

# Avtron Encoders and Tachometers



**Industrial Encoders and Tachometers for Drive  
System Feedback, Instrumentation, and Control**



ALL ENCODERS MADE IN USA  
BULLETIN 453 REV. M

**AVTRON**  
QUALITY SYSTEM CERTIFIED TO ISO 9001  
[WWW.AVTRONENCODERS.COM](http://WWW.AVTRONENCODERS.COM)

# General Information

## INTRODUCTION

Avtron Industrial Automation, Inc. is a leader in the design and manufacture of industrial encoders (also known as rotary pulse generators or digital tachometers).

We have been proudly manufacturing rugged designs in the U.S.A. for over 40 years and provide full support and service for all our models, even older units.

## ENCODER SELECTION

Avtron offers ultra-reliable encoders for all applications. Select using:

- Mechanical mounting style
- Environmental rating

Avtron's encoders are far more durable than competitive units. They feature cast aluminum housings, potted electronics, and huge bearings. For maximum reliability, select our modular models with no bearings at all, and Wide-Gap Technology to eliminate scraping.

Look for our models with high-power, fully short circuit protected outputs. These encoders can drive the longest cables, yet they are protected from wiring errors.

Many of our encoders come with onboard diagnostics. They digitally self-tune for best signal, and a remote alarm contact and LED notify you if there is a problem. Yet our encoders keep working as long as they can, giving you time to schedule maintenance.

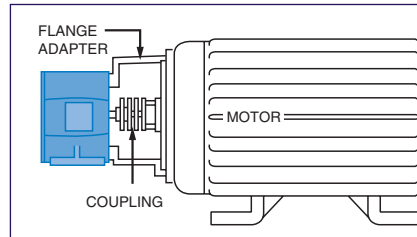
Some Avtron models have experienced over 4,500,000 hours Mean-Time-Between-Failure! Keep your machines running with Avtron encoders!

## PRICING

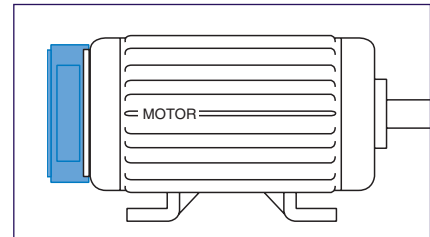
Pricing and ordering information can be obtained by calling, faxing, or e-mailing us (see page 16 for contact information).

## MECHANICAL MOUNTING

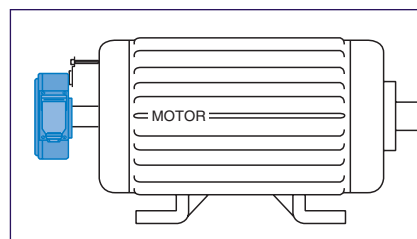
Avtron encoders can be mounted several different ways. The standard mounting methods include:



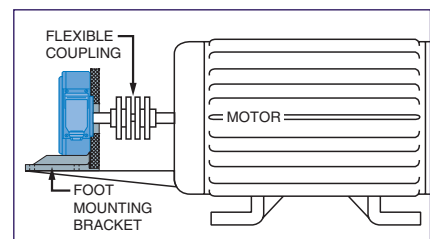
**NEMA 56C Face Mounting:** (Solid Shaft Coupled) Requires 4.5" flange adapter with coupling.



**NEMA C/FC Face Mounting:** Requires motor stub shaft and one of the following: 115mm, 4.5", 6.75", 8.5", 12.5" C/FC-Face.



**Hollow Shaft/Tether Mounting:** Stub shaft required. Shaft requirements depend on the encoder selected.



**Foot Mounting:** This method is usually used when encoders are coupled directly to rolls, gear boxes, or motors without C-Faces.

## SENSOR TECHNOLOGY

Avtron uses two different sensor technologies to generate the signals in our encoders: optical and magnetic. Both technologies are field proven with thousands of successful installations with all brands of variable speed drives and controls. The choice is based on price and durability needs.

**Optical** sensors are offered in Light Mill and Mill Duty encoders. Optical sensing technology performs best when used in environments without frequent temperature changes and/or chronically wet conditions.

The optical sensing circuit uses an LED light source that shines through a rotating disk. Unlike the competition, which sometimes uses fragile glass disks, Avtron uses only shatterproof disks. As the disk rotates, the sensor sees an interruption in the light beam, and generates pulses as a result. Avtron encoders feature Wide-Gap technology, with up to 8X the distance between disk and sensor. This eliminates sensor damage from vibration or shock.

**Magnetic** sensors are offered in Mill Duty, Heavy Mill Duty, and Severe Duty encoders. Because they are not affected by dust or moisture, they are suited to rough service in modular style encoders like the SMARTach II™ and the THIN-LINE II™ series.

A magnetic sensor detects a rotating wheel (rotor) that is encoded with a series of magnetic poles on its surface. As the poles pass the sensor, a small change in resistance of the sensor is detected and pulses are generated as a result. Avtron Wide-Gap Technology allows the wheel to be 2-4X farther from the sensor, eliminating sensor damage from misalignment, shaft runout, and bearing movement.

# Ratings and Features

## ENVIRONMENTAL RATINGS

Avtron environmental ratings don't mean IP sealing. Seals may break down quickly in applications with temperature changes or small, sealed bearings can be destroyed by loads. Instead, Avtron rates encoders for overall durability:

**OEM Components:** Require additional physical protection.

**Light, Mill Duty:** For use in dry commercial and industrial environments with temperature controlled spaces.

**Mill Duty:** For use in typical industrial environments. More mechanically robust than light mill duty. Not recommended for environments with frequent temperature changes and chronically wet conditions.

**Heavy, Mill Duty:** For more rugged environments with frequent temperature fluctuations and increased levels of contamination and moisture.

**Severe Duty:** This rating is for very wet and dusty environments with large and frequent temperature extremes including outdoor applications.

**Explosion Protected:** Avtron encoders are available for use in explosive atmospheres and are also extremely rugged.

## ENCODER SELECTION GUIDE

| TYPE       | TYPICAL APPLICATIONS * (see key bottom right) |            |       |                   |                 |       |        |                     |                           |  |
|------------|---|------------|-------|-------------------|-----------------|-------|--------|---------------------|---------------------------|--|
|            | Conveying                                     | Converting | Films | Food <sup>S</sup> | Paper           | Steel | Mining | Marine <sup>S</sup> | Oil Drilling <sup>E</sup> |  |
| LIGHT MILL |   |            |       | Not Recommended   |                 |       |        |                     |                           |  |
| STD. MILL  |   |            |       |                   | Not Recommended |       |        |                     |                           |  |
| HEAVY MILL |   |            |       |                   |                 |       |        |                     |                           |  |
| SEVERE     |   |            |       |                   |                 |       |        |                     |                           |  |

See Specification Chart on pages 14-15 for more details on the encoders below.

|                   | TYPE of ENCODER                 | MOUNTING                           | MODEL   | PAGE   |
|-------------------|---------------------------------|------------------------------------|---|--------|
| HEAVIER DUTY<br>↓ | Optical Light Mill Duty         | Face or Foot Solid Shaft (Coupled) | AV20, AV25  | 6      |
|                   |                                 | Hollow Shaft                       | HS25A, HS35A  | 8      |
|                   | Optical Mill Duty               | Hollow Shaft                       | M3  | 10     |
|                   | Magnetic Mill Duty              | Hollow Shaft                       | HS35M   | 9      |
|                   | Magnetic Heavy Mill Duty        | Modular C-Face                     | AV125, AV850<br>AV56, AV56S <sup>S</sup> ,<br>AV67, AV85, AV115 | 4<br>5 |
|                   |                                 | Hollow Shaft                       | M4, M7  | 10, 11 |
|                   | Magnetic Severe Duty            | Face or Foot Solid Shaft (Coupled) | AV485   | 7      |
|                   |                                 | Hollow Shaft                       | AV685   | 12     |
|                   | Explosion Protected Severe Duty | Hollow Shaft                       | M6, XP45  | 11     |

Avtron Industrial Automation, Inc. makes no warranty as to suitability of purpose; recommendations are based on industry standard applications and are subject to warranty terms and conditions of sale.

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## ENCODER SELECTION GUIDE KEY

- \* Darker = Better Suited for Application;
- = Not Recommended.
- <sup>S</sup> Stainless Steel Option Recommended.
- <sup>E</sup> Red = Explosion Protected Option Recommended.

# Modular C-Face Mount

AV850 • AV125 (SMARTach II™)

## MODULAR ENCODERS

Modular encoders, such as AV850 and AV125 SMARTach II™ and THIN-LINE II™ series offer extremely high durability. A machined C-face is required on the motor. The rotor mounts on the motor shaft, and the stator with electronics bolts directly to the flange or face. This design has no couplings, bearings, or wearing parts.

## FAST, RELIABLE INSTALLATION

The SMARTach II and THIN-LINE II designs permit installation in under 5 minutes. These designs also eliminate common encoder failures such as:

**Installation Damage.** The sensor gap is 2-4X larger than older models, so sensor scraping, gapping, and shimming are eliminated.

**Mechanical Misalignment.** On power-up, the green LED shows that the encoder and rotor are installed properly and are providing optimal output signals. Digital self-tuning ensures the optimal signal is maintained, even as physical conditions change.

**Contamination.** Oil, water, dirt, and debris are ignored by the Avtron magnetic sensor system.

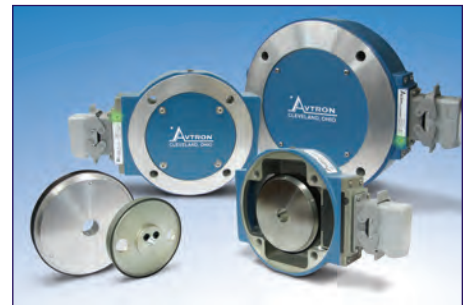
**Damaged Outputs.** The electronics in the SMARTach II and THIN-LINE II are protected against wiring errors, short circuits, reverse voltage, over-voltage, and surges.

See our web site for an AV850 installation video. See it to believe it!

