



ACURO™

*ACURO with Parallel Interface***DESCRIPTION**

The Dynapar brand ACURO Absolute Encoder offers a modern full-feature design equipped with Parallel interface.

The Acuro AI25 optical absolute industrial encoder is available in a single-turn or multi-turn version. The multi-turn design is based on a reliable high-speed gear with optical scanning and the latest generation of OptoASIC technology.

The mechanical concept is based on a double ball bearing design, which is available as a solid-shaft or hollow-shaft version in common shaft diameters.

## Series AI25™

### *Absolute Encoder With Parallel Interface*

**APPLICATIONS:**

Ideal for applications requiring digital feedback to be sent over an industrial bus network

- Elevators
- Machine Tool
- Assembly
- Positioning

**INDUSTRIES**

Manufacturing, Assembly, Material Handling and any other where precise, repeatable bidirectional position measurement is required.

**FEATURES/BENEFITS**

- Compact design to save valuable space
- Up to 14 Bit single-turn resolution
- 4096 revolution multi-turn resolution
- Short installation depth
- Safety through self-diagnostics
- Solid shaft and hollow shaft versions
- -40°C to +100°C Operating temperature
- Low power consumption
- Fast delivery of any model variant
- Additional field-bus and point-to-point interfaces available



## ACURO with Parallel Interface

# Series AI25

## Absolute Encoder With Parallel Interface

### SPECIFICATIONS\*

#### STANDARD OPERATING CHARACTERISTICS

**Single-turn Resolution:** 10, 12, 13, 14 Bit, 360 PPR, 720 PPR  
**Multi-turn Resolution:** 12 bit (only available with 12 bit ST resolution)  
**Absolute Accuracy:**  $\pm 0.01^\circ$  mechanical (36 arc-sec.)  
**Repeatability:**  $\pm 0.002^\circ$  mechanical (7.2 arc-sec.)  
**Code format:** Binary, Gray, Gray Excess

#### ELECTRICAL

**Connection:** Cable, Conin Connector, MS Connector, Cable with Sub-D Connector (MT only)  
**Supply voltage:** 5 VDC -5%/+10%, or 10-30 VDC  
**Intrinsic current consumption:** 200 mA (ST), 300 mA (MT)  
**Output current:** 30 mA per bit, short circuit protected  
**Frequency response:** 500 kHz on single-turn, 1.5m cable\*  
**Alarm output:** NPN open collector max 5 mA  
**Maximum cable length:** 100 m

\*Data refresh rate: 70µsec is for multi-turn and single-turn with preset

| Control Inputs |             |   |
|----------------|-------------|---|
| Input          | Logic Level | Function                                      |
| Direction      | 1           | Ascending code values when turning clockwise  |
|                | 0           | Descending code values when turning clockwise |
| Latch          | 1           | Encoder data continuously changing at output  |
|                | 0           | Encoder data stored and constant at output    |
| Tristate (ST)  | 1           | Outputs active                                |
|                | 0           | Outputs at high impedance (Tristate mode)     |
| Tristate (MT)  | 1           | Outputs at high impedance (Tristate mode)     |
|                | 0           | Outputs active                                |

**Status LED:** Green = OK, Red = Alarm (IP64 only, not available on connector type J)

**Preset Switch:** Sets encoder to zero output at present mechanical position (Multi-turn IP64 only, not available on connector type J)

**Control Inputs:** Latch, Direction, Tri-state (see table below)

#### MECHANICAL

##### All Types

**Maximum shaft speed:** 10,000 RPM (continuous), 12,000 RPM (peak)

**Starting torque:** < 1.4 in-oz

##### Bearing life:

1 x 10<sup>10</sup> revolutions at 35% full rated shaft load

1 x 10<sup>9</sup> revolutions at 75% full rated shaft load

1 x 10<sup>8</sup> revolutions at 100% full rated shaft load

**Weight (approx.):** 350 g ST, 400 g MT

##### Shafted Types

**Flange configurations:** Square, Clamp, Servo

**Shaft diameter:** 6 mm (Servo Mount), 10 mm (Clamping Mount), 3/8" (Square Flange Mount)

**Maximum shaft load:**

6 mm shaft: 13 lb axial, 24 lb radial

10 mm shaft: 24 lb axial, 35 lb radial

3/8" Shaft: 24 lb axial, 35 lb radial

##### Hubshaft Types

**Flange configuration:** Hubshaft with flexible tether

**Accepted Mating Shaft Diameter (min./max.):**

6mm (5.984/5.996); 10mm (9.980/9.995);

