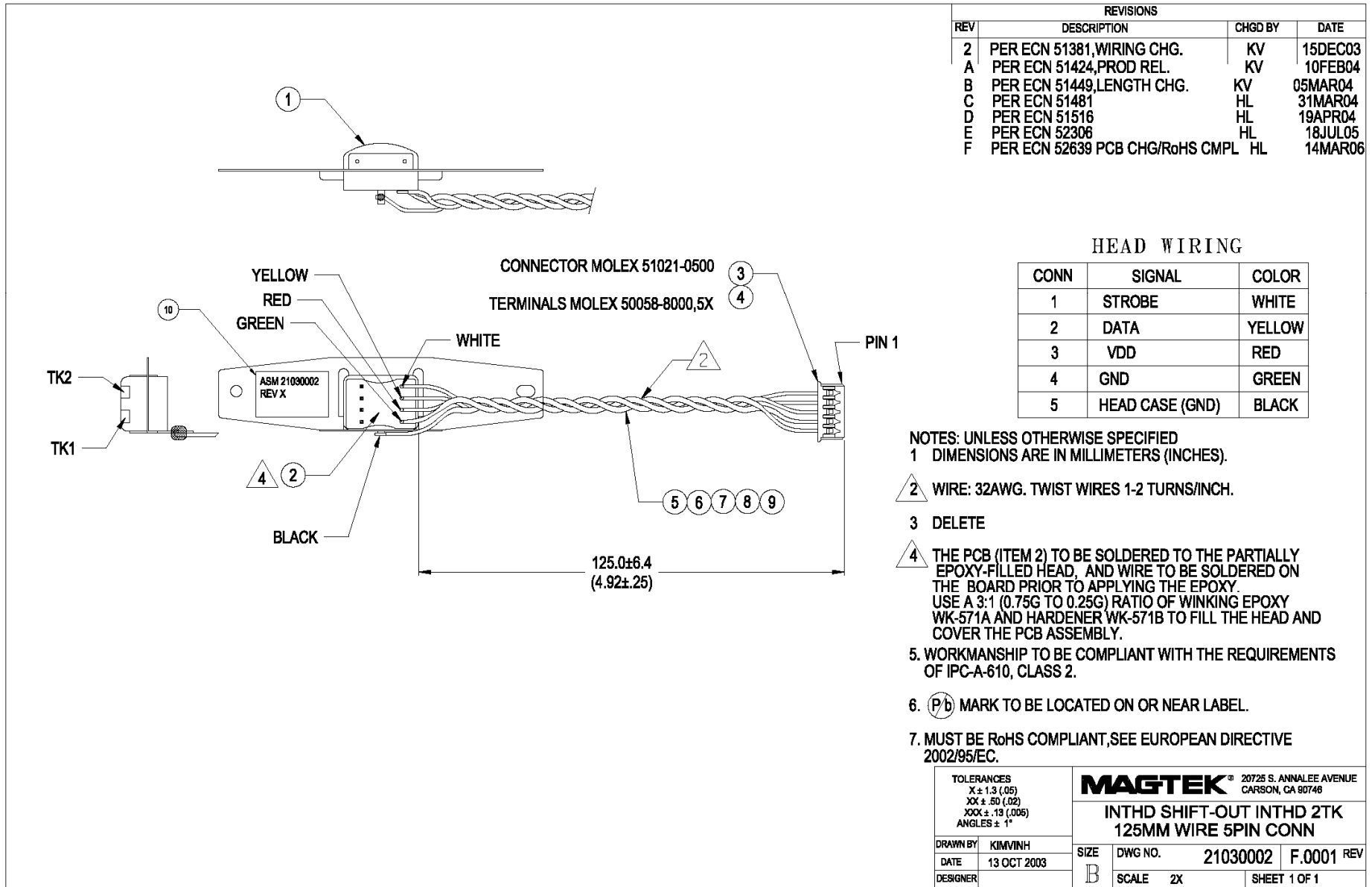


Figure 4. Two-Track 3V Shift-Out IntelliHead, Butterfly Spring