## MAGNETIC, HEAVY MILL DUTY

### AV850 & AV125 FEATURES

- -40° to 100°C Operation, (Rotors -40°C to 150°C)
- High Power Outputs
- Full Short Circuit and Wiring Protection
- Wide Rotor to Sensor Gap
- Replaceable Sensors
- Diagnostic LED
- No Bearings or Couplings
- Large Axial Tolerance: ±0.100" [±2.5mm]
- Universal Rotor System
- Installs in Minutes, Lasts for Decades



AV850 (left back) and AV125 (right back) SMARTach II encoders with diagnostic LED and connector option "P". AV125 rotor (left front), AV850 Universal rotor (center) patent pending, AV850 front view (right front).

### AV850

- Fits Shafts up to 4 1/2" [115mm]
- Fits 8 1/2" C-Face
- 8 – 5000 PPR

AV850 Direct Replacement for Avtron M193B and M285, Lakeshore/Northstar RIM 8500™, and GE ANDG series.

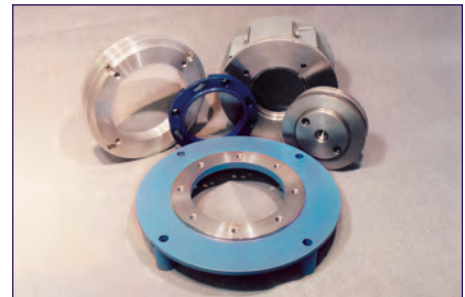
### AV125

- Fits Shafts up to 7 7/8" [200mm]
- Fits 12 1/2" C-Face
- 8 – 8192 PPR

AV125 Direct replacement for Avtron M1250, Lakeshore/Northstar RIM 1250™, and SL1250™.

## ADAPTERS & UPGRADES

Many motors are not equipped with the necessary flanges or C-faces to properly mount an encoder. Avtron can supply adapters and modification kits to mount any Avtron encoder on any motor, roll, or gearbox.



Adapter plates and flanges.

## SELECTION GUIDE

| Model | Rotor Bore Size/Mounting |             |                           |                 | Inboard & Outboard Cover Plates | Left Module  |         |          | Right Module |         |                 | Connector Options   | Modifications |
|-------|--------------------------|-------------|---------------------------|-----------------|---------------------------------|--------------|---------|----------|--------------|---------|-----------------|---------------------|---------------|
|       | Thru Shaft               |             | End of Shaft* (GE Motors) |                 |                                 | Line Driver  | PPR     |          | Line Driver  | PPR     |                 |                     |               |
| AV850 | XX- none                 | CR- 2.500   | XX- no rotor              | UY- CD46xx,     | X- none                         | X- none      | R- 512  | X- none  | X- none      | R- 512  | P- Ind. w/ Plug | 000- none           |               |
| AV125 | CB- 0.625*               | CT- 2.625   | UF- CD180-32x*            | 47xx, 85xx,     | B- inboard,                     | 8- 5-24V in/ | C- 50^  | S- 600   | 8- 5-24V in/ | C- 50^  | S- 600          | G- Ind. w/ Plug     | 002- select   |
|       | CA- 0.750*               | C2- 2.875   | UN- CD36x*                | 86xx, 9xxx*     | thru outboard*                  | 5-15V out    | F- 60   | V- 900   | 5-15V out    | F- 60   | V- 900          | (Northstar Pinout)  | alt. PPR      |
|       | CC- 0.875*               | CW- 3.250   | UP- CD4xx*                | UZ- CD68x*      | F- no inboard,                  | hi power     | G- 100  | J- 960   | hi power     | G- 100  | J- 960          | C- 10 Pin MS w/     | codes^        |
|       | CE- 1.000*               | CY- 3.375   | UQ- CD444/                | U9- CD6xx-62xx, | flat outboard                   | 9- 5-24V in, | H- 120  | Y- 1024  | 9- 5-24V in, | H- 120  | Y- 1024         | Plug & Flexible     | 700- large    |
|       | CF- 1.125*               | CZ- 3.421   | 505E*                     | 67xx-69xx*      | N- inboard, flat                | 5V fixed out | A- 128  | Z- 1200  | 5V fixed out | A- 128  | Z- 1200         | Conduit Adapter     | motor stator  |
|       | CH- 1.375                | C3- 3.500   | U2- CD5xx*                | UU- Universal:  | outboard*                       |              | B- 150^ | A- 1270^ |              | B- 150^ | A- 1270^        | L- 10 Pin MS w/     | adapter*      |
|       | CJ- 1.625                | T4- 3.875   | UR- CD507/509*            | CD180-CD9xxx*   | T- no inboard,                  |              | L- 240  | 3- 2000  |              | L- 240  | 3- 2000         | Right Angle Plug    |               |
|       | CK- 1.750                | T5- 4.250   | UV- CD43xx,               | U4- ABB         | thru out board                  |              | N- 256  | 4- 2048  |              | N- 256  | 4- 2048         | W- 3' Leads only    |               |
|       | CL- 1.875                | T6- 4.500   | 44xx, 54xx,               | 95mm*           |                                 |              | P- 300  | 5- 2500  |              | P- 300  | 5- 2500         | K- Condulet w/      |               |
|       | CM- 2.000                | T7- 5.375** | 64xx, 65xx*               |                 |                                 |              | E- 360  | D- 4096  |              | E- 360  | D- 4096         | Leads               |               |
|       | CN- 2.125                | T8- 6.750** | UW- CD45xx,               | *N/A AV125      | See manual for all options      |              | B- 480  | 8- 4800  |              | B- 480  | 8- 4800         | T- 5' Flexible Con- |               |
|       | CQ- 2.250                | T9- 7.875** | 75xx, 76xx*               | **N/A AV850     | including metric rotors,        |              | Q- 500  | 9- 5000  |              | Q- 500  | 9- 5000         | duit Terminal Box   |               |
|       | CP- 2.375                |             |                           |                 | grounding kits, and additional  |              |         |          |              |         |                 |                     |               |
|       |                          |             |                           |                 | connector options.              |              |         |          |              |         |                 |                     |               |

# Modular C-Face Mount

AV56 • AV67 • AV85 • AV115 (THIN-LINE II™)

## MAGNETIC, HEAVY MILL DUTY

### AV56, AV67, AV85, & AV115 FEATURES

- Fits Shafts 1/2" to 3 3/16" [10mm to 85mm]
- Fits 4 1/2", 6 3/4", 8 1/2", and 115mm C-Face
- 8 – 5000 PPR
- -40° to 100°C Operation (Rotors -40°C to 150°C)
- High Power Outputs with Full Short Circuit and Wiring Protection
- Diagnostic LED + Alarm
- Sensor-Rotor Gap up to 3X Larger than the Competition
- Immune to Stray Magnetic Fields from Motors/Brakes
- Direct Replacement for Avtron M56, M67, M85, M115 and LakeShore/Northstar SL56, RL67, SL85, MSL115



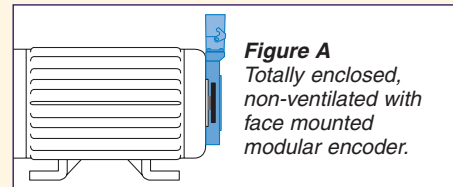
Avtron model AV85, AV56, and AV67 with "P" connector option and diagnostic LED.

### OPTIONS

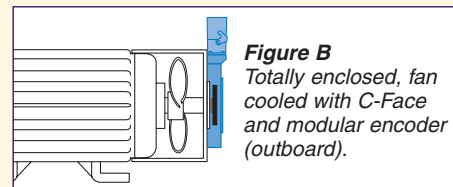
- Stainless Steel Model, AV56S
- Shaft Grounding Kits
- Remote Wiring Base "Q" for mounting under fan/blower covers

## MODULAR ENCODER MOUNTING OPTIONS

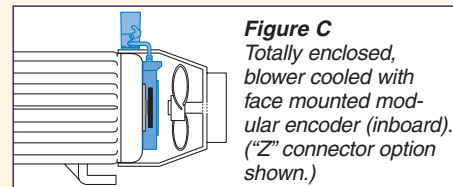
Modular encoders can be easily installed on most AC and DC motors equipped with accessory mounting faces as shown below.



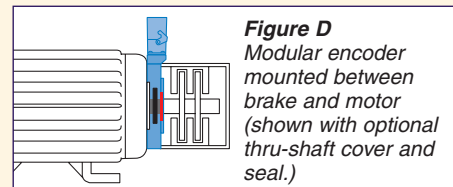
**Figure A**  
Totally enclosed, non-ventilated with face mounted modular encoder.



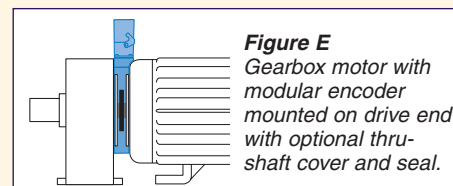
**Figure B**  
Totally enclosed, fan cooled with C-Face and modular encoder (outboard).



**Figure C**  
Totally enclosed, blower cooled with face mounted modular encoder (inboard). ("Z" connector option shown.)