12 mm (11.976/11.994); 3/8" (.3742/.3748);

1/2" (.4991/.4997)

**Allowable Mating Shaft Movement (hubshaft only):**

+/- 1.5 mm axial, +/- 0.2 mm radial

#### ENVIRONMENTAL

**Operating Temperature:** -40 to 100° C

**Storage Temperature:** -40 to 100° C

**Enclosure Rating:** IP64 or IP67

**Shock:** 1,000 m/s<sup>2</sup> (6 ms)

**Vibration:** 100 m/s<sup>2</sup> (10 to 2,000 Hz)

\* Specifications are for base models with standard features only unless otherwise noted. Specifications subject to change without notice in accordance with our DBS policy of continuous improvement. All product and brand names are trademarks of their respective owners. All rights reserved.

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Dynapar Brand AI25 Parallel Data Sheet (8/05)

| Code 1: Model   | Code 2: Bits  | Code 3: Mounting   | Code 4: Shaft Size   | Code 5: Protocol                         | Code 6: Electrical       | Code 7: Connector                           |
|---|---|--|--|--|--------------------------|---|
| <b>AI25</b>   | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>                 | <input type="checkbox"/> | <input type="checkbox"/>                    |
| <b>AI25</b><br>Size25<br>Acuro<br>Absolute<br>Encoder | <b>Single-Turn</b>  | Available when Code 4 is 0 or A                                    | <b>w/o shaft seal (IP64)</b><br>0 6 mm<br>1 3/8"<br>2 10 mm<br>3 3/8" Hub Shaft<br>4 12 mm Hub Shaft<br>5 1/2" Hubshaft<br>6 10 mm Hub Shaft<br><br><b>w/ shaft seal (IP67)</b><br>A 6 mm<br>B 3/8"<br>C 10 mm | 0 Parallel Binary<br><br>1 Parallel Gray | 0 5 VDC<br>2 10-30 VDC   | 0 1.5m axial cable                          |
|   | 0010 10 Bit   | 0 Servo*   |  |  |                          | 1 1.5m radial cable                         |
|   | 0012 12 Bit   | Available when Code 4 is 2 or C                                    |  |  |                          | Available when Code 2 is 00XX, 0360 or 0720 |
|   | 0013 13 Bit   | 1 Clamping*  |  |  |                          | 6 M23 Conin<br>17 pin axial CW              |
|   | 0014 14 Bit   | Available when Code 4 is 1 or B                                    |  |  |                          | 7 M23 Conin<br>17 pin radial CW             |
|   | 0720 720 PPR Gray Excess  | 2 Square flange**  |  |  |                          | J 17 pin MS axial *                         |
|   | Available when Code 7 is 0, 1, 6, 7 or J  | Available when Code 4 is 3, 4, 5 or 6                              |  |  |                          | K 19 pin Bayonet radial                     |
|   | 0360 360 PPR Gray Excess  |  |  |  |                          | Available when Code 2 is 1212               |
|   | Available when Code 6 is 2  |  |  |  |                          | A Cable 1.5m radial w/ 37 pin sub-D         |
|   | <b>Multi-Turn</b><br>1212 12 Bit Multi-Turn, 12 Bit Single-Turn                                     | 3 Hubshaft w/tether†<br>* 58mm Dia.<br>** 2.5" Square<br>† 63mm BC |  |  |                          | B Cable 1.5m axial w/37 pin sub-D           |

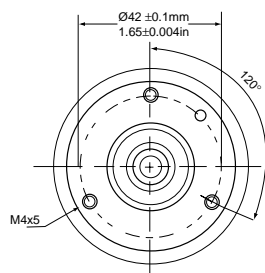
\* Status LED and Preset Switch features not available with "J"