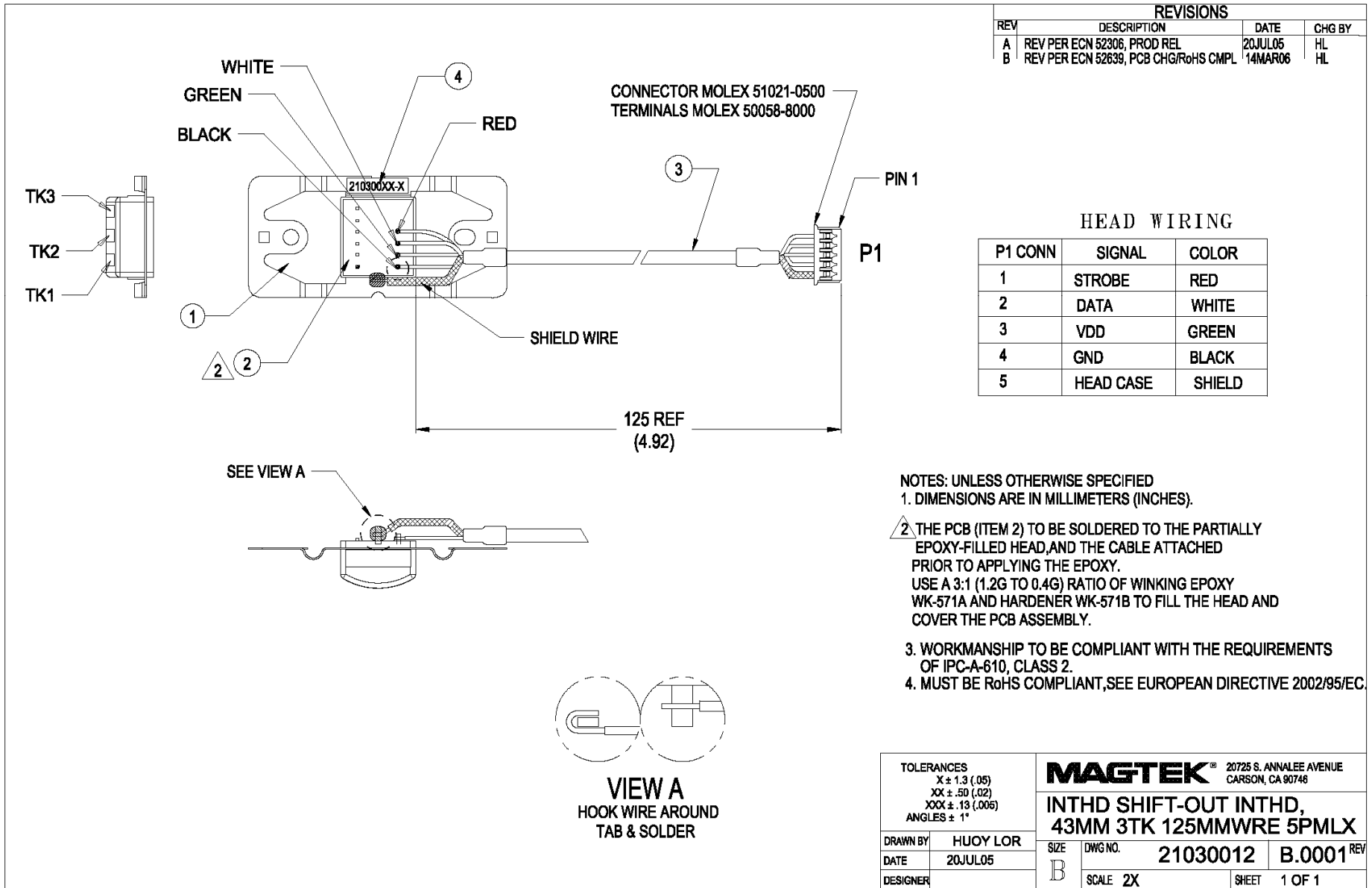


Figure 5. Three-Track 3V Shift-Out IntelliHead, 43mm Spring