**Figure D**  
Modular encoder mounted between brake and motor (shown with optional thru-shaft cover and seal.)



**Figure E**  
Gearbox motor with modular encoder mounted on drive end with optional thru-shaft cover and seal.

## SELECTION GUIDE

| Model | Housing Type   | Rotor Bore Size <sup>▲</sup> |              |               | Cover Style  | Line Driver   | Single/Left Output PPR |         | Right Output PPR |  | Connector Options  | Special Features  |
|-------|--|------------------------------|--------------|---------------|--|---|------------------------|---------|------------------|--|--|---|
|       |  | Thru Shaft                   | End of Shaft |               |  |   |                        |         |                  |  |  |   |
| AV56A | 1- Single Output:<br>4 1/2", 6 3/4",<br>8 1/2", 115mm<br>Pilot | CA- 1/2"                     | CL- 1 7/8"   | EF- CD180-32x | X- None<br>E- Extended Shaft Cover<br>F- Flat Cover<br>T- Flat Thru-Hole Cover with Shaft Seal | X- None<br>8- 5-24V in/<br>5-15V out hi power<br>9- 5-24V in,<br>5V fixed out | F- 60                  | S- 600  | X- None          | G- 100 V- 900<br>H- 120 J- 960<br>A- 128 Y- 1024<br>L- 240 Z- 1200<br>N- 256 4- 2048<br>P- 300 5- 2500<br>E- 360 D- 4096<br>B- 480 8- 4800<br>R- 512 9- 5000 | G- Plug-in Ind. w/ Northstar pinout<br>P- Plug-in Ind.<br>Q- Plug-in Ind., 18" cable, remote mounting base<br>W- 3' Flex. Cable<br>Z- Plug-in Ind., 3' Flex. Cable | 000- None<br>004- Add Housing Drain<br>9xx- Special Cable Length, xx=feet (see instruction manual for full list.) |
| AV56S |  | CB- 5/8"                     | CM- 2"       | EN- CD36x     |  |   |                        |         | G- 100           |  |  |   |
| AV67A | 2- Dual Output:<br>4 1/2" Pilot*<br>8- 1/2" Pilot*             | CC- 7/8"                     | CN- 2 1/8"   | EP- CD4xx     |  |   | H- 120                 | J- 960  | G- 100           | V- 900   |  |   |
| AV85A |  | CD- 15/16"                   | CQ- 2 1/4"   | E2- CD5xx     |  |   | A- 128                 | Y- 1024 | H- 120           | J- 960   |  |   |
| AV115 |  | CE- 1"                       | CP- 2 3/8"   |               |  |   | L- 240                 | Z- 1200 | A- 128           | Y- 1024  |  |   |
|       |  | CF- 1 1/8"                   | CR- 2 1/2"   |               |  |   | N- 256                 | 4- 2048 | L- 240           | Z- 1200  |  |   |
|       |  | CG- 1 1/4"                   | CS- 2 5/8"   |               |  |   | P- 300                 | 5- 2500 | N- 256           | 4- 2048  |  |   |
|       |  | CH- 1 3/8"                   | CU- 2 7/8"   |               |  |   | E- 360                 | D- 4096 | P- 300           | 5- 2500  |  |   |
|       |  | CI- 1 1/2"                   | TV- 3"       |               |  |   | B- 480                 | 8- 4800 | E- 360           | D- 4096  |  |   |
|       |  | CJ- 1 5/8"                   | T4- 3 1/8"   |               |  |   | R- 512                 | 9- 5000 | B- 480           | 8- 4800  |  |   |
|       |  | CK- 1 3/4"                   | T7- 3 3/16"  |               |  |   |                        |         | R- 512           | 9- 5000  |  |   |

\* Dual Output not available on AV56S.

▲ Rotor Bore Size. See instruction manual for metric sizes.

See manual for all options.

# Solid Shaft Coupled Face or Flange Mount

AV20 • AV25

## COMPETITIVE MODELS

Avtron offers 100% compatible versions to replace competitors' models. Enjoy the superior durability of Avtron encoders with no wiring changes!

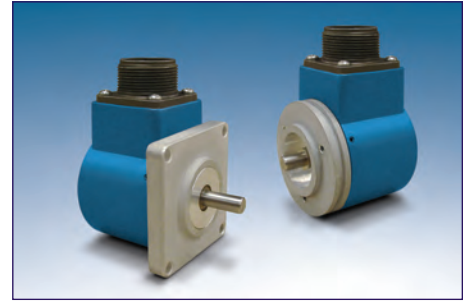
To assist you, Avtron has a full conversion assistant on our web site; here are some common models:

| Model    | Brand    | Avtron Model | Avtron Connector |
|----------|----------|--------------|------------------|
| 62P      | DYN      | AV485        | T                |
| H20      | BEI, DYN | AV20         | A, E, J          |
| H25      | BEI, DYN | AV25         | A, E, J          |
| H56      | DYN      | AV485        | G                |
| HS20     | DYN      | HS25A        | A                |
| HS22     | BEI      | HS25A        | A                |
| HS25     | BEI      | HS25A        | A                |
| HS35     | BEI      | HS35A        | A                |
| HS35     | DYN      | HS35A        | B                |
| HS35M    | NOR      | HS35M        | P                |
| HSD35    | NOR      | HS35M        | P                |
| HS45     | BEI      | M3           | A030             |
| HS56     | NOR      | M4           | P                |
| HS85     | NOR      | AV685        | G                |
| RIM 1250 | NOR      | AV125        | G                |
| RIM 6200 | NOR      | AV485        | G                |
| RIM 8500 | NOR      | AV850        | G                |
| RL67     | NOR      | AV67         | P                |
| SL56     | NOR      | AV56         | P                |
| SL85     | NOR      | AV85         | P                |
| SL1250   | NOR      | AV125        | G                |

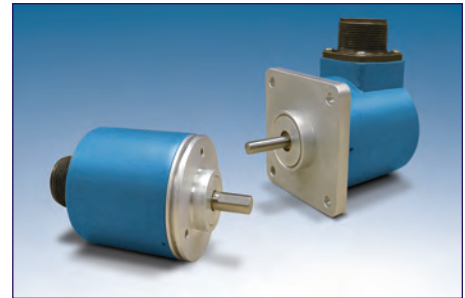
## OPTICAL, LIGHT MILL DUTY

### AV20, AV25 FEATURES

- 1/4", 3/8", and 10mm Shaft Options
- 1 – 16,384 PPR AV20
- 1 – 32,768 PPR AV25
- -40° to 100°C Operation
- Industry Standard Mounting and Form Factor
- Optical Sensor-Rotor Gap up to 8X Larger than the Competition
- Shatterproof Optical Disk
- 100lb Shaft Loads Permitted (2-4X the Competition)



Avtron model AV20 shown with mounting style "1" (left) and mounting style "4" (right).



Avtron model AV25 shown with mounting style "2" (left) and mounting style "4" (right).

DYN = Dynapar ◀ NOR = Northstar/Lakeshore ◀

◀ All brand and product names are trademarks of their respective holders. H20 ® and H25 ® are registered trademarks of BEI.

AV20 available up to 16,384 PPR  
AV25 available up to 32,768 PPR

## SELECTION GUIDE

| Model        | PPR  | Line Driver   | Shaft Size  | Connector Options  | Wiring                 | Mounting Style     | Face/Bolt Pattern   | Seals   | Channels  | Special Features  |   |
|--------------|--|---|---|--|------------------------|--------------------|---|---|---|---|---|
| AV20<br>AV25 | A- 1<br>C- 25<br>F- 60<br>G- 100<br>H- 120<br>K- 200<br>L- 240<br>M- 250<br>N- 256<br>P- 300<br>E- 360<br>Q- 500<br>R- 512<br>S- 600<br>T- 625 | U- 720<br>V- 900*<br>W- 1000<br>Y- 1024<br>Z- 1200<br>1- 1250<br>2- 1440<br>3- 2000<br>4- 2048<br>5- 2500<br>6- 2540<br>7- 3600<br>D- 4096*<br>9- 5000*<br>0- Special | 1- 5-28V (7272)<br>2- 5-28V, open collector (7273)<br>3- 5-15V*(4469)<br>4- 5-28V in, 5V out (7272) | 0- Non-std.<br><b>With Flat</b><br>A- 0.25"<br>B- 0.375"<br>C- 10mm<br><b>Without Flat</b><br>N- 0.25"<br>P- 0.375"<br>R- 10mm | W- 18" cable (pigtail) | A- Side<br>E- End* | <b>AV20</b><br>1- Sq. Flange 2.06", 1.25" mp<br>2- Rnd. Flange 2.0", 1.25" mp<br>3- Sq. Flange 2.06", 1.181" fp<br>4- Rnd. Flange 2.0", 1.181" fp<br><b>AV25</b><br>1- Sq. Flange 2.650", 1.250" mp<br>2- Rnd. Servo Mount 2.500", 1.250" mp<br>3- Rnd. Servo Mount 2.625", 2.500" mp<br><i>mp = male pilot fp = female pilot</i> | <b>X- None</b><br><b>AV25</b><br>1- 3x 10-32 @ 1.875"<br>2- 4x 4-40 @ 1.272" ^<br>3- 4x 4-40 @ 2"<br>4- 3x 6-32 @ 2"<br><b>AV20</b><br>5- 4x 6-32 @ 2"<br>6- 4x 10-32 @ 1.625"<br>7- 3x 4-40 @ 1.5" | X- None<br>A- Shaft Sealed**<br>B- Bearing Sealed | <b>With Comp.</b><br>A- A,A,B,B<br>Z,Z***<br>B- A,A,B,B<br>D- A,A<br><b>Without Comp.</b><br>E- A,B,Z<br>F- A,B | <b>000-</b> None<br><b>00W-</b> Connector on 18" cable: Use w/ Option "T"- "U"<br><b>9xx-</b> Specify cable length<br>xx=feet (use w/ Option "W") |

See manual for all options.

### Connector Options

#### Mounted on Encoder

| 10 Pin MS  | 6 Pin MS   | 7 Pin MS   | 8 Pin M12   |
|--|--|--|---|
| A- w/o plug (std. phasing)<br>B- w/o plug (reverse phasing)<br>C- w/ plug (std. phasing)<br>D- w/ plug (reverse phasing) | E- w/o plug (std. phasing)<br>F- w/o plug (reverse phasing)<br>G- w/ plug (std. phasing)<br>H- w/ plug (reverse phasing) | J- w/o plug (std. phasing)<br>K- w/o plug (reverse phasing)<br>M- w/ plug (std. phasing)<br>N- w/ plug (reverse phasing) | T- w/o plug (Turck Pinout)<br>U- w/o plug (US Pinout) |

- \* AV25 Only.
- \*\* N/A with AV20 Mounting Styles "3" & "4".
- \*\*\* N/A with AV25 Mounting Style "3".
- \*\*\*\* N/A with MS 6 or 7 Pin Connector.
- ^ Only available with AV25 Mounting Style "3".

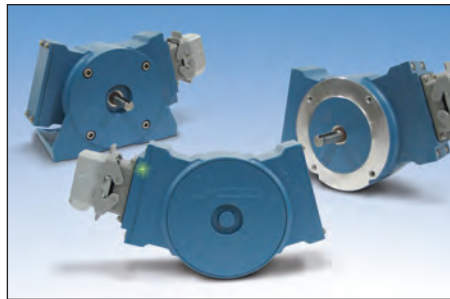
# Solid Shaft Coupled NEMA 56C Face & Foot

AV485 (SMARTach II™)

## MAGNETIC, SEVERE DUTY

### AV485 FEATURES

- 5/8" Stainless Steel Shaft
- 8 – 5000 PPR
- -40° to 120°C Operation
- Replaceable Sensors to Maximize Uptime
- Diagnostic LED, Remote Alarm
- High Power Outputs with Full Short Circuit and Wiring Protection
- Direct Replacement for Avtron M485, Lakeshore/Northstar RIM 6200™, Dynapar H56 Rotopulser™
- The Most Rugged Solid Shaft Encoder Available!



