Nidec | AVTRON ENCODERS

Nidec-Avtron Makes the Most Reliable Encoders in the World

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Encoder Instructions

HS45

5/8-1 1/8" [16-30mm]
HOLLOW SHAFT

DESCRIPTION

The Avtron Model HS45 is a **heavy duty** incremental encoder (also known as tachometer or rotary pulse generator). Its output is directly proportional to shaft position (pulse count) or speed (pulse rate). The HS45 operates down to zero speed and can be used for both control and instrumentation applications.

CAUTION
Do not utilize HS45 in hazardous locations which require ATEX, UL, CUL, CSA, or other explosion protection certification. HS45 is not certified for hazardous locations. Use XR models for hazardous applications.

When mounted to a machine shaft, the HS45 design eliminates the need for shaft couplings, adapter flanges, or accessory mounting faces. The high clamping-force collar holds the HS45 in place, even under severe vibration & shock. A high-performance composite shaft insert provides electrical isolation from motor shaft currents. The shaft insert permits models to fit a range of shaft sizes from 5/8" to 1 1/8" [16mm - 30mm]; additional sizes available upon request. An anti-rotation arm prevents housing rotation while allowing for shaft end float.

The HS45 utilizes magnetoresistive sensors. This proven technology is ideal for rugged environments since it is immune to many contaminants that cause optical encoders to fail. All of the HS45 electronics are potted, providing full protection against liquids. The outputs are protected against short circuits and wiring errors.

HS45 PART NUMBERS AND AVAILABLE OPTIONS

Model	Bore Size		Left Output PPR	Right Output PPR	Line Driver	Connector Options	Tether	Channels	Modifications
HS45	**Clamping Collar Mount U.S.** **C-** 5/8" **D-** 3/4" **E-** 7/8" **F-** 1" **G-** 1 1/8 **U-** All US Sizes **K-** 1.375' **N-** 1.118" **Clamping Collar Mount Metric** **S-** 16mm **T-** 18mm **V-** 19mm **W-** 20mm **Y-** 25mm **3-** 30mm **Z-** All Metric Sizes	**End of Shaft: Center Bolt Mount** **L-** 16mm (no taper) **M-** 17mm (10:1 taper) **P-** 20mm **J-** 30mm	**XX**-None **BC**-50 **AF**-60 **AK**-80 **AG**-100 **AH**-120 **AA**-128 **AM**-200 **AL**-240 **AN**-256 **AP**-300 **AE**-360 **AC**-400 **AB**-480 **AQ**-500 **AR**-512 **AS**-600 **AU**-720 **AV**-900 **AJ**-960 **AW**-1000 **AY**-1024 **AZ**-1200 **CX**-1500 **A3**-2000 **A4**-2048 **A5**-2500 **AT**-3072 **A7**-3600 **AD**-4096 **A8**-4800 **A9**-5000 **A0**-Special	**XX**-None **BC**-50 **AF**-60 **AK**-80 **AG**-100 **AH**-120 **AA**-128 **AM**-200 **AL**-240 **AN**-256 **AP**-300 **AE**-360 **AC**-400 **AB**-480 **AQ**-500 **AR**-512 **AS**-600 **AU**-720 **AV**-900 **AJ**-960 **AW**-1000 **AY**-1024 **AZ**-1200 **CX**-1500 **A3**-2000 **A4**-2048 **A5**-2500 **AT**-3072 **A7**-3600 **AD**-4096 **A8**-4800 **A9**-5000 **A0**-Special Note Dual Output NA with Foot Mount Bracket	**6-** 5-24V in/out (7272) **8-** 5-24V in/out (HX) **9-** 5-24V in, 5V out (7272)	**10 Pin MS Connector- Small Encoder Pinout** **A-** Avtron/BEI Pinout, w/o plug **B-** Dynapar HS35 Pinout, w/o plug **C-** Avtron/BEI Pinout, mating plug **D-** Dynapar HS35 Pinout, mating plug **Y-** 12" cable w/plug **10 Pin MS Connector- Large Encoder Pinout** **4-** Avtron/Northstar Pinout, mating plug **6 Pin MS Connector- Small Encoder Pinout** **E-** Avtron/BEI Pinout, w/o plug **F-** Dynapar HS35 Pinout, w/o plug **7 Pin MS Connector- Small Encoder Pinout** **J-** Avtron/BEI Pinout, w/o plug **K-** Dynapar HS35 Pinout, w/o plug **M-** 4 foot cable w/o plug, channel B **Small EPIC Connector** **P-** Avtron pinout, w/mate **G-** Northstar pinout w/mate **Q-** Avtron pinout on remote base, 18" cable w/mate **Z-** Avtron pinout on 18" cable w/mate **Terminal Box w/terminal strip** **H-** USA, 1/2" conduit **L-** Europe w/cord grip **8 Pin M12 Connector** **T-** Global pinout, w/o plug **U-** USA Pinout, w/o plug **12 Pin M23 Connector** **2-** Leine and Linde pinout, w/o plug **3-** Hubner Pinout w/o plug **W-** Cable 3' (or special length) **R-** Mini Twist Lock (Mini MS) w/ mating plug **V-** Mini Twist Lock (Mini MS) w/ mating plug (Reverse Phasing) **S-** Mini Twist Lock (Mini MS) on 3' cable w/mating plug **N-** Mini Twist Lock (Mini MS) w/o plug (Reverse Phasing)	**X- None Flat Styles:** **A-** Fan Cover 1/4" mount **D-** Fan Cover (T-bolt) **E-** 4.5" NEMA C-face **F-** 8.5" NEMA FC-face **Threaded Rod Styles:** **G-** 70-500mm w/bracket **P-** 70mm fixed w/screw **T-** Fan Cover 70-500mm w/T-bolt **Combinations:** **H-** Fan Cover & 8.5" C-face **M-** Fan Cover & 4.5" C-Face **U-** Universal (includes all styles) **Dual/Ganged Encoders:** **Y-** Tether 2nd encoder to 1st (select any tether from above list for first encoder)	**A-** All A,B,$\overline{A}$,$\overline{B}$,Z,$\overline{Z}$ (req'd for 8, 10 pin connectors) **For 6,7 pin conns only** **B-** A,B,$\overline{A}$,$\overline{B}$ (no marker) **E-** A,B,Z (single ended) **F-** A,B (single ended, no marker) **D-** A, $\overline{A}$,	**000-** None **004-** Super Magnetic Shielding **500-** Add 100C temperature range to shaft bores 5/8-1" and 16mm-25mm **6xx-** Add over speed switch xx=speed code **9xx-** Specify cable length xx=feet max 33ft (use w/ Option "Q","W", "Z")

ELECTRICAL SPECIFICATIONS

A. Operating Power (Vin)
   1. Volts..... 5-24 VDC in
   2. Current ..... 100mA, nominal, plus cable load
B. Output Format
   1. 2Ø & Comp ..... A,$\overline{A}$, B,$\overline{B}$ (differential line driver)
   2. Marker: ..... 1/Rev Z, $\overline{Z}$
C. Signal Type..... Incremental, Square Wave, 50 +/-10% Duty Cycle.
D. Direction Sensing ..... ØA leads ØB for CW rotation as viewed from the back of the tach looking at the non-drive end of the motor.
E. Transition Sep. ..... 15% minimum
F. Frequency Range..... See below
G. PPR 3-2,500***
H. Line Driver Specs:..... See table

Frequency Range: @5V, @1m cable, 250 kHz Max
@24V, @300m cable, #8 output, 45 kHz Max
Max Cable Lenght: 300m

*** (PPR) Standard PPR is 5000. Consult factory with your application for PPRs up to 25,000

I. Connectors:..... See connector options on page 1

MECHANICAL

A. Shaft Inertia ..... 1.59 lb-in-sec^2
B. Acceleration..... 5000 RPM/Sec. Max.
C. Speed:..... 5000 RPM Max (also see overspeed)****
D. Weight: ..... 10-12 lbs [4.5-5.5kg]
E. Vibration ..... 20 Gs, 5-2000 Hz (any orientation)
F. Shock ..... 100 Gs, any orientation
G. Shaft Engagement (clamp style)
   5/8"-7/8" bore.....2" [51mm] min.
   16-20mm bore.....51mm min.
   1"- 1 1/8" bore.....1.75" [45mm] min.
   25-30mm bore.....45mm min.
   with overspeed switch.....2.65" +/-0.05" [68mm +/-1.27mm]

****(Speed) Maximum RPM may be limited for PPR > 2,500 consult factory with your application

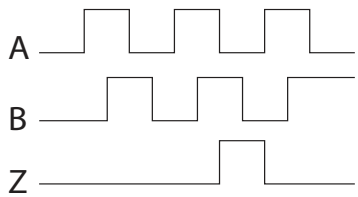
ENVIRONMENTAL

Solid cast aluminum stator and rotor
Fully potted electronics, protected against oil and water spray
Operating Temperature:.....-40°C to +100°C.
(note for shaft codes C-F, S-Y, +85C or use option 500 = +100C)

MECHANICAL OVERSPEED SWITCH OPTION

A. Shaft Inertia ..... +0.0018 lb-in-sec^2
B. Acceleration..... 3600 RPM/Sec. Max.
C. Speed:..... 1.25 x Overspeed set point Max.
   Minimum trip speed: 700 RPM
   Maximum trip: 3600 RPM
   Accuracy +/- 4% of trip point
   Hysteresis: 40% of trip point
D. Weight:..... +2.55 lbs [+1.16kg]
E. Vibration: ..... 20 Gs, 5-2000 Hz (radial only)
F. Shock: ..... 100Gs, any orientation
G. Electrical Contact (NO/NC Contact)
   1. ..... 6A/230VAC
   2. ..... 3A/380VAC
   3. .....1A/125VDC
H. Operating Temperature:.....-40°C to +100°C.

Timing Diagram (A leads B for CW rotation)



		LINE DRIVER OPTIONS			
Electrical Specifications		6	8	9	Units
Input Voltage		5-24	5-24	5-24	VDC
Nom Output Voltage		5-24	5-24	5	VDC
Line Driver		7272	HX	7272	
Output Resistance Typ		13	75	13	ohms
Maximum Peak Current		1500	800	1500	mA
Maximum Average Current		120	200	120	mA
Voh Typ		V_{IN-1}	V_{IN-1}	V_{IN-1}	VDC
Vol Typ		0.5	0.4	0.5	VDC
Cable Drive Capacity		1000' @ 5V 500' @ 12V 200' @ 24V	1000'	1000'	feet
Protection	Reverse Voltage	yes	yes	yes	
	Short Circuit	yes	yes	yes	
	Transient	yes	yes	yes	
Mis-Wiring		yes	yes	yes	
Alarm	+V(out)	Output voltage equal to input voltage.			
	Alarm*	Open collector, normally off, goes low on alarm, sink 100mA max, 50VDC max			
Marker		One per revolution. Pulse width 1/4 AB Period. Gated with A&B High			

LED	**Green** = Power on **Red** = Alarm **Orange** = Line Driver Shutdown (Due to thermal overload or undervoltage)

Each HS45 has a two-phase output (A, B) 90° out of phase, with complements ($\overline{A}$, $\overline{B}$), (A Quad B Output). A marker pulse with complement (Z, $\overline{Z}$) is also present.

The HS45 has a diagnostic package that includes Adaptive Electronics and a Fault-Check output and red/green LED for local indication. With this package, the HS45 can maintain itself, and provide an alarm if there is a problem **before** the problem causes unscheduled downtime.

ADAPTIVE ELECTRONICS

A perfect duty cycle consists of a waveform whose "high" and "low" conditions are of the same duration (50%/50%). It is possible over time for the duty cycle and edge separation to change due to component drift, temperature changes, or mechanical wear. The Adaptive Electronics extend the life of the HS45 by constantly monitoring and correcting duty cycle and edge separation over time.

FAULT-CHECK

If the Adaptive Electronics reach their adjustment limit, the LED will turn red and Fault-Check alarm will notify the drive and operator of an impending failure. This output can occur before a failure, allowing steps to be taken to replace the unit before it causes unscheduled downtime. Fault-Check annunciation is available as an "alarm" output through the connector.

SAFETY

The HS45 is not considered as a safety device and is not suitable for connection into a safety system. The mechanical overspeed switch (option 6xx) is suitable for connection into safety systems.

CAUTION
Do not disassemble mechanical overspeed option. Doing so may modify the overspeed set point or cause the switch to malfunction. If the factory seals are not intact on the overspeed switch, do not use it--return to the factory for service and calibration.

HS45

Remote Alarm

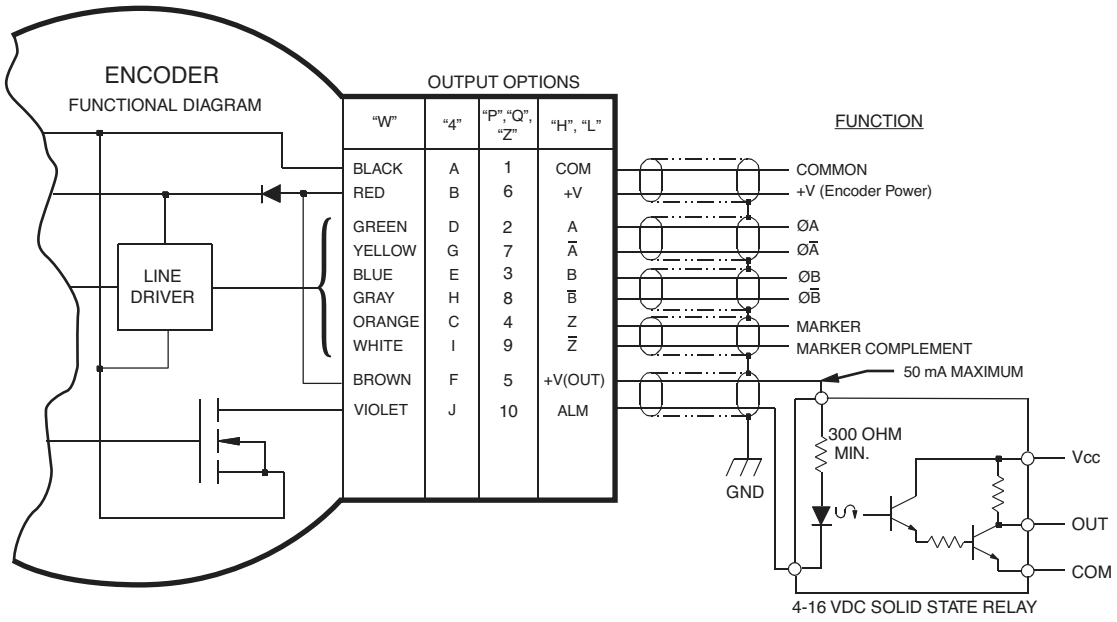
Applies to Model HS45 Encoders connector styles “H”, “L”, “P”, “Q”, “W”, “Z”, “4”

ALARM OUTPUT CONNECTION