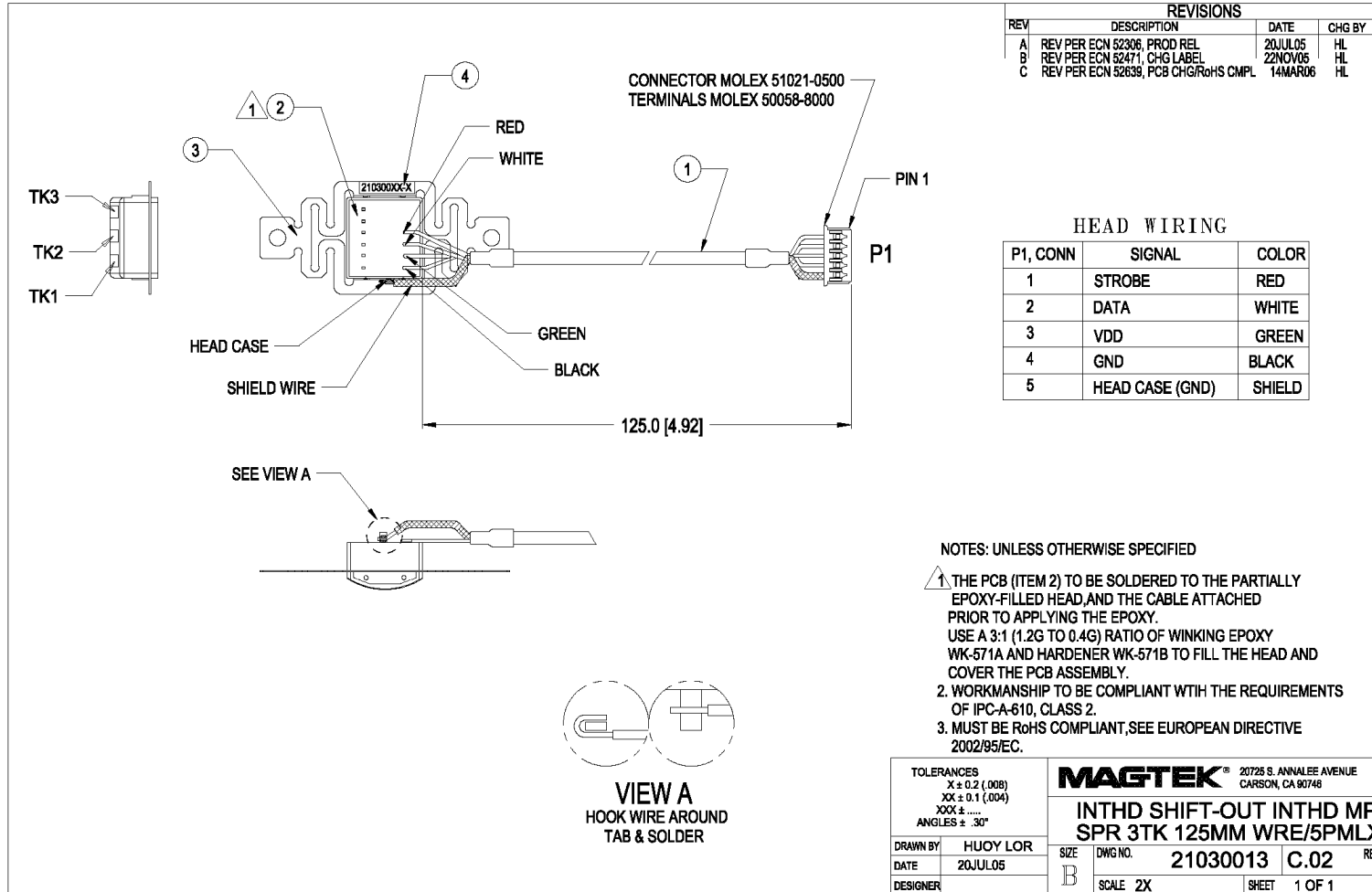


Figure 6. Three-Track 3V Shift-Out IntelliHead, Accordion Spring