High resolution performance in a tough package. (Model AV485 SMARTach II encoder shown with connector option "P" with diagnostic LED, remote alarm.)

### OPTIONS

- Dual Shaft
- Second Isolated Output
- Overspeed Switch
- Shaft Grounding Brush
- Foot Mounting Bracket

### COUPLINGS

Avtron can provide couplings for many foot and flange mounting applications on motors. Consult the factory for specifications and details.



Flexible disk couplings.

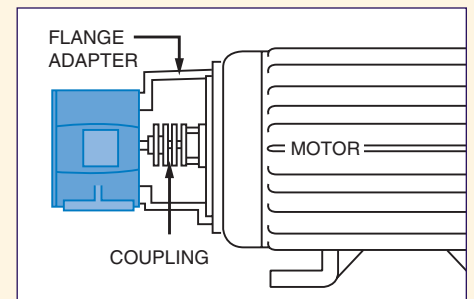
### SELECTION GUIDE

| Model | Temperature Rating  | Foot Bracket                                  | Style  | Left Module                    |                           | Right Module                   |                           | Connector Options   | Modifications  |  |
|-------|---|---|--|--------------------------------|---------------------------|--------------------------------|---------------------------|---|--|--|
|       |   |   |  | Line Driver                    | PPR                       | Line Driver                    | PPR                       |   |  |  |
| AV485 | N- -20°C to 80°C<br>C- -40°C to 80°C<br>H- -20°C to 120°C | X- None<br>1- Standard<br>2- BC42/46<br>Style | S- Single Shaft<br>D- Dual Shaft<br>G- Grounding | X- None                        | X- none S- 600            | X- None                        | X- none S- 600            | P- Ind. w/ Plug<br>G- Ind. w/ Plug (Northstar Pinout)<br>C- 10 Pin MS w/ Plug & Flex. Conduit Adapter<br>L- 10 Pin MS w/ Right Angle Plug<br>W- 3' Leads only<br>K- Condulet w/ Leads<br>T- 5' Flex. Conduit Terminal Box | 000- none<br>002- select alt. PPR codes <sup>^</sup> |  |
|       |   |   |  | 8- 5-24V in/5-15V out hi power | C- 50 <sup>^</sup> V- 900 | 8- 5-24V in/5-15V out hi power | C- 50 <sup>^</sup> V- 900 |   |  |  |
|       |   |   |  | 9- 5-24V in, 5V fixed out      | F- 60 J- 960              | 9- 5-24V in, 5V fixed out      | F- 60 J- 960              |   |  |  |
|       |   |   | A- 128 A- 1270 <sup>^</sup>                      | H- 120 Z- 1200                 |                           | H- 120 Z- 1200                 |                           |   |  |  |
|       |   |   | B- 150 <sup>^</sup> 3- 2000                      | A- 128 A- 1270 <sup>^</sup>    |                           | A- 128 A- 1270 <sup>^</sup>    |                           |   |  |  |
|       |   |   | L- 240 4- 2048                                   | B- 150 <sup>^</sup> 3- 2000    |                           | B- 150 <sup>^</sup> 3- 2000    |                           |   |  |  |
|       |   |   | N- 256 5- 2500                                   | L- 240 4- 2048                 |                           | L- 240 4- 2048                 |                           |   |  |  |
|       |   |   | P- 300 D- 4096                                   | N- 256 5- 2500                 |                           | N- 256 5- 2500                 |                           |   |  |  |
|       |   |   | E- 360 8- 4800                                   | P- 300 D- 4096                 |                           | P- 300 D- 4096                 |                           |   |  |  |
|       |   |   | B- 480 9- 5000                                   | E- 360 8- 4800                 |                           | E- 360 8- 4800                 |                           |   |  |  |
|       |   |   | Q- 500 0- special                                | B- 480 9- 5000                 |                           | B- 480 9- 5000                 |                           |   |  |  |
|       |   |   | R- 512   | Q- 500 0- special              |                           | Q- 500 0- special              |                           |   |  |  |
|       |   |   | R- 512   |                                | R- 512                    |                                |                           |   |  |  |

<sup>^</sup> To specify this PPR, also specify modification code 002.

## NEMA 56C FACE

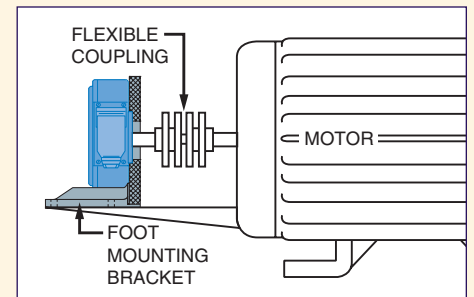
Historically, this is the most common encoder mounting system for DC motors. NEMA 56C Face provides a 4 1/2" flange (with 5.88" bolt circle) for flange adapter mounting. Solid shaft encoders are bolted to a flange adapter, and coupled to the motor or remove the flange adapter and mount a modular encoder such as AV850 (pages 4-5).



NEMA 56C Face Mounting.

## FOOT MOUNTING BRACKET OPTION

The AV485 offers an optional foot mount bracket. The AV485 only needs to be aligned once, rather than each time the encoder is serviced.



Direct coupled encoder. Bracket Part Numbers: BC46 Style: A25448, Standard: A36261

# Hollow Shaft Mount

HS25A • HS35A

## APPLICATIONS

Hollow shaft mounted encoders are ideal for many applications:

- TEFC Motors without Machined C-Faces (**Figure 1**)

A hollow shaft mounted encoder like the HS25A, HS35A, or M4 eliminates the need for a machined C-Face and minimizes assembly time.

- Motors Equipped with Disk or Shoe Brakes (**Figure 2**)

Motors equipped with either disk or shoe type brakes can cause significant shaft deflection when engaged. A hollow shaft mounted encoder will not be affected by this shaft movement.

- Motors with Sleeve or Roller Bearings (**Figure 3**)

Motors built with sleeve or roller bearings like MD frames or elevator motors, can experience a significant amount of axial shaft movement or end float. A flange or foot mounted encoder can have its bearings damaged by this movement. Hollow shaft mounted encoders mount on the shaft and move with it, avoiding damage.

Hollow shaft mounted encoders can also be mounted on:

- Non-Driven Process Rolls (**Figure 4**)
- Gear Boxes
- Line Shafts

In many cases, you can eliminate belt and chain drives in these applications, greatly increasing reliability.

## OPTICAL, LIGHT MILL DUTY

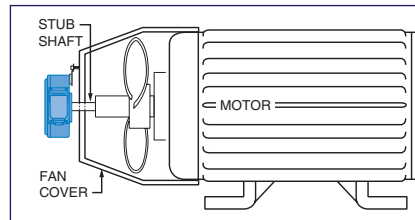
### HS25A, HS35A FEATURES

- HS25A: Fits Shafts from 3/8" to 3/4" [6mm to 16mm]
- HS35A: Fits Shafts from 1/2" to 1" [12mm to 20mm]
- 1 – 8192 PPR
- -20° to 100°C Operation
- Field Resizeable by Swapping Inserts
- Wide-Gap Sensor
- Shatterproof Optical Disk

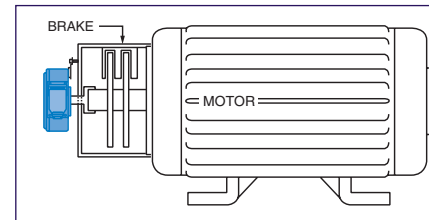


Avtron model HS35A (left) and model HS25A (right) shown with connector option "A".

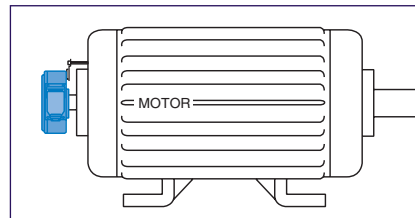
## HOLLOW SHAFT APPLICATION FIGURES



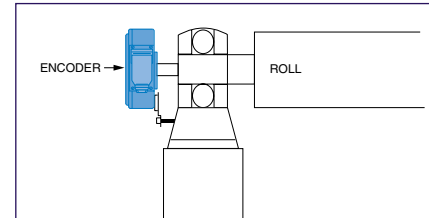
Shaft mounted on totally enclosed fan cooled motor. (**Figure 1**)



Shaft mounted outboard of disk brake. (**Figure 2**)



Shaft mounted on totally enclosed non-ventilated motor. (**Figure 3**)



Shaft mounted encoder on process roll. (**Figure 4**)

## SELECTION GUIDE

| Model                     | PPR   | Line Driver  | Bore Size  | Connector Options  | Mounting Style  | Protection                         | Anti-Rotation Tether Options  | Channels   | Special Features   |
|---------------------------|---|--|--|--|---|------------------------------------|---|--|--|
| HS25A<br>HS35A            | A- 1*<br>C- 25*<br>F- 60*<br>G- 100<br>H- 120*<br>K- 200<br>L- 240<br>M- 250<br>N- 256*<br>P- 300*<br>E- 360*<br>Q- 500<br>R- 512<br>S- 600<br>T- 625*<br>U- 720* | V- 900*<br>W- 1000<br>Y- 1024<br>Z- 1200<br>1- 1250*<br>2- 1440*<br>3- 2000<br>4- 2048<br>5- 2500*<br>6- 2540*<br>7- 3600*<br>8- 4000*<br>D- 4096*<br>9- 5000*<br>0- Special | 1- 5-28V (7272)<br>2- 5-28V, Open Collector (7273)<br>4- 5-28V in, 5V out (7272) | 0- Non-Std. Shaft<br>A- 3/8*<br>B- 1/2*<br>C- 5/8*<br>D- 3/4**<br>E- 7/8*<br>F- 1*<br>L- 6mm*<br>X- No inserts<br>U- all U.S. inserts<br>Z- all metric inserts | W- 18" flex. cable<br>E- End-of-Shaft* (HS25A)<br>U- Universal End-of-Shaft & Thru Shaft* (HS35A) | 0- None<br>1- Basket               | X- None<br>A- Fan cover, 1/4-20<br>B- Fan cover, 5/16-18<br>C- Fan cover, 3/8-16<br>D- Fan cover, all<br>E- 4.5" C-Face<br>F- 8.5" C-Face<br>M- 4.5" C-Face or Fan Cover<br>U- Universal (all tether options) | A- A,Ā,B,Ī, Z, Z̄<<br>B- A,Ā,B,Ī<<br>D- A,Ā<<br>E- A,B,Z<<br>F- A,B< | 000- None<br>00W- Connector on 18" cable: Use w/ Option "E"-N, "T"-U)<br>9xx- Specify cable length xx=feet (use w/ Option "W") |
| <b>Connector Options</b>  |   |  |  |  |   |                                    |   |  |  |
| <b>Mounted on Encoder</b> |   |  |  |  |   |                                    |   |  |  |
|                           |   |  | <b>10 Pin MS</b>   |  | <b>6 Pin MS</b>   |                                    | <b>7 Pin MS</b>   |  | <b>8 Pin M12</b>   |
|                           |   |  | A- w/o plug (std. phasing)   | E- w/o plug (std. phasing)   | J- w/o plug (std. phasing)  | K- w/o plug (Dynapar HS35 phasing) |   | T- w/o plug (Turck Pinout)   | U- w/o plug (US Pinout)  |
|                           |   |  | B- w/o plug (Dynapar HS35 phasing)   | F- w/o plug (Dynapar HS35 phasing)   | M- "J" w/ plug  | N- "K" w/ plug                     |   |  |  |
|                           |   |  | C- "A" w/ plug   | G- "E" w/ plug   |   |                                    |   |  |  |
|                           |   |  | D- "B" w/ plug   | H- "F" w/ plug   |   |                                    |   |  |  |