## ACURO with BiSS Interface

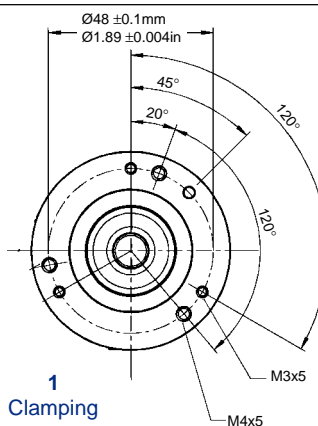
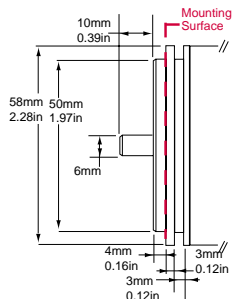
# Series AI25

## Absolute Encoder With BiSS Interface

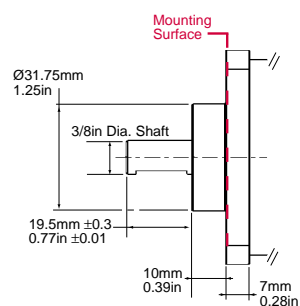
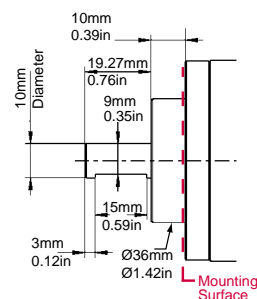
### Code 3: Mounting



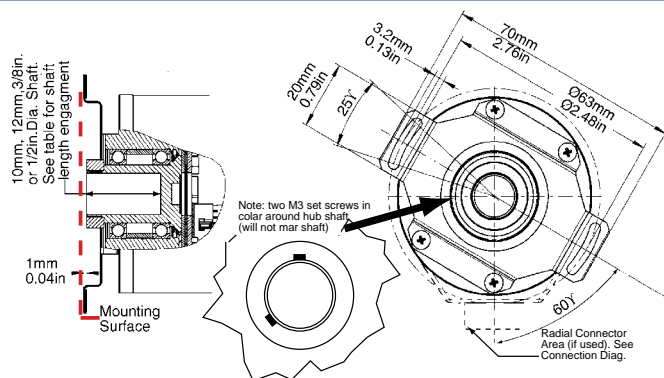
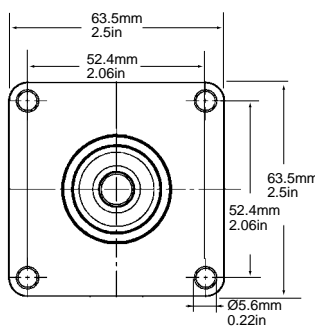
## 0 Servo



## 1 Clamping



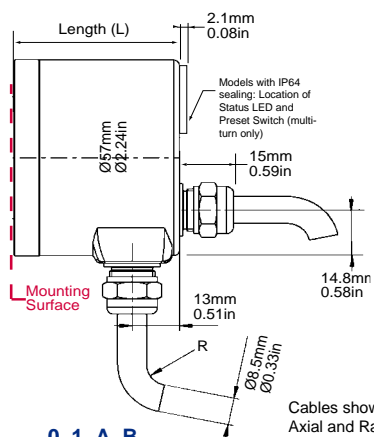
## 2 Square Flange



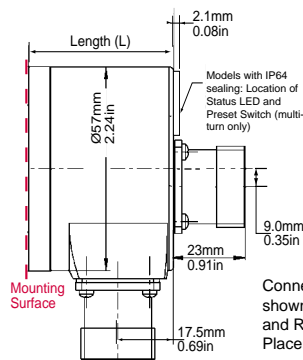
### 3 Hubshaft w/Tether

| HubShaft Diameter | Min. Shaft Length | Max. Shaft Length |
|-------------------|-------------------|-------------------|
| 10mm, 3/8"        | 15mm (0.59")      | 20mm (0.79")      |
| 12mm, 1/2"        | 18mm (0.71")      | 20mm (0.79")      |