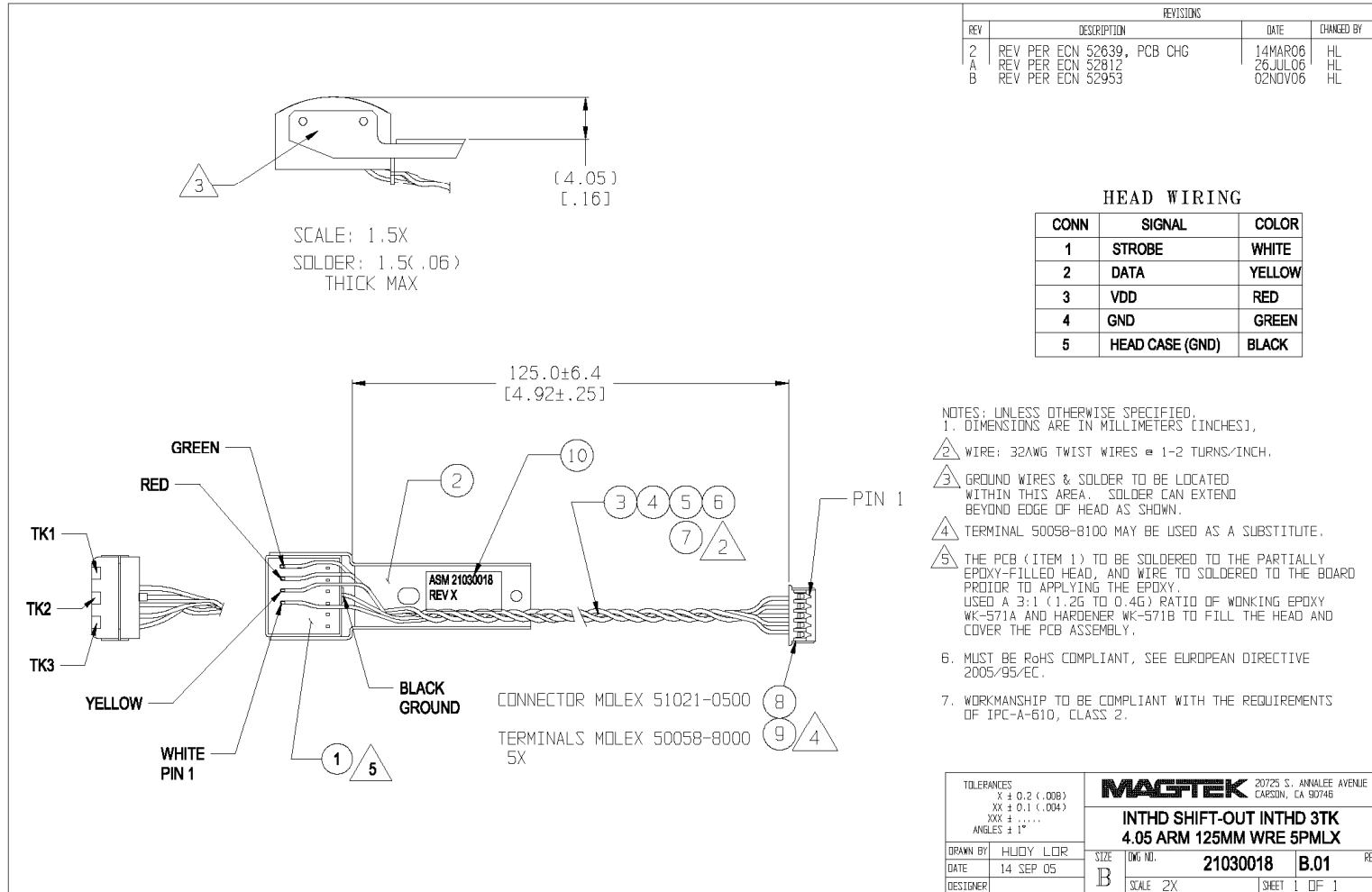


Figure 7. Three-Track 3V Shift-Out IntelliHead, 4.05mm Beam Head