\* HS25A only.      ^ HS35A only.

\*\* No insert for HS25A.

<< Only available with 6 & 7 pin MS connectors.

< Only available with cable, 10 pin MS, 8 pin M12 connectors.

# Hollow Shaft Mount

## HS35M

### MAGNETIC, MILL DUTY

### HS35M FEATURES

- Fits Shafts from 1/2" to 1 1/8" [12mm to 30mm]
- 1 – 3072 PPR
- -20° to 85°C Operation
- Field Resizeable by Swapping Inserts
- Magnetic Technology Shrugs off Dirt, Dust, and Moisture
- Industrial Connector Eliminates Soldering
- Optional High Power Outputs with Full Short Circuit and Wiring Protection



Avtron model HS35M shown with connector option "P" (left) and connector option "A" (right).

### STUB SHAFTS

For hollow shaft mounted encoders, Avtron has a complete selection of stub shafts to fit over 50 different motor configurations.



Stub shaft kits.

### WIDE-GAP TECHNOLOGY

Avtron's optical and magnetic encoders feature Wide-Gap technology, which enables the sensor to ride 2-8X farther from the disk or rotor, which is spinning at full motor speeds. This prevents sensor scraping. As a result, Avtron encoders are more tolerant of shock, vibration, and permit more generous mounting tolerances.

### PROTECTIVE GUARDS

Avtron offers optional guards to protect the encoder from damage, or to provide finger safety when the encoder is not directly adjacent to the motor.



Basket guard.

### SELECTION GUIDE

| Model  | Left & Right Output Range   |   | Line Driver  | Bore Size   |   | Connector Options                      | Mounting Style        | Protection   | Anti-Rotation Tether Options  | Channels   | Special Features |   |  |  |  |                           |  |
|--|---|---|--|---|---|--|-----------------------|--|---|--|------------------|---|--|--|--|---------------------------|--|
| HS35M  | A- 1<br>F- 60<br>G- 100<br>H- 120<br>K- 200<br>L- 240<br>M- 250<br>N- 256<br>P- 300<br>E- 360<br>Q- 500<br>R- 512<br>S- 600<br>U- 720 | V- 900<br>W- 1000<br>Y- 1024<br>Z- 1200<br>1- 1250<br>2- 1440<br>B- 1500<br>3- 2000<br>4- 2048<br>5- 2500<br>C- 3072<br>X- None | 6- 5-24V (7272)<br>8- 5-15V (4125)<br>9- 5-24V in, 5V out (7272) | 0- Non-Std.<br>B- 1/2" P- 12mm<br>C- 5/8" R- 15mm<br>D- 3/4" S- 16mm<br>E- 7/8" W- 20mm<br>F- 1" ^ Y- 25mm ^<br>G- 1 1/8" ^ 3- 30mm ^<br>U- U.S. Universal (all inserts, 1/2"-1")<br>Z- Metric (all inserts, 12mm-20mm) | W- 18" flex. cable<br><br>See manual for all options. | U- Universal End-of-Shaft & Thru Shaft | 0- None<br>1- Basket* | X- None<br>A- Fan cover, 1/4-20<br>B- Fan cover, 5/16-18<br>C- Fan cover, 3/8-16<br>D- Fan cover, all<br>E- 4.5" or 6.75" C-Face<br>F- 8.5" C-Face<br>G- Torque Arm<br>M- 4.5" C-Face or Fan Cover<br>U- Universal (all tether options, excluding "G") | A- A, A-bar, B, B-bar, Z, Z-bar<br>B- A, A-bar, B, B-bar<br>D- A, A-bar<br>E- A, B, Z<br>F- A, B<br>9- All. Enter specific cable length xx=feet under Special Features (Use w/ Connector Option "W"). | 00- None<br>0W- Connector on 18" cable: Use w/ Options "E"- "N", "S"- "U", "Z")                      |                  |   |  |  |  |                           |  |
| <b>Connector Options</b>   |   |   |  |   |   |  |                       |  |   |  |                  |   |  |  |  |                           |  |
| <b>Mounted on Encoder</b>  |   |   |  |   |   | <b>Mounted on 18" cable (0W)</b>       |                       |  |   |  |                  |   |  |  |  |                           |  |
| 10 Pin MS  |   | 10 Pin EPIC   |  | 10 Pin Mini MS/ TwistLock   |   | 12 Pin M23                             |                       | 6 Pin MS**   |   | 7 Pin MS**   |                  | 8 Pin M12**   |  | 10 Pin EPIC**                          |  | 10 Pin Mini MS/ TwistLock |  |
| A- w/o plug (std. phasing)<br>B- w/o plug (Dynapar HS35 phasing)<br>C- "A" w/ plug<br>D- "B" w/ plug |   | P- w/ plug<br>V- w/o plug   |  | R- w/ plug  |   | 2- w/o plug                            |                       | E- w/o plug (std. phasing)<br>F- w/o plug (Dynapar HS35 phasing)<br>G- "E" w/ plug<br>H- "F" w/ plug   |   | J- w/o plug (std. phasing)<br>K- w/o plug (Dynapar HS35 phasing)<br>M- "J" w/ plug<br>N- "K" w/ plug |                  | T- w/o plug (Turck Pinout)<br>U- w/o plug (US Pinout) |  | Q- w/ remote base + plug<br>Z- w/ plug |  | S- w/ plug                |  |

\* Not applicable on dual output.  
^ No insert used for Options "F", "G", "Y", "Z".  
\*\* Only available with 0W special feature.

# Hollow Shaft Mount

M3 • M4

## SELECTING HOLLOW SHAFT ENCODERS

With such a broad range of hollow shaft encoders available, how do you select the best encoder for your application? Encoders on these pages range from Light, Mill Duty weighing less than 1 pound, to Explosion Protected, weighing over 17 pounds!

To choose, consider the environment and application:

Do you have water or oil sprays?

Do you have frequent temperature changes?

Is the application outdoors?

Is the mounting shaft large?

Do you need explosion protection?

The rougher the service environment, the more you need a durable, larger encoder to survive in these conditions.

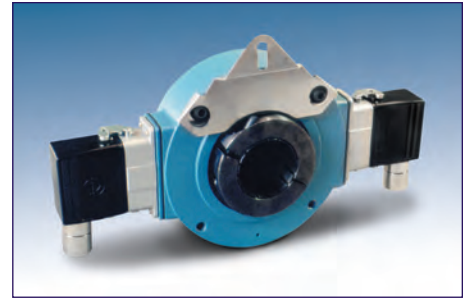
Our encoder guide on page 3 can assist you by application and offers a guide to the terms used.

Our web site also has a "Help Me Choose" expert system to select encoders based on your needs.

## OPTICAL, MILL DUTY M3 FEATURES

- Fits Shafts from 5/8" to 2 3/8" [12mm to 60mm]
- 240 – 2500 PPR
- -40\* to 85°C Operation
- Optical Sensor-Rotor Gap up to 8X Larger than the Competition!
- Shatterproof Optical Disk
- The Most Durable Optical Encoder Available!

\* -40°C rating is optional. -20°C is standard.



Avtron model M3-7 (M4-7) hollow shaft encoder shown with connector option "P" and optional dual output.

## MAGNETIC, HEAVY MILL DUTY M4 FEATURES

- Fits Shafts from 5/8" to 2 3/8" [12mm to 60mm]
- 240 – 1200 PPR
- -40\* to 85°C Operation
- More Resistant to Water, Oil, and Grease than Optical Encoders

\* -40°C rating is optional. -20°C is standard.

## SELECTION GUIDE

| Model     | Bore Size                       | Mounting Style  | Line Driver  | Output  | Base PPR    | Connector Options  | Special Features   |
|-----------|---------------------------------|---|--|---|-------------|--|--|
| <b>M3</b> | 3- 5/8" <b>B-</b> 12mm          | <b>S-</b> End-of-Shaft<br><b>G-</b> End-of-Shaft with Grounding<br><b>T-</b> Thru-Shaft | <b>1-</b> 5-24V<br><b>2-</b> 5-18V hi power<br><b>3-</b> 18-24V hi power<br><b>4-</b> 5-24V in, 5V out | <b>R-</b> Right<br><b>L-</b> Left<br><b>D-</b> Dual | 240    600  | <b>N-</b> Wire Leads Only<br><b>C-</b> MS Bulkhead<br><b>A-</b> "C" w/o plug<br><b>L-</b> MS Elbow<br><b>T-</b> Terminal Box<br><b>K-</b> Condulet<br><b>P-</b> Plug-in Industrial<br><b>Q-</b> Plug-in Industrial, w/ remote + base<br><b>Z-</b> Plug-in Industrial, 3' Flexible Cable<br><b>W-</b> 3' Flexible Cable | <b>000-</b> None (see instruction manual for full list.) |
|           | <b>A-</b> 3/4" <b>C-</b> 16mm   |   |  |   | 256    1024 |  |  |
|           | <b>4-</b> 1" <b>F-</b> 25mm     |   |  |   | 360    1200 |  |  |
|           | <b>5-</b> 1 1/8" <b>G-</b> 48mm |   |  |   | 480    2048 |  |  |
|           | <b>8-</b> 1 1/2" <b>D-</b> 52mm |   |  |   | 512    2500 |  |  |
|           | <b>9-</b> 1 5/8" <b>E-</b> 58mm |   |  |   |             |  |  |
|           | <b>6-</b> 2" <b>H-</b> 60mm     |   |  |   |             |  |  |
|           | <b>J-</b> 2 1/8"                |   |  |   |             |  |  |
|           | <b>7-</b> 2 3/8"                |   |  |   |             |  |  |
|           | See manual for all options.     |   |  |   |             |  |  |

## SELECTION GUIDE

| Model     | Bore Size                       | Mounting Style  | Line Driver  | Left & Right Output Range  | Base PPR   | Marker                     | Connector Options  | Special Features   |  |
|-----------|---------------------------------|---|--|--|--|----------------------------|--|--|--|
| <b>M4</b> | 3- 5/8" <b>B-</b> 12mm          | <b>S-</b> End-of-Shaft<br><b>G-</b> End-of-Shaft with Grounding<br><b>T-</b> Thru-Shaft | <b>1-</b> 5-24V<br><b>2-</b> 5-18V hi power<br><b>3-</b> 12-24V hi power<br><b>4-</b> 5-24V in, 5V out | <b>X-</b> None<br><b>L-</b> Low Range (Base PPR x 1/2)<br><b>M-</b> Medium Range (Base PPR x 1)<br><b>H-</b> High Range (Base PPR x 2) | <b>48-</b> 480<br><b>51-</b> 512<br><b>60-</b> 600 | <b>Z-</b> Marker<br>- None | <b>N-</b> Wire Leads only<br><b>C-</b> MS Bulkhead<br><b>A-</b> "C" w/o plug<br><b>L-</b> MS Elbow<br><b>T-</b> Terminal Box<br><b>K-</b> Condulet<br><b>P-</b> Plug-in Industrial | <b>Q-</b> Plug-in Industrial, w/ remote + base<br><b>Z-</b> Plug-in Industrial, 3' Flexible Cable<br><b>W-</b> 3' Flexible Cable M6 Cable Gland only |  |
|           | <b>A-</b> 3/4" <b>C-</b> 16mm   |   |  |  |  |                            |  |  |  |
|           | <b>4-</b> 1" <b>F-</b> 25mm     |   |  |  |  |                            |  |  |  |
|           | <b>5-</b> 1 1/8" <b>G-</b> 48mm |   |  |  |  |                            |  |  |  |
|           | <b>8-</b> 1 1/2" <b>D-</b> 52mm |   |  |  |  |                            |  |  |  |
|           | <b>9-</b> 1 5/8" <b>E-</b> 58mm |   |  |  |  |                            |  |  |  |
|           | <b>6-</b> 2" <b>H-</b> 60mm     |   |  |  |  |                            |  |  |  |
|           | <b>J-</b> 2 1/8"                |   |  |  |  |                            |  |  |  |
|           | <b>7-</b> 2 3/8"                |   |  |  |  |                            |  |  |  |
|           | See manual for all options.     |   |  |  |  |                            |  |  |  |

# Hollow Shaft Mount

M6 • M7 • XP45

## MAGNETIC, SEVERE DUTY, EXPLOSION PROTECTED

### M6 FEATURES

- Fits Shafts from 1" to 2 3/8"
- 240 – 1200 PPR
- -45°\* to 80°C Operation
- ATEX Certified:  
EEx de IIC T4/Ex II 2G
- Explosion Protected Without the Need for Isolation Barriers

\* M6 std. -20°C, optional -40°C, M7 std. -45°C.



Avtron model M6-7 (M7-5) encoder shown with connector option "W".

## MAGNETIC, SEVERE DUTY, EXPLOSION PROTECTION PENDING

### XP45 FEATURES

- Fits Shafts from 7/8" to 1 1/8"
- 8 – 5000 PPR
- -40° to 100°C Operation
- ATEX, UL, CUL, CSA, CE Pending
- Tested to 300G Shock
- Onboard Diagnostics
- High-Power Outputs with Full Short Circuit and Wiring Protection



Avtron model XP45 severe duty encoder.

## EXTREME APPLICATIONS

All Avtron encoders are designed to be far more durable than units from other companies. Our Severe Duty encoders are designed for the harshest, most extreme environments:

- Need an encoder that works to -45°C?
- Need an encoder that can withstand repeated field wiring errors and short circuits?
- Need an encoder that withstands 300G shock and 20Gs of continuous vibration?
- Need an encoder with full ATEX certification for hazardous, Zone 1 environments?
- Need an encoder for top drives, drawworks, rotary tables, or other oil and gas drilling applications on or off shore?

Avtron's Severe Duty encoders help you easily overcome these challenges and provide extremely long service life.

## SELECTION GUIDE

| Model   | Bore Size*                               | Mounting Style  | Line Driver  | Left & Right Output Range   | Base PPR                      | Marker              | Connector Options | Modifications                    |
|---|--|-----------------|--|---|-------------------------------|---------------------|-------------------|----------------------------------|
| M6<br>M7  | 4- 1"<br>5- 1 1/8"<br>6- 2"<br>7- 2 3/8" | S- End of Shaft | 1- 5-24 VDC<br>2- 5-18 VDC hi power<br>3- 12-24 VDC hi power | X- None<br>L- Low Range (Base PPR x 1/2)<br>M-Medium Range (Base PPR x 1)<br>H- High Range (Base PPR x 2) | 48- 480<br>51- 512<br>60- 600 | Z- Marker<br>— None | T- Terminal Box   | 000- None<br>005- -40°C rating** |
| *Contact factory for metric sizes.<br>**M6 only |  |                 |  |   |                               |                     |                   |                                  |

## SELECTION GUIDE

| Model   | Bore Size*                               | Left PPR   | Right PPR**   | Line Driver | Connector Options               | Tether  | Channels   | Modifications  |
|---|--|--|---|-------------|---------------------------------|---|--|--|
| XP45  | D- 3/4"<br>E- 7/8"<br>F- 1"<br>G- 1 1/8" | AF- 60<br>AG- 100<br>AH- 120<br>AA- 128<br>AL- 240<br>AN- 256<br>AP- 300<br>AE- 360<br>AB- 480<br>AQ- 500<br>AR- 512 | AS- 600<br>AV- 900<br>AJ- 960<br>AY- 1024<br>AZ- 1200<br>A3- 2000<br>A4- 2048<br>A5- 2500<br>AD- 4096<br>A8- 4800<br>A9- 5000 | XX- None    | 8- 5-24 V in, 5-15 out hi power | W- 18" Flex. Cable<br>Y- 10 Pin MS on 18" Cable<br>N- Condulet w/ Leads | X- None<br>G- Torque Arm<br>A- A, Ā, B, B̄<br>Z, Z̄ | 000- none<br>001- Omit rear shaft cover<br>9xx- specify cable length xx=feet (use w/ option "W") |
| *Contact factory for metric sizes.<br>**Dual output available 4Q2010. |  |  |   |             |                                 |   |  |  |
| See manual for all options.   |  |  |   |             |                                 |   |  |  |

# Hollow Shaft Mount

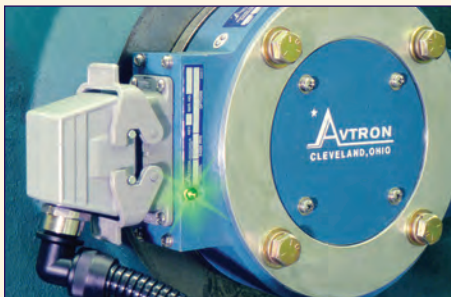
AV685 (SMARTach II™)

## HOLLOW SHAFT ADVANTAGES

- No C-Face Required
- No Couplings to Maintain
- High Tolerance of Axial Shaft Movement
- No Misalignment Issues
- Reduced Installation Costs

## ADVANCED DIAGNOSTICS

Many Avtron encoders feature our self-diagnostic system. The microprocessor-based system continuously monitors the output of the encoder for signal quality. A red/green LED and an alarm contact indicate if the signal is nearing specification limits. Operators can replace the removable sensor module or correct mechanical issues before an actual failure occurs.



SMARTach II Diagnostic LED (AV850 shown).

## MAGNETIC, SEVERE DUTY

### AV685 FEATURES

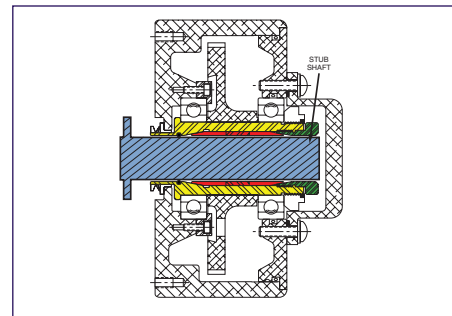
- Fits Shafts with Diameter of 1 1/8"
- 8 – 5000 PPR
- -40° to 120°C Operation
- Replaceable Sensors to Maximize Uptime
- Diagnostic LED, Alarm Contact
- High Power Outputs with Full Short Circuit and Wiring Protection
- The Most Durable Hollow Shaft Encoder Available!
- Auto-Centering Spline Shaft System for Perfect Fit Every Time.
- Option: Overspeed Switch



Avtron model AV685 SMARTach II encoder with connector option "P" and diagnostic LED.

## HOLLOW SHAFT/TETHER MOUNTED

This is the most common encoder mounting system: hollow shaft encoders fit over the shaft and clamp onto it. As the shaft rotates, so does the disk or rotor of the encoder. An anti-rotation or torque arm prevents the housing from also rotating. Avtron hollow-shaft encoders feature our Wide-Gap technology for shock and vibration resistance, enhanced with shatter-proof optical disks or chip-resistant magnetic rotors.



Hollow shaft configuration (AV685 shown).