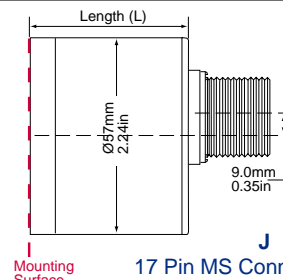
### Code 7: Connector



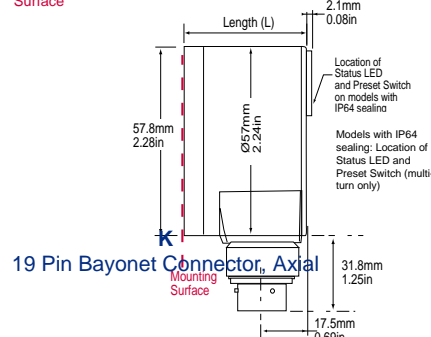
**0, 1, A, B**  
1.5M Cable



**6, 7**  
Conin 12/17 Pin Connector



17 Pin MS Connector, Axial



19 Pin Bayonet Connector, Axial

Length (L) Mounting Surface to Rear

| Mount (Code 3)  | Single-Turn | Multi-Turn |
|-----------------|-------------|------------|
| (0) Servo       | 46.5/1.83   | 60.2/2.37  |
| (1) Clamping    | 45.5/1.79   | 59.2/2.33  |
| (2) Square Flng | 45.5/1.79   | 59.2/2.33  |
| (3) Hubshaft    | 49.9/1.96   | 67.1/2.64  |

## Absolute Encoder With Parallel Interface

## CONNECTOR WIRING

| Explanation of Terms    |                     |  |
|-------------------------|---------------------|--|
| Tristate                | +UB =               | Outputs at high impedance (Tristate mode)    |
|                         | 0 V <sup>2)</sup> = | Outputs active                               |
| Tristate                | +UB <sup>2)</sup> = | Outputs active                               |
|                         | 0 V =               | Outputs at high impedance (Tristate-Mode)    |
| Latch                   | +UB <sup>2)</sup> = | Encoder data continuously changing at output |
|                         | 0 V =               | Encoder data stored and constant at output   |
| Direction               | +UB <sup>2)</sup> = | Ascending code value when turning cw         |
|                         | 0 V =               | Descending code value when turning cw        |
| N.C.                    | =                   | Not Connected                                |
| LSB                     | =                   | Least Significant Bit                        |
| MSB                     | =                   | Most Significant Bit                         |
| S0, S1, ...             | =                   | Data bits for resolution per turn            |
| M0, M1, ... (Multiturn) | =                   | Data bits for number of turns                |

2) Or unattached (floating)

| PVC-cable (Singleturn) 9-12 Bit |                           |                          |                     |
|---------------------------------|---------------------------|--------------------------|---------------------|
| Color                           | 9 Bit / 360 <sup>3)</sup> | 10 Bit/720 <sup>3)</sup> | 12 Bit              |
| brn/gry                         | N.C.                      | N.C.                     | S0 (LSB)            |
| red/blu                         | N.C.                      | N.C.                     | S1                  |
| vio                             | N.C.                      | S0 (LSB)                 | S2                  |
| wht/brn                         | S0 (LSB)                  | S1                       | S3                  |
| wht/grn                         | S1                        | S2                       | S4                  |
| wht/yel                         | S2                        | S3                       | S5                  |
| wht/gry                         | S3                        | S4                       | S6                  |
| wht/pnk                         | S4                        | S5                       | S7                  |
| wht/blu                         | S5                        | S6                       | S8                  |
| wht/red                         | S6                        | S7                       | S9                  |
| wht/blk                         | S7                        | S8                       | S10                 |
| brn/grn                         | S8 (MSB)                  | S9 (MSB)                 | S11 (MSB)           |
| yel                             | Tristate D0...D8          | Tristate D0...D9         | Tristate D0... D11  |
| pnk                             | Latch <sup>4)</sup>       | Latch <sup>4)</sup>      | Latch <sup>4)</sup> |
| grn                             | Direction                 | Direction                | Direction           |
| blk                             | 0 V                       | 0 V                      | 0 V                 |
| red                             | 5/10...30VDC              | 5/10...30VDC             | 5/10...30VDC        |
| brn                             | Alarm                     | Alarm                    | Alarm               |