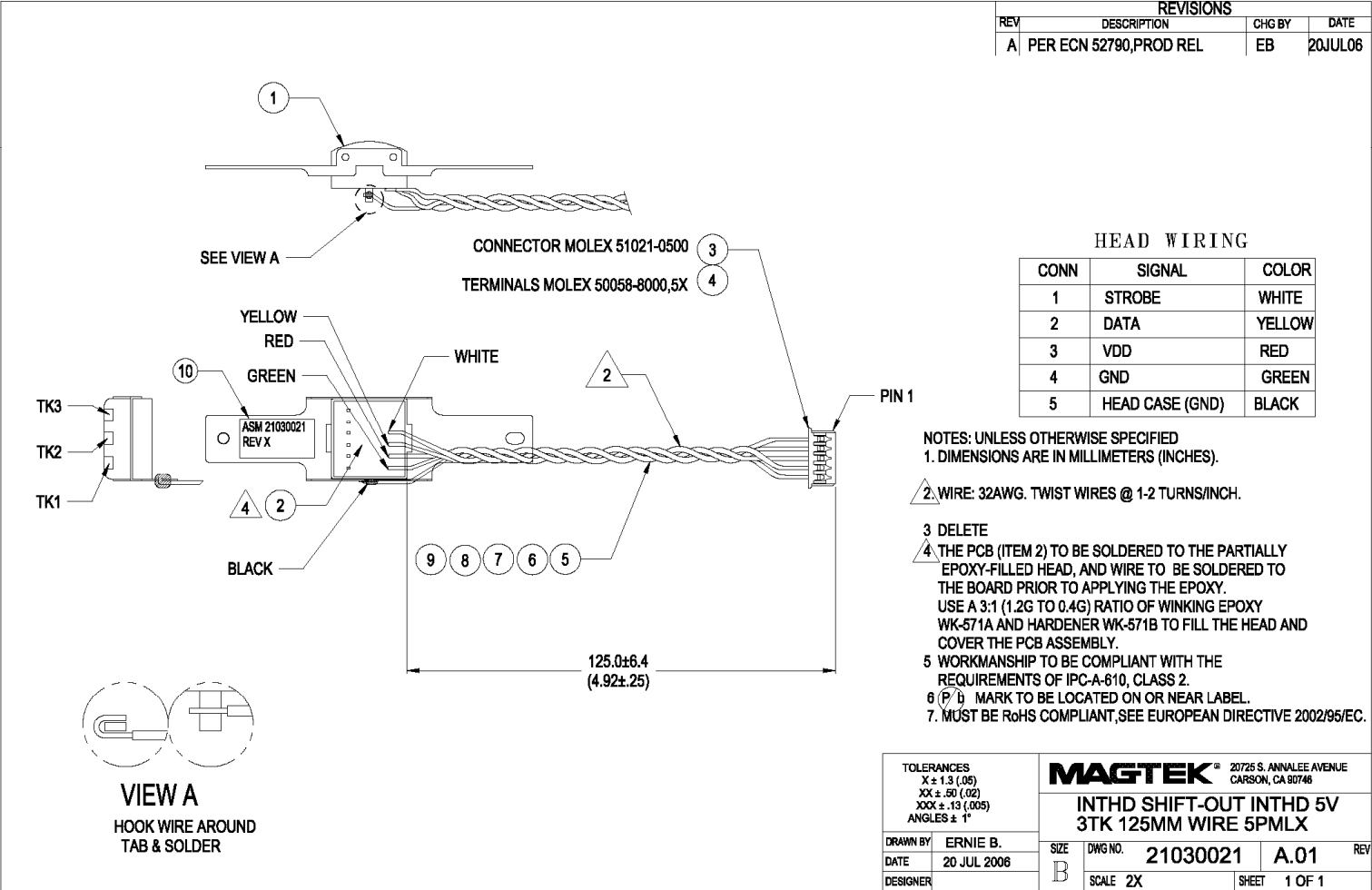


Figure 8. Three-Track 5V Shift-Out IntelliHead, 125mm, Wire 5PMLX, Butterfly Spring