## SELECTION GUIDE

| Model | Temperature Rating  | Tether                            | Style   | Left Module  |  | Right Module   |  | Connector Options   | Modifications  |
|-------|---|-----------------------------------|---|--|--|--|--|---|--|
|       |   |                                   |   | Line Driver  | PPR  | Line Driver  | PPR  |   |  |
| AV685 | N- -20°C to 80°C<br>C- -40°C to 80°C<br>H- -20°C to 120°C | X- None<br>1- B21958 threaded rod | E- Standard (EOS)<br>T- Thru Shaft<br>G- Grounding<br>O- Overspeed Switch | X- None<br>8- 5-24V in/5-15V out hi power<br>9- 5-24V in, 5V fixed out | X- none R- 512<br>C- 50 <sup>^</sup> S- 600<br>F- 60 V- 900<br>G- 100 J- 960<br>H- 120 Y- 1024<br>A- 128 Z- 1200<br>B- 150 <sup>^</sup> A- 1270 <sup>^</sup><br>L- 240 3- 2000<br>N- 256 4- 2048<br>P- 300 5- 2500<br>E- 360 D- 4096<br>B- 480 8- 4800<br>Q- 500 9- 5000 | X- None<br>8- 5-24V in/5-15V out hi power<br>9- 5-24V in, 5V fixed out | X- none R- 512<br>C- 50 <sup>^</sup> S- 600<br>F- 60 V- 900<br>G- 100 J- 960<br>H- 120 Y- 1024<br>A- 128 Z- 1200<br>B- 150 <sup>^</sup> A- 1270 <sup>^</sup><br>L- 240 3- 2000<br>N- 256 4- 2048<br>P- 300 5- 2500<br>E- 360 D- 4096<br>B- 480 8- 4800<br>Q- 500 9- 5000 | P- Ind. w/ Plug<br>G- Ind. w/ Plug (Northstar Pinout)<br>C- 10 Pin MS w/ Plug & Flex. Conduit Adapter<br>L- 10 Pin MS w/ Right Angle Plug<br>W- 3' Leads only<br>K- Condulet w/ Leads<br>T- 5' Flex. Conduit Terminal Box | 000- none<br>002- select alt. PPR codes <sup>^</sup> |

See manual for all options.

<sup>^</sup> To specify this PPR, also specify modification code 002.

# Output Specifications & Compatible Models

## OUTPUT SPECIFICATIONS – ALL ENCODER MODELS

| OUTPUT CHART 0                               |    | Voltage Input (Vin) | Output Current                | Protection                                | Maximum Cable Drive (feet)        |
|--|----|---------------------|-------------------------------|---|-----------------------------------|
| AV20, AV25, HS25A, HS35A Line Driver Options | 1  | 5-28 VDC            | 50mA                          | Reverse Voltage, Transient, Short Circuit | 500 ft@5V, 250 ft@12V, 125 ft@24V |
|  | 2  | 5-28 VDC            | 50mA sink max, (add resistor) |   | 500 ft.                           |
|  | 3* | 5-15 VDC            | 80mA                          |   | 1000 ft.                          |
|  | 4  | 5-28 VDC (5V out)   | 50mA                          |   | 500 ft.                           |

\* Available only on AV25, no short circuit protection for this option.

| OUTPUT CHART 1                     |   | Voltage Input (Vin) | Output Current | Protection                                      | Maximum Cable Drive (feet)         |
|------------------------------------|---|---------------------|----------------|---|------------------------------------|
| M3, M4, M6, M7 Line Driver Options | 1 | 5-24 VDC            | 80mA           | Reverse Voltage, Transient, Short Circuit       | 1000 ft@5V, 500 ft@12V, 200 ft@24V |
|                                    | 2 | 5-18 VDC            | 1500mA         | Reverse Voltage, Transient                      | 2000 ft.                           |
|                                    | 3 | 12-24 VDC           | 50mA           | Reverse Voltage, Transient, Short Circuit (low) | 1000 ft.                           |
|                                    | 4 | 5-24 VDC (5V out)*  | 80mA           | Reverse Voltage, Transient, Short Circuit       |                                    |

\* N/A on M6 and M7.

| OUTPUT CHART 2   |    | Voltage Input (+V) | Output Current | Protection  | Maximum Cable Drive (feet)         |
|--|----|--------------------|----------------|---|------------------------------------|
| AV56, AV56S, AV67, AV85, AV115 AV125, AV485, AV685, AV850, HS35M, XP45 Line Driver Options | 6* | 5-24 VDC           | 80mA           | Reverse Voltage, Enhanced Transient, Enhanced Short Circuit | 1000 ft@5V, 500 ft@12V, 250 ft@24V |
|  | 8  | 5-24 V<br>5-15 V*  | 3000mA         |   | 2000 ft                            |
|  | 9  | 5-24 VDC (5V out)  | 40mA           |   | 500 ft@5V, 250 ft@12V, 125 ft@24V  |

\* HS35M only.

## HIGH POWER, FULL PROTECTION

Many of our newest encoder models feature our universal 5-24V, high-power line driver outputs to drive long cables and offer full wiring and short

circuit protection. On these models (shown in Output Chart 2 above), specify line driver “8” for maximum flexibility and performance!

## COMPATIBLE MODELS

Industrial factories need equipment to last for decades, not years. Avtron proudly manufactures these high-quality, durable models to keep your mill running without costly physical revamps, wiring changes, or drive replacements: M460 Sandwich Encoders, M185 Unipulser™, M925 “PY” Style, and K661 and K662 Frequency to Voltage Converters. (K66x models enable analog tach replacement).



Avtron models (from left) M925, K661, M460, and M185 (front).

## AVTRON SUPPORT

Unlike most competitors, Avtron offers 24x7x365 engineering support for our encoder products at no charge!

Technical support is provided by application engineers familiar not only with our products, but also with industrial applications, motors, etc., to provide complete product support.



Avtron Industrial Automation, Inc., Digital Facility, Independence, Ohio.

Avtron’s Quality System is Certified to ISO 9001:2000. We are a vertically integrated manufacturing company whose facilities include:

- Machine shop with the latest in high performance machine tools.
- Circuit board assembly.
- Fabrication shop for sheet metal, junction boxes, and other welded and fabricated items.
- Test department that performs incoming inspections, environmental testing, final testing, and quality control.

## REPAIRS

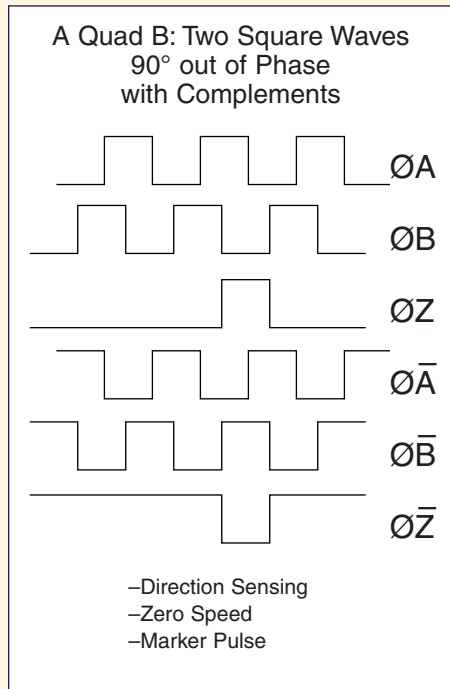
Many Avtron encoders can be repaired or refurbished at our factory. Obtain a return material advice (RMA) number prior to returning units. Please call us for details or receive your RMA online instantly through our web site at [www.avtron.com/rma.htm](http://www.avtron.com/rma.htm)

# Encoder & Tachometer Specifications

## OUTPUT DESCRIPTION

Most Avtron encoders have a two square wave output: A Quad B (A, B) 90° out of phase, with complements ( $\bar{A}$ ,  $\bar{B}$ ). Marker pulses (Z) are available on most units. Resolver and sine-cosine outputs also available on Admotec components.

## OUTPUT WAVEFORMS



## OTHER AVTRON MODELS

Avtron still services and supports older designs like the units listed in the table below. Please consult our web site to update older models or call us for upgrade/replacement options.

| Model      | Replacement Model |
|------------|-------------------|
| M190, M285 | AV850             |
| M585, M685 | AV685             |
| M485, M785 | AV485             |
| M727A      | AV485             |
| M737A      | AV485             |
| M738, M938 | AV485             |
| M940, M945 | AV485             |
| M1250      | AV125             |

| Enclosure           | Mounting Style                | Model   | Sensing Circuit   | Output Specifications (page 13) |
|---------------------|-------------------------------|---------|-------------------|---------------------------------|
| Components          | Modular Mount                 | KA      | Magnetic          | Sine-Cosine 1V p-p              |
|                     | Modular Mount                 | KX, PXL | Magnetic          | 3.3-5V @ 6mA                    |
|                     | Modular Mount                 | Rotasyn | Magnetic Resolver | 1-6V, ~0.5X Transformation      |
| Light Mill Duty     | Face or Foot                  | AV20    | Optical           | See Output Chart 0              |
|                     | Face or Foot                  | AV25    | Optical           | See Output Chart 0              |
|                     | Hollow Shaft                  | HS25A   | Optical           | See Output Chart 0              |
|                     | Hollow Shaft                  | HS35A   | Optical           | See Output Chart 0              |
| Mill Duty           | Hollow Shaft                  | M3      | Optical           | See Output Chart 1              |
|                     | Hollow Shaft                  | HS35M   | Magnetic          | See Output Chart 2              |
| Heavy Mill Duty     | Modular Mount on 12.5" C-Face | AV125   | Magnetic          | See Output Chart 2              |
|                     | Modular Mount on 8.5" C-Face  | AV850   | Magnetic          | See Output Chart 2              |
|                     | Modular Mount on 8.5" C-Face  | AV85    | Magnetic          | See Output Chart 2              |
|                     | Modular Mount on 4.5" C-Face  | AV56    | Magnetic          | See Output Chart 2              |
|                     | 115mm                         | AV115   |                   |                                 |
|                     | Modular Mount on 6.75" C-Face | AV67    | Magnetic          | See Output Chart 2              |
|                     | Hollow Shaft                  | M4      | Magnetic          | See Output Chart 1              |
|                     | Hollow Shaft                  | M7      | Magnetic          | See Output Chart 1              |
| Severe Duty         | 56C Face or Foot              | AV485   | Magnetic          | See Output Chart 2              |
|                     | Hollow Shaft                  | AV685   | Magnetic          | See Output Chart 2              |
| Explosion Protected | Hollow Shaft                  | M6      | Magnetic          | See Output Chart 1              |
|                     | Hollow Shaft                  | XP45*** | Magnetic          | See Output Chart 2              |

\* -40°C rating is optional.

\*\* 3600 RPM max. for bore  $\geq 2"$  [52mm].

\*\*\* XP45 ATEX, UL, CUL, CSA, CE Pending.

^ Optional, standard temperature range is -40° to 130°C.

^^ Analog position signals of resolver are converted to digital signals by external analog-to-digital board not provided by Avtron.

| Enclosure           | Shaft or Bore Size            | Pulses Per Revolution (PPR) | Temp. Range     | Speed Range           | Options Available |            |                 |                     |              | Comments   | Page |
|---------------------|-------------------------------|-----------------------------|-----------------|-----------------------|-------------------|------------|-----------------|---------------------|--------------|--|------|
|                     |                               |                             |                 |                       | No. of Outputs    | Thru Shaft | Grounding Brush | Replaceable Sensors | Diag-nostics |  |      |
| Components          | 5/16" to 10" [8mm-250mm]      | 1-720 CPR                   | -40° to 115°C   | 100KRPM or 500 KHz    | 1                 | Yes        | No              | Yes                 | No           | OEM Solution for Sine-Cosine Applications.               | 16   |
|                     | 5/16" to 10" [8mm-250mm]      | 1-45000                     | -40° to 115°C   | 100KRPM or 500 KHz    | 1                 | Yes        | No              | Yes                 | No           | Magnetic Encoder Components for OEM Integration.         | 16   |
|                     | 5/32" to 1 3/4" [4mm-45mm]    | ^^A/D Dependent             | -60° to 260°C^A | 20KRPM or 200 KHz     | 1                 | Yes        | No              | No                  | No           | Resolver for OEM Applications.                           | 16   |
| Light Mill Duty     | 1/4", 3/8" [10mm]             | 1-16384                     | -40° to 100°C   | 6000 RPM or 125 KHz   | 1                 | No         | No              | No                  | No           | Replaces all 2" Encoders.                                | 6    |
|                     | 1/4", 3/8" [10mm]             | 1-32768                     | -40° to 100°C   | 6000 RPM or 125 KHz   | 1                 | No         | No              | No                  | No           | Replaces all 2.5" Encoders.                              | 6    |
|                     | 3/8" to 3/4" [6mm-16mm]       | 1-8192                      | -20° to 100°C   | 6000 RPM or 125 KHz   | 1                 | No         | No              | No                  | No           | Low Cost. Avtron Toughness.                              | 8    |
|                     | 1/2" to 1" [12mm-20mm]        | 100-5000                    | -20° to 100°C   | 6000 RPM or 125 KHz   | 1                 | Yes        | No              | No                  | No           | Low Cost. Avtron Toughness.                              | 8    |
| Mill Duty           | 5/8" to 2 3/8" [12mm-60mm]    | 240-2500                    | -40°* to 85°C   | 5000 RPM** or 150 KHz | 1 or 2            | Yes        | Yes             | No                  | No           | M3 Durability in a Hollow Shaft Design.                  | 10   |
|                     | 1/2" to 1 1/8" [12mm-30mm]    | 1-2500                      | -20° to 85°C    | 4700 RPM or 165 KHz   | 1 or 2            | Yes        | No              | No                  | No           | HS35 Form Factor with Magnetic Durability.               | 9    |
| Heavy Mill Duty     | 1 3/8" to 7 7/8" [35mm-200mm] | 8-8192                      | -40° to 100°C   | 4400 RPM or 165 KHz   | 1 or 2            | Yes        | No              | Yes                 | Yes          | Replaces M1250, RIM 1250™, SL1250™.                      | 4    |
|                     | 5/8" to 4 1/2" [12mm-115mm]   | 8-5000                      | -40° to 100°C   | 4400 RPM or 165 KHz   | 1 or 2            | Yes        | Yes             | Yes                 | Yes          | Replaces M285, RIM 8500™, GE ANDG and Dynapar™ 97AN.     | 4    |
|                     | 1/2" to 3 3/16" [11mm-85mm]   | 8-5000                      | -40° to 100°C   | 5000 RPM or 165 KHz   | 1 or 2            | Yes        | Yes             | No                  | Yes          | Economical Heavy Mill Duty. Replaces SL85™.              | 5    |
|                     | 1/2" to 3 3/16" [11mm-85mm]   | 8-5000                      | -40° to 100°C   | 5000 RPM or 165 KHz   | 1 or 2            | Yes        | Yes             | No                  | Yes          | Heavy Mill Duty. Replaces SL56™, MSL115™.                | 5    |
|                     | 1/2" to 3 3/16" [11mm-85mm]   | 8-5000                      | -40° to 100°C   | 5000 RPM or 165 KHz   | 1                 | Yes        | Yes             | No                  | Yes          | Economical, Heavy Mill Duty. Replaces RL67™.             | 5    |
|                     | 5/8" to 2 3/8" [12mm-60mm]    | 240-1200                    | -40°* to 85°C   | 5000 RPM** or 150 KHz | 1 or 2            | Yes        | Yes             | No                  | No           | Hollow Shaft. Replaces HS56™, HS85™                      | 10   |
|                     | 1" to 1 1/8"                  | 240-1200                    | -45° to 80°C    | 5000 RPM** or 150 KHz | 1 or 2            | No         | No              | No                  | No           | Ultra Low Temperature Outdoor Applications.              | 11   |
| Severe Duty         | 5/8"                          | 8-5000                      | -40°* to 120°C  | 5000 RPM or 165 KHz   | 1 or 2            | No         | Yes             | Yes                 | Yes          | Ideal for the Toughest Environments.                     | 7    |
|                     | 1 1/8"                        | 8-5000                      | -40°* to 120°C  | 4000 RPM or 165 KHz   | 1 or 2            | Yes        | Yes             | Yes                 | Yes          | Ideal for Large Motors.                                  | 12   |
| Explosion Protected | 1" to 2 3/8" [25mm-60mm]      | 240-1200                    | -40°* to 80°C   | 5000 RPM** or 150 KHz | 1 or 2            | No         | No              | No                  | No           | Ideal for DC Motors in Oil Drilling and Gas Pipelines.   | 11   |
|                     | 7/8" to 1 1/8" [22mm-28mm]    | 8-5000                      | -40° to 100°C   | 5000 RPM or 165 KHz   | 1                 | Yes        | No              | No                  | Yes          | Built for Extremely Shock & High Vibration Applications. | 11   |

Features and specifications subject to change without notice.

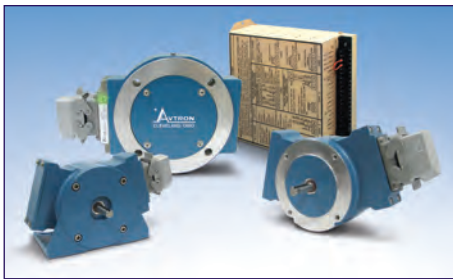
**CE** All Avtron and Admotec products shown in the specifications table above are CE Rated.

SMARTach™, SMARTach II™, THIN-LINE II™, and Unipulser™ are trademarks of Avtron.  
Viton™ is a trademark of DuPont for Fluoroelastomers. H20 ® and H25 ® are registered trademarks of BEI.

# Encoder Options and Accessories

## ANALOG RETROFITS

Avtron's retrofit solutions replace obsolete tachogenerators such as GE 5BC42, 5BC46, & 5BC66 with durable magnetic encoders and signal converters, without any drive changes.



Model AV850 encoder, K661, AV485 with foot mount, and AV485 encoder.

## SHAFT GROUNDING BRUSHES

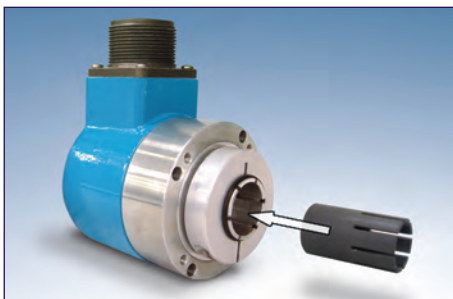
AC motor shaft current can cause damage to both the motor and the encoder bearings. Most Avtron encoders have an integral shaft grounding brush available as an option.



Model M3 encoder with shaft grounding brush.

## MOTOR SHAFT ISOLATION

The HS25A and HS35A hollow shaft encoders are available with a shaft isolating insert to insulate the encoder from the motor shaft. This eliminates induced shaft currents common to AC motor applications. The HS35M features a fully insulated housing for shaft isolation.



HS25A encoder with standard motor shaft isolation insert.

*Avtron has been the most successful supplier of rugged feedback solutions for over 40 years. You can count on Avtron for reliable products that will handle a wide variety of jobs. Our industrial manufacturing capability, and 100% testing requirement guarantees the quality of every product.*



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## OVERSPEED SWITCHES

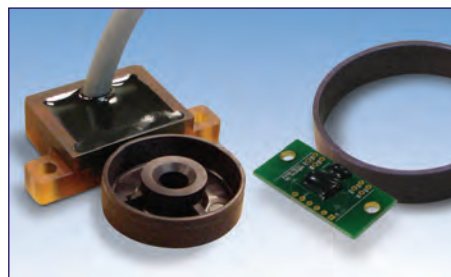
The AV850, AV85, AV485, and AV685 encoders can be mounted with a mechanical overspeed switch on the same shaft assembly. This single assembly eliminates the need for couplings or foot mounting pedestals.



M685 SMARTach™ shown with overspeed switch. AV850, AV85, and AV485 versions also available.

## MODULAR ENCODER COMPONENTS

Admotec brand modular encoders provide OEM's with compact, durable solutions where a full-size encoder is not practical. KA offers sine-cosine output; KX & PXL are standard quadrature.



PXL encoder sensor with 29mm wheel (left) and KX encoder sensor with 40mm (right).

## MODULAR RESOLVER COMPONENTS

Admotec Rotasyn resolver components offer rotary absolute position feedback with OEM hollow shaft mount. Rotasyn also has ultra-high temperature performance and the ability to run immersed.



Rotasyn rotors (left) and stators (right).

## SPEED METERS

The K753 Mill Duty Speed Indicator accepts input from any encoder and displays speed in any engineering units. It also provides a serial output for process computers. Programmable limits are provided for over speed and under speed protection.



Avtron model K753 Speed Indicator.