



Product Manual

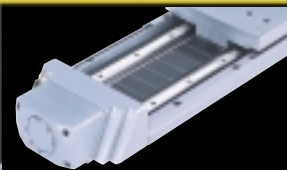
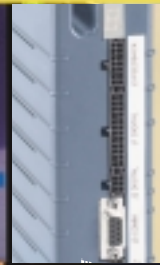
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**BAYSIDE**  
Automation Systems & Components  
PRECISION IN MOTION

Zwedge  
Product Manual



# **Zwedge (Direct Drive) & R Series Precision Linear Stage**

## **Product Manual**

Rev: 2.0 / 1101  
P/N: 12197010

# Product Manual

## Zwedge

### Precision Linear Stage

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### **I. Introduction**

Thank you for your purchase of the Micro Plus Series of precision linear stages. The Micro Plus is a high speed stage designed to meet the most demanding of automation applications. This manual provides installation and maintenance information for the:

Z1D Series  
Z2D Series  
Z1R Series  
Z2R Series

If there are any questions regarding the set up of your product, please feel free to contact Bayside Motion Group, Technical Services at (516)484-5353 for additional support

### **II. Packaging**

The stage is packaged in a wooden crate/carton with high density foam padding to avoid any damage during transportation. The assembly is wrapped in plastic to maintain cleanliness and should be handled with appropriate care.

#### Uncrating

All appropriate stage documentation (including this manual) will be found on top of the stage. The stage can be easily lifted out of the crate and placed on a secure surface.

#### Unlocking

Some models may arrive with a locking bracket that restrains the slide plate from moving during transportation. All locking brackets will be identified with an orange tag, and must be removed before operating the stage.

### III. Electrical Specifications

#### General

##### Z1R & Z2R Series

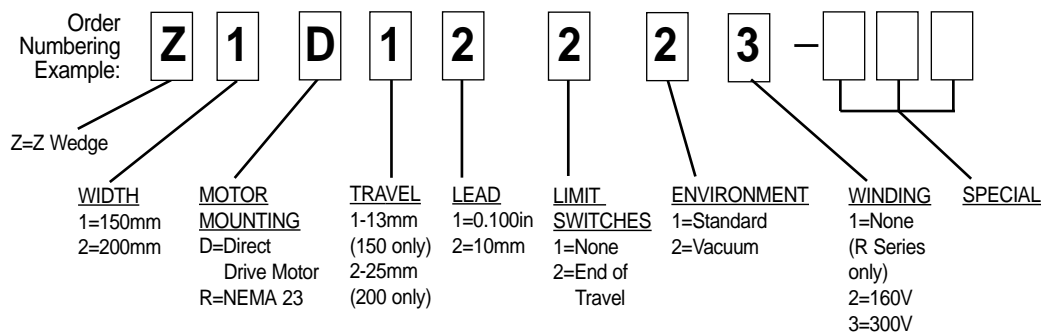
The Zwedge Series is supplied with limit and home sensors. These sensors are magnetically activated reed switches, manufactured by Hamlin Inc. The sensors terminate at a high density 26 pin Sub D connector, defined in Section IV.

##### Z1D & Z2D Series

The Direct Drive Zwedge Series are supplied with a motor power connector and an encoder, hall, limit switch connector located at the motor end of the assembly. The motor power connector is a 15 pin Sub D type defined in Section IV. The encoder, hall, limit switch connector is a 26 pin Sub D type defined in Section IV.

#### Motor

Motors in the Zwedge are available for either 160 vdc or 300 vd operation. To identify the specific winding please refer to the following model number definition.



For easy installation, motor power and encoder, hall, limit cables can be purchased from Bayside Motion Group. To order cables, please contact Bayside Sales Department at 516-484-5353

**3 meter Motor Power Cable  
Part Number: 10963018**



**3 meter Encoder, Hall, Limit Cable  
Part Number: 10963019**



**Z Wedge Direct Drive Motor Specifications**

|            | PARAMETERS              | UNITS   | A WINDING         | B WINDING |
|------------|-------------------------|---------|-------------------|-----------|
| General    | Torque Constant $K_t$   | Nm/amps | 0.222             | 0.443     |
|            | Back Emf Constant $K_e$ | V/kRPM  | 23.5              | 46.9      |
|            | Number of Poles         |         | 6                 | 6         |
|            | Inertia                 | ←       | See Table 1 below | →         |
| Electrical | Resistance              | ohms    | 7.7               | 30.8      |
|            | Inductance              | mH      | 8                 | 32        |
|            | Rated Voltage           | Volts   | 160               | 300       |
| Rating     | Max Speed               |         |                   |           |
|            | Peak Current            | Amps    | 7                 | 4         |
|            | Continuous Current      | Amps    | 2.3               | 1.37      |