3) Increments 4) Binary Only

| Connector 17pol. (CONIN) 9-12 Bit |                           |                            |                     |
|-----------------------------------|---------------------------|----------------------------|---------------------|
| Pin                               | 9 Bit / 360 <sup>3)</sup> | 10 Bit / 720 <sup>3)</sup> | 12 Bit              |
| 1                                 | S0 (LSB)                  | S0 (LSB)                   | S0 (LSB)            |
| 2                                 | S1                        | S1                         | S1                  |
| 3                                 | S2                        | S2                         | S2                  |
| 4                                 | S3                        | S3                         | S3                  |
| 5                                 | S4                        | S4                         | S4                  |
| 6                                 | S5                        | S5                         | S5                  |
| 7                                 | S6                        | S6                         | S6                  |
| 8                                 | S7                        | S7                         | S7                  |
| 9                                 | S8 (MSB)                  | S8                         | S8                  |
| 10                                | N.C.                      | S9 (MSB)                   | S9                  |
| 11                                | N.C.                      | N.C.                       | S10                 |
| 12                                | Tristate S0...S8          | Tristate S0...S9           | S11 (MSB)           |
| 13                                | Latch <sup>4)</sup>       | Latch <sup>4)</sup>        | Latch <sup>4)</sup> |
| 14                                | Direction                 | Direction                  | Direction           |
| 15                                | 0 V                       | 0 V                        | 0 V                 |
| 16                                | 5/10...30VDC              | 5/10...30VDC               | 5/10...30VDC        |
| 17                                | Alarm                     | Alarm                      | Alarm               |

3) Increments 4) Binary Only

| Connector 17pol. (CONIN) 13-14 Bit |  |  |
|------------------------------------|--|--|
| Pin                                | 13 Bit                                 | 14 Bit                                 |
| 1                                  | S12 (MSB)                              | S13 (MSB)                              |
| 2                                  | S11                                    | S12                                    |
| 3                                  | S10                                    | S11                                    |
| 4                                  | S9                                     | S10                                    |
| 5                                  | S8                                     | S9                                     |
| 6                                  | S7                                     | S8                                     |
| 7                                  | S6                                     | S7                                     |
| 8                                  | S5                                     | S6                                     |
| 9                                  | S4                                     | S5                                     |
| 10                                 | S3                                     | S4                                     |
| 11                                 | S2                                     | S3                                     |
| 12                                 | S1                                     | S2                                     |
| 13                                 | S0 (LSB)                               | S1                                     |
| 14                                 | Direction                              | S0 (LSB)                               |
| 15                                 | 0 V                                    | 0 V                                    |
| 16                                 | 5/10...30VDC                           | 5/10...30VDC                           |
| 17                                 | Latch (Binarycode)<br>Alarm (Graycode) | Latch (Binarycode)<br>Alarm (Graycode) |

| TPE-cable (Multiturn 13-14 Bit) 37 pol. Sub-D |     |             |
|---|-----|-------------|
| Color   | Pin |             |
| brn   | 2   | S0          |
| grn   | 21  | S1          |
| yel   | 3   | S2          |
| gry   | 22  | S3          |
| pnk   | 4   | S4          |
| vio   | 23  | S5          |
| gry/pnk                                       | 5   | S6          |
| red/blu                                       | 24  | S7          |
| wht/grn                                       | 6   | S8          |
| brn/grn                                       | 25  | S9          |
| wht/yel                                       | 7   | S10         |
| yel/brn                                       | 26  | S11         |
| wht/gry                                       | 8   | M0          |
| gry/brn                                       | 27  | M1          |
| wht/pnk                                       | 9   | M2          |
| pnk/brn                                       | 28  | M3          |
| wht/blu                                       | 14  | M4          |
| brn/blu                                       | 33  | M5          |
| wht/red                                       | 15  | M6          |
| brn/red                                       | 34  | M7          |
| wht/blk                                       | 16  | M8          |
| brn/blk                                       | 35  | M9          |
| gry/grn                                       | 17  | M10         |
| yel/gry                                       | 36  | M11         |
| pnk/grn                                       | 18  | Alarm       |
| yel/pnk                                       | 10  | Direction   |
| grn/blu                                       | 30  | Latch       |
| yel/blu                                       | 12  | Tristate    |
| red   | 13  | 10...30 VDC |
| wht   | 31  | 10...30 VDC |
| blu   | 1   | 0 V         |
| blk   | 20  | 0 V         |