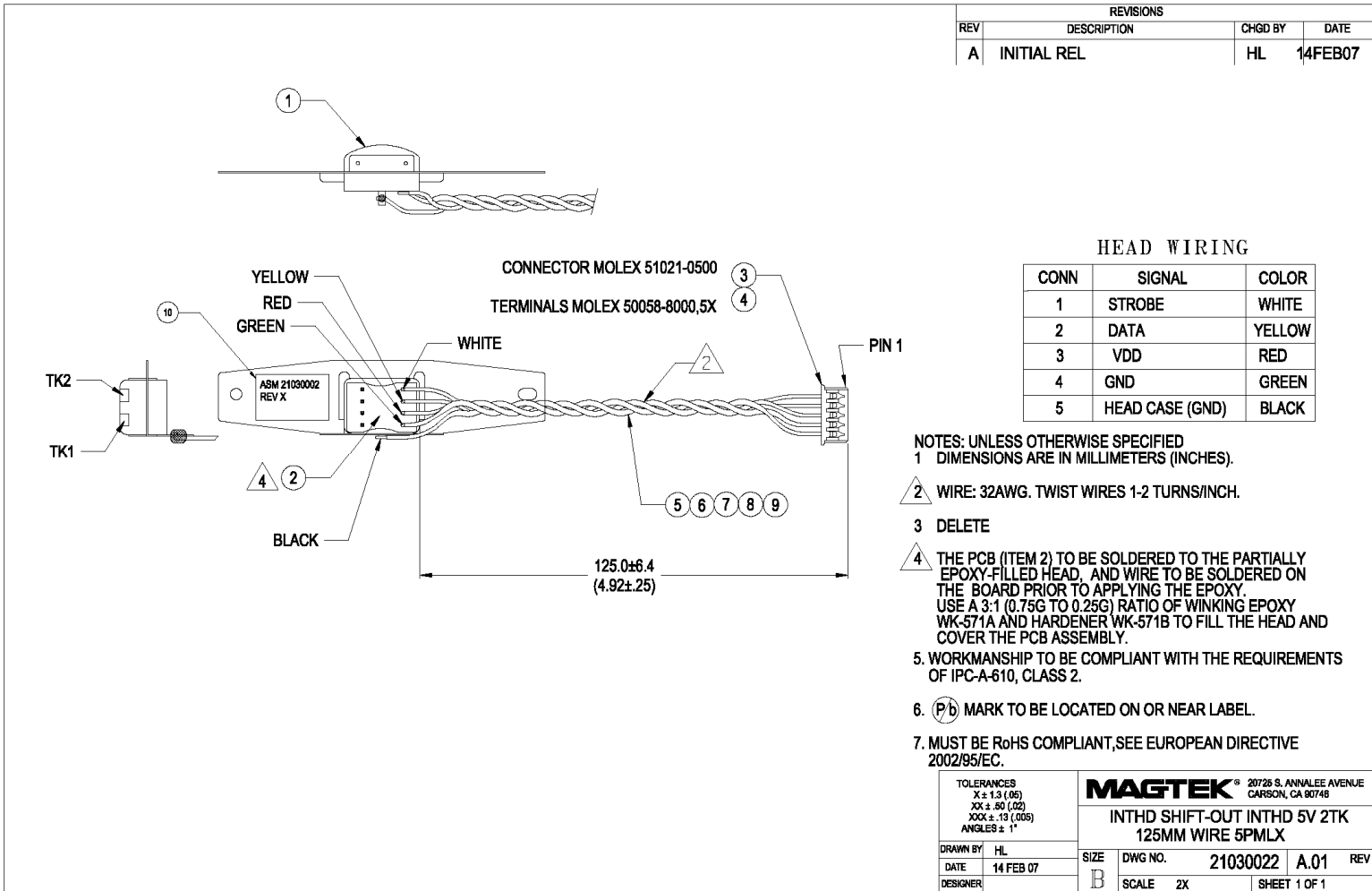


Figure 9. Two-Track 5V Shift-Out IntelliHead, 125mm, Wire 5PMLX, Butterfly Spring

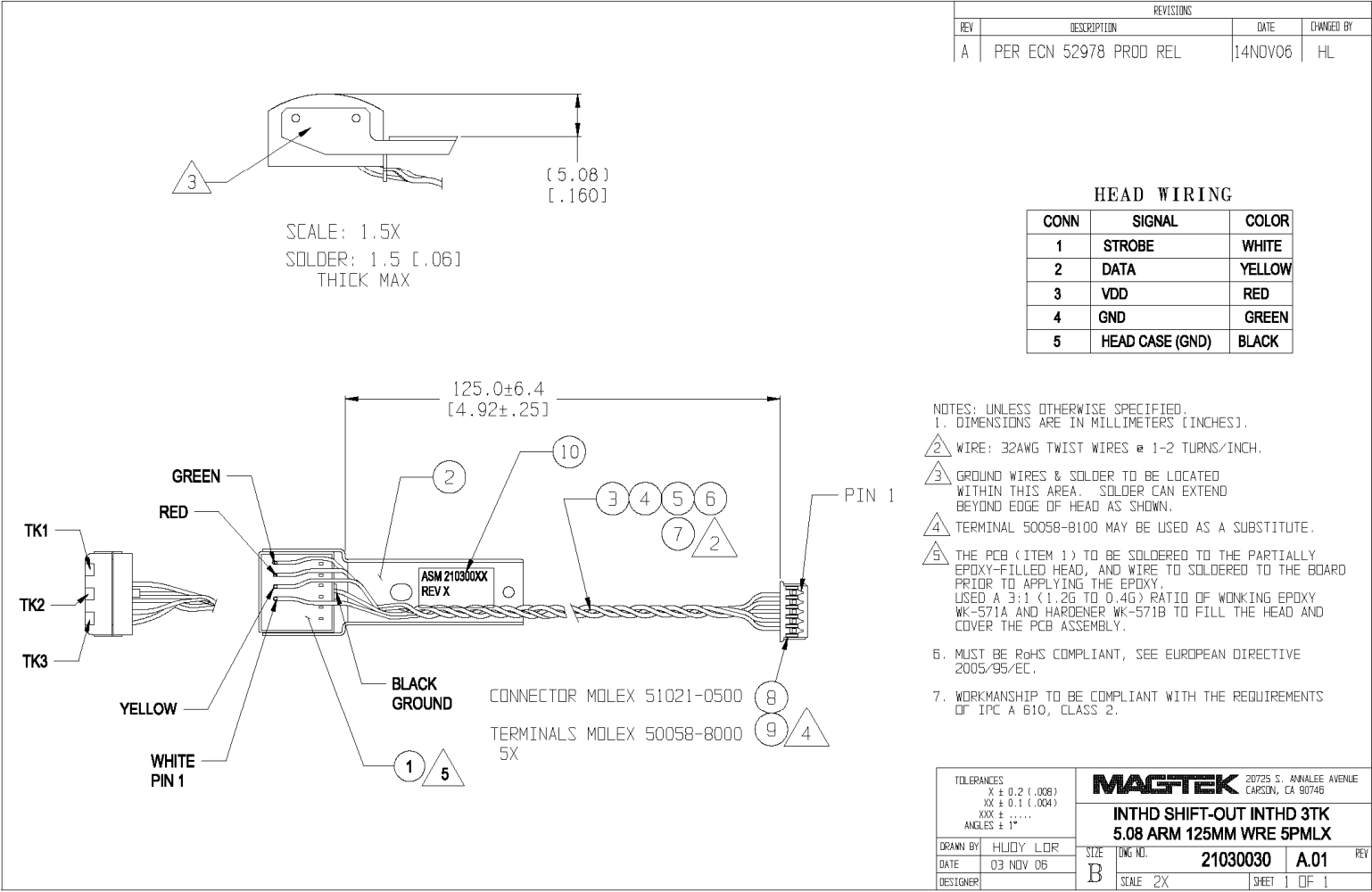


Figure 10. Three-Track 3V Shift-Out IntelliHead, 5.08mm Beam Head