Note: Thermal Resistance for both models is 2-36 °C/watt

**Table 1**

| MODEL | INERTIA                        | LEAD        |
|-------|--------------------------------|-------------|
| Z150  | 0.00006 kg.cm.sec <sup>2</sup> | 2.0 mm/rev. |
| Z200  | 0.00006 kg.cm.sec <sup>2</sup> | 2.5 mm/rev. |

**Zwedge Vertical Motion Formula**

$$Z_{motion} = (\text{Lead mm/rev}) \times \text{Number of revs} \times \tan 20^\circ$$

## Z Wedge - Rotary Encoder Specifications

The standard encoder is a 2000 line rotary encoder, providing 8000 pulses per revolution, post quadrature.

### Electrical Characteristics

|                    |                                                      |
|--------------------|------------------------------------------------------|
| Supply Voltage     | 5Vdc $\pm$ 10% at 60mA maximum                       |
| Output Format      | Dual channel quadrature plus index; diff line driver |
| Frequency Response | 125 kHz                                              |

### Environmental Conditions

|                       |                  |
|-----------------------|------------------|
| Operating Temperature | -40 to 70 deg C  |
| Storage Temperature   | -40 to 100 deg C |

### Commutation

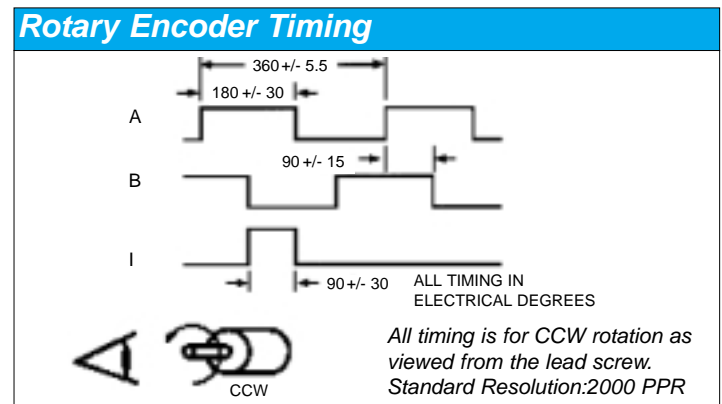
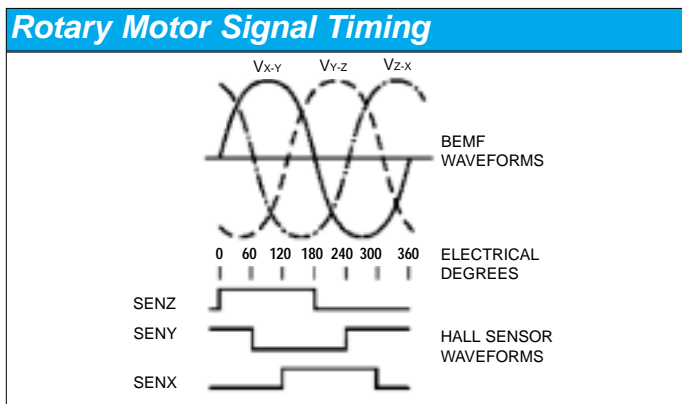
Three commutation signals, developed by hall sensors, are available for proper control of the motor by your amplifier.

### Electrical Characteristics

|                |                                           |
|----------------|-------------------------------------------|
| Supply Voltage | 5Vdc $\pm$ 5% (100 mA)                    |
| Output Format  | TTL (Internal pull-up resistors provided) |

### Signal Timing

The following chart shows the timing of the commutation and encoder signals in relation to the motor bmf. See section IV, Wiring, for signal pin designations.



For Micro R and D timing is for CCW rotation as viewed from the lead screw.

### Brake

The brake is a fail safe type, i.e. braking action occurs when power is removed. Therefore, for slide operation, the brake must be electrically energized.

Power Requirements are: 24Vdc @ 0.2 amps.

## VI. Wiring

### Motor Power Signals and Connector

| Pin | Signal            |
|-----|-------------------|
| 1   | Motor Phase U (X) |
| 2   | Motor Phase U (X) |
| 9   | Motor Phase U (X) |
| 10  | Motor Phase U (X) |
| 3   | Motor Phase V (Y) |
| 4   | Motor Phase V (Y) |
| 11  | Motor Phase V (Y) |
| 12  | Motor Phase V (Y) |
| 5   | Motor Phase W (Z) |
| 6   | Motor Phase W (Z) |
| 13  | Motor Phase W (Z) |
| 14  | Motor Phase W (Z) |
| 7   | Motor Ground      |
| 8   | Motor Ground      |
| 15  | Motor Ground      |

| Stage Connector (Male) |           |           |
|------------------------|-----------|-----------|
| <u>Part Numbers:</u>   |           |           |
| Amp                    | Body      | 205206-1  |
|                        | Crimp Pin | 1-66506-0 |

| Mating Connector (Female) |           |           |
|---------------------------|-----------|-----------|
| <u>Part Numbers:</u>      |           |           |
| Amp                       | Body      | 205205-1  |
|                           | Crimp Pin | 1-66504-0 |

### Motor Power Cable Option

The following mating power cable is available to enable connecting the slide to your controller. The cable has a mating connector at the slide end and flying leads at the controller end.

Micro Plus 150 Series Power Cable  
 3m length with mating connector  
 Order part number: 10963018

| Pin          | Signal      | Wire Color |
|--------------|-------------|------------|
| 1, 2, 9, 10  | Phase U (X) | Red        |
| 3, 4, 11, 12 | Phase V (Y) | Black      |
| 5, 6, 13, 14 | Phase W (Z) | White      |
| 7, 8, 15     | Chassis     | Green      |

|                                            |
|--------------------------------------------|
| <b>Power Cable Part Number</b><br>10963018 |
| Cable Length: 3 meter                      |
| Wire Termination to user: Flying Leads     |



## Sensor Signals and Connector

| Pin | Signal                         |
|-----|--------------------------------|
| 1   | Encoder Channel A <sup>-</sup> |
| 2   | Encoder Channel A              |
| 3   | Encoder Channel B <sup>-</sup> |
| 4   | Encoder Channel B              |
| 5   | Encoder Channel Z <sup>-</sup> |
| 6   | Encoder Channel Z              |
| 7   | +5V *                          |
| 8   | Ground *                       |
| 9   | Motor End Limit ( N.O. )       |
| 10  | Motor End Limit ( N.C. )       |
| 11  | Motor End Limit ( COM )        |
| 12  | Far End Limit ( N.O. )         |
| 13  | Far End Limit ( N.C. )         |
| 14  | Far End Limit ( COM )          |
| 15  | Home SW ( N.O. )               |
| 16  | Home SW ( N.C. )               |
| 17  | Home SW ( COM )                |
| 18  | Brake (+)                      |
| 19  | Mtr Hall 1 (X)                 |
| 20  | Mtr Hall 2 (Y)                 |
| 21  | Mtr Hall 3 (Z)                 |
| 22  | +5v **                         |
| 23  | Ground **                      |
| 24  | T1 (Thermistor)                |
| 25  | T2 (Thermistor)                |
| 26  | Brake ( - )                    |

**Stage Connector (Male)**Part Numbers:

|          |           |               |
|----------|-----------|---------------|
| Amp      | Body      | 748365-1      |
|          | Crimp Pin | 748333-7      |
| Amphenol |           | 17HD026PAA000 |

**Mating Connector (Female)**Part Numbers:

|          |           |               |
|----------|-----------|---------------|
| Amp      | Body      | 748566-1      |
|          | Crimp Pin | 748610-7      |
|          | Hood      | 745172-1      |
| Amphenol |           | 17HD026PAA000 |

**Sensor Cable Part Number: 10963019**

Cable Length: 3 meter

Wire Termination to user: Flying Leads

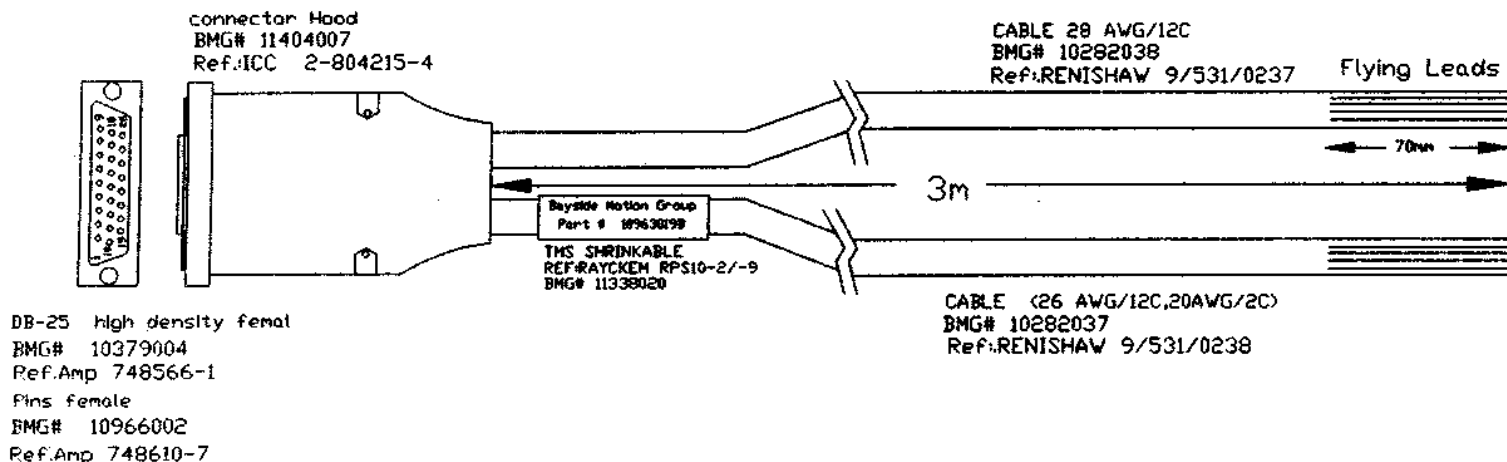
**Note:**

\* +5v and Ground defined on Pins 7 &amp; 8 to be used for BMG rotary stage only to supply power to encoder

\*\* +5v and Ground defined on Pins 22 &amp; 23 to be used for Linear Stages to supply power for encoder &amp; Hall Effects

### Sensor Cable Detail

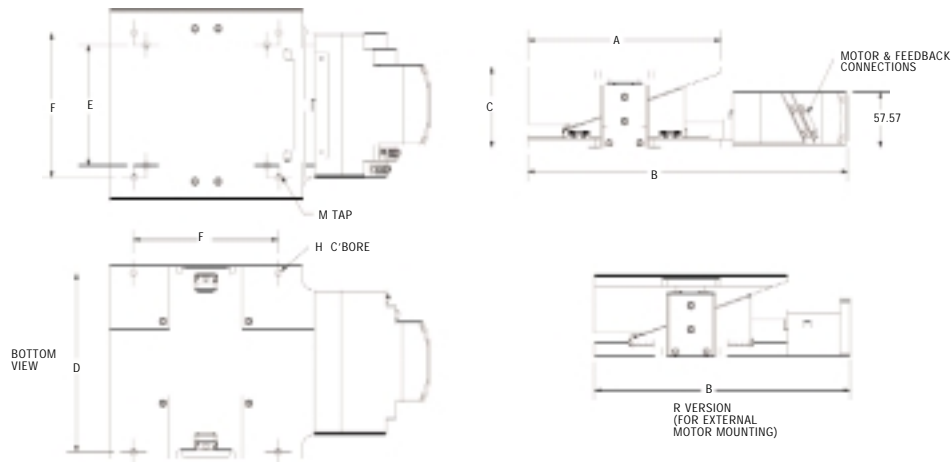
The following mating sensor cable is available to enable connecting the slide to your controller. The cable has a mating connector at the slide and flying leads at the controller end. Lengths available are 3m, 8m lengths. Diagram shows 3m length.



| ENCODER |          |                |         |                     |                 |            |
|---------|----------|----------------|---------|---------------------|-----------------|------------|
| DB PIN# | COLOR    | FUNCTION       | DB PIN# | LINEAR FUNCTION     | ROTARY FUNCTION | wire color |
| 1       | PINK     | ENCA'          | 7       | ---                 | +5V             | WHITE/20   |
| 2       | GREEN    | ENCA           | 8       | ---                 | GND             | BROWN/20   |
| 3       | YELLOW   | ENCB'          | 9       | MTR END LIMIT (NO)  | ---             | PINK       |
| 4       | BLUE     | ENCB           | 10      | MTR END LIMIT (NC)  | OVSPD LIMIT     | GREEN      |
| 5       | RED      | INDEX'         | 11      | MTR END LIMIT (com) | A LIMIT         | YELLOW     |
| 6       | VIOLET   | INDEX          | 12      | FAR END LIMIT (NO)  | B LIMIT         | RED        |
| 19      | GREY     | MTR HALL1 (x)  | 13      | FAR END LIMIT (NC)  | C LIMIT         | VIOLET     |
| 20      | BLACK    | MTR HALL2 (y)  | 14      | FAR END LIMIT (com) | LIMIT COM       | GREY       |
| 21      | ORANGE   | MTR HALL3 (z)  | 15      | HOME SW (NO)        | ---             | BLACK      |
| 22      | WHITE/20 | +5V ***        | 16      | HOME SW (NC)        | ---             | WHITE      |
| 23      | BROWN/20 | GND ***        | 17      | HOME SW (com)       | ---             | CLEAR      |
| 24      | WHITE    | T2(THERMISTOR) | 18      | BRAKE+              | ---             | ORANGE     |
| 25      | CLEAR    | T1(THERMISTOR) | 26      | BRAKE-              | ---             | BLUE       |
| --      | DRAIN    | SHIELD         |         |                     |                 |            |

V. Mechanical Specifications

Zwedge Dimensions



| MODEL NO.                 | A<br>(mm) | B<br>(mm) | C                   |                     | D<br>(mm) | E<br>(mm) | F<br>(mm) | H<br>C'Bore | M<br>Tap | STAGE WEIGHT<br>(kg) |
|---------------------------|-----------|-----------|---------------------|---------------------|-----------|-----------|-----------|-------------|----------|----------------------|
|                           |           |           | Max. Height<br>(mm) | Min. Height<br>(mm) |           |           |           |             |          |                      |
| Z150D-013<br>Direct Drive | 150       | 282       | 80.5                | 67.5                | 130       | 100       | 125       | M6          | M6x1     | 5.5                  |
| Z150R-013                 | 150       | 215       | 80.5                | 67.5                | 130       | 100       | 125       | M6          | M6x1     | 4                    |
| Z200D-025<br>Direct Drive | 200       | 332       | 96.5                | 71.5                | 185       | 125       | 150       | M6          | M6x1     | 8                    |
| Z200R-025                 | 200       | 265       | 96.5                | 71.5                | 185       | 125       | 150       | M6          | M6x1     | 6.5                  |

## VI. Stage Performance & Accuracy

All appropriate stage documentation, including straightness/flatness data, and special testing, is provided with this manual. If the documentation is not included, please contact Bayside Motion Group, Technical Services at (516)484-5482 ext. 130.

### Performance Specifications

| MODEL NO.   | TRAVEL RANGE | MAXIMUM VERTICAL VELOCITY <sup>1</sup> | MAXIMUM VERTICAL FORCE |
|-------------|--------------|----------------------------------------|------------------------|
|             | (mm)         | Ball Screw (mm/sec)                    | Ball Screw (kgf)       |
| Z150 Series | 13           | 50                                     | 20                     |
| Z200 Series | 25           | 50                                     | 28                     |

1. Based on 10mm lead ball screw.

### Accuracy Specifications<sup>2</sup>

| MODEL NO.   | STRAIGHTNESS/ FLATNESS | PITCH & ROLL | ACCURACY <sup>3</sup> | REPEATABILITY <sup>3</sup> |
|-------------|------------------------|--------------|-----------------------|----------------------------|
|             | (microns/25mm)         | (arc sec)    | (microns)             | (microns)                  |
| Z150 Series | ±2.5                   | ±5           | ±5                    | 3                          |
| Z200 Series | ±2.5                   | ±5           | ±5                    | 3                          |

2. Accuracy is based on stage mounted to a flat granite surface and measured at 25mm above the center of the stage.

3. Accuracy and repeatability are based on open loop lead accuracy and can be enhanced with encoder feedback.

### **VII. Maintenance & Lubrication**

The only periodic maintenance required is lubrication of the bearings and ball screws. As the frequency of lubrication varies based on the specific application, parameters, it is recommended that each axis be analyzed and lubricated after the first 50,000 meters of travel. Based on this evaluation, future lubrication frequency should be developed. It is expected, that a three to six month lubrication frequency will be adequate to assure the reliable service life of the bearing structure.

#### **Lubrication Type**

Recirculating guides and ball screws

Lithium soap based grease #2 or equivalent is acceptable for linear bearings.

Acceptable products are:

Nye Lubricants: Rheolube 716B

Kluber Lubrication: Isoflex NBU 15