## Absolute Encoder With Parallel Interface

| MS style 17 pin connectors   |                     |                    |   |           |           |
|--|---------------------|--------------------|---|-----------|-----------|
| Pin  | Function            |                    | 107865<br>Cable<br>Accessory*<br>Color Code | 14 BIT    | 13 BIT    |
|  | 12 Bit<br>4096 CPR  | 10 Bit<br>1024 CPR |   |           |           |
| A  | Vin                 |                    | Red   | D13 (MSB) | D12 (MSB) |
| B  | N.C.                |                    | Violet                                      | D12       | D11       |
| C  | Latch (binary only) |                    | Green                                       | D11       | D10       |
| D  | Direction           |                    | Orange                                      | D10       | D9        |
| E  | S1                  | N.C.               | White                                       | D9        | D8        |
| F  | S3                  | S1                 | White/Brown                                 | D8        | D7        |
| G  | S5                  | S3                 | White/Orange                                | D7        | D6        |
| H  | S7                  | S5                 | White/Green                                 | D6        | D5        |
| J  | S8                  | S6                 | White/Blue                                  | D5        | D4        |
| K  | S9                  | S7                 | White/Violet                                | D4        | D3        |
| L  | S11 (MSB)           | S9 (MSB)           | White/Black/Brown                           | D3        | D2        |
| M  | GND                 |                    | Black                                       | D2        | D1        |
| N  | S4                  | S2                 | White/Red                                   | D1        | D0 (LSB)  |
| P  | S0 (LSB)            | N.C.               | Gray  | D0 (LSB)  | Direction |
| R  | S2                  | S0 (LSB)           | White/Black                                 | GND       | GND       |
| S  | S6                  | S4                 | White/Yellow                                | Latch     | Latch     |
| T  | S10                 | S8                 | White/Grey                                  | Vin       | Vin       |
| 10ft Cable # 107865-0010   |                     |                    |   | NA        |           |
| Mating Connector: MS 17 pin style<br>MS3106A-20-29S part # MCN-N8                                      |                     |                    |   |           |           |
| *This is a mating connector/cable assembly.<br>Color coding information is provides here for reference |                     |                    |   |           |           |

| PVC-cable (Singleturn 13-14 Bit) |                     |                     |
|----------------------------------|---------------------|---------------------|
| Color                            | 13 Bit              | 14 Bit              |
| gry/pnk                          | N.C                 | S0 (LSB)            |
| brn/yel                          | S0 (LSB)            | S1                  |
| brn/gry                          | S1                  | S2                  |
| red/blu                          | S2                  | S3                  |
| vio                              | S3                  | S4                  |
| wht/brn                          | S4                  | S5                  |
| wht/grn                          | S5                  | S6                  |
| wht/yel                          | S6                  | S7                  |
| wht/gry                          | S7                  | S8                  |
| wht/pnk                          | S8                  | S9                  |
| wht/blu                          | S9                  | S10                 |
| wht/red                          | S10                 | S11                 |
| wht/blk                          | S11                 | S12                 |
| brn/grn                          | S12 (MSB)           | S13 (MSB)           |
| yel                              | Tristate S0...S12   | Tristate S0...S13   |
| pnk                              | Latch <sup>4)</sup> | Latch <sup>4)</sup> |
| grn                              | Direction           | Direction           |
| blk                              | 0 V                 | 0 V                 |
| red                              | 5/10...30VDC        | 5/10...30VDC        |
| brn                              | Alarm               | Alarm               |

4) Binary Only

| Bayonet style 19 pin connectors  |                                 |  |                               |  |                          |                    |  |
|--|---------------------------------|--|-------------------------------|--|--------------------------|--------------------|--|
| Pin  | Function<br>14 Bit<br>16384 CPR | 112077 Cable<br>Accessory*<br>Color Code | Function<br>13 it<br>8192 CPR | 112076 Cable<br>Accessory*<br>Color Code | Function                 |                    | 110158 Cable<br>Accessory*<br>Color Code |
|  |                                 |  |                               |  | 12 Bit<br>4096 CPR       | 10 Bit<br>1024 CPR |  |
| A  | S13 (MSB)                       | White/Black/Brown                        | S12                           | White/Black/Brown                        | S11 (MSB)                | S9 (MSB)           | White/Black/Brown                        |
| B  | S12                             | White/Grey                               | S11                           | White/Grey                               | S10                      | S8                 | White/Grey                               |
| C  | S11                             | White/Violet                             | S10                           | White/Violet                             | S9                       | S7                 | White/Violet                             |
| D  | S10                             | White/Blue                               | S9                            | White/Blue                               | S8                       | S6                 | White/Blue                               |
| E  | S9                              | White/Green                              | S8                            | White/Green                              | S7                       | S5                 | White/Green                              |
| F  | S8                              | White/Orange                             | S7                            | White/Orange                             | S6                       | S4                 | White/Orange                             |
| G  | S7                              | White/Yellow                             | S6                            | White/Yellow                             | S5                       | S3                 | White/Yellow                             |
| H  | S6                              | White/Red                                | S5                            | White/Red                                | S4                       | S2                 | White/Red                                |
| J  | S5                              | White/Brown                              | S4                            | White/Brown                              | S3                       | S1                 | White/Brown                              |
| K  | S4                              | White/Black                              | S3                            | White/Black                              | S2                       | S0 (LSB)           | White/Black                              |
| L  | S3                              | Brown                                    | S2                            | Blue                                     | S1                       | N.C.               | White                                    |
| M  | S2                              | Blue                                     | S1                            | White                                    | S0 (LSB)                 | N.C.               | Grey                                     |
| N  | S1                              | White                                    | S0 (LSB)                      | Grey                                     | N.C                      | N.C.               |  |
| P  | S0 (LSB)                        | Grey                                     | GND                           | Black                                    | GND                      |                    | Black                                    |
| R  | Direction                       | Orange                                   | Direction                     | Orange                                   | Direction                |                    | Orange                                   |
| S  | Case                            | Violet                                   | Case                          | Violet                                   | Case                     |                    | Violet                                   |
| T  | GND                             | Black                                    | GND                           | Yellow                                   | GND                      |                    | Yellow                                   |
| U  | Latch                           | Green                                    | Latch                         | Green                                    | Latch (binary only)      |                    | Green                                    |
| V  | Vin                             | Red                                      | Vin                           | Red                                      | Vin                      |                    | Red                                      |
| 10ft Cable # 112077-0010   |                                 |  | 10ft Cable # 112076-0010      |  | 10ft Cable # 110158-0010 |                    |  |
| Mating Connector: 19 pin Bayonet style PT06E-14-19S part # 606219-0001 |                                 |  |                               |  |                          |                    |  |

\*This is a mating connector/cable assembly. Color coding information is provided here for reference



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**More Available.** With factories around the world, global sales and applications support, and an expansive network of distributors, we stay close to our customers - shortening lead times and fostering responsiveness. Three-day lead time is standard, with same-day shipments available on many of our products.

**More Selection.** We have a broad selection of controllers to meet application requirements in a variety of industries. User-configurable, accurate and flexible, with low, mid, or high level performance ranges, our controller products meet your system and budgetary requirements.

**More Reliable.** Our experience with more than 25,000 customers has taught us to design controllers that are reliable and durable, with quality standards that meet six sigma requirements.

For additional information or a full-line catalog, contact DICG Customer Service or visit our web site.

\* Specifications are for base models with standard features only unless otherwise noted. Specifications subject to change without notice in accordance with our DBS policy of continuous improvement. All product and brand names are trademarks of their respective owners. All rights reserved.

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Dynapar Brand AI25 Parallel Data Sheet (8/05)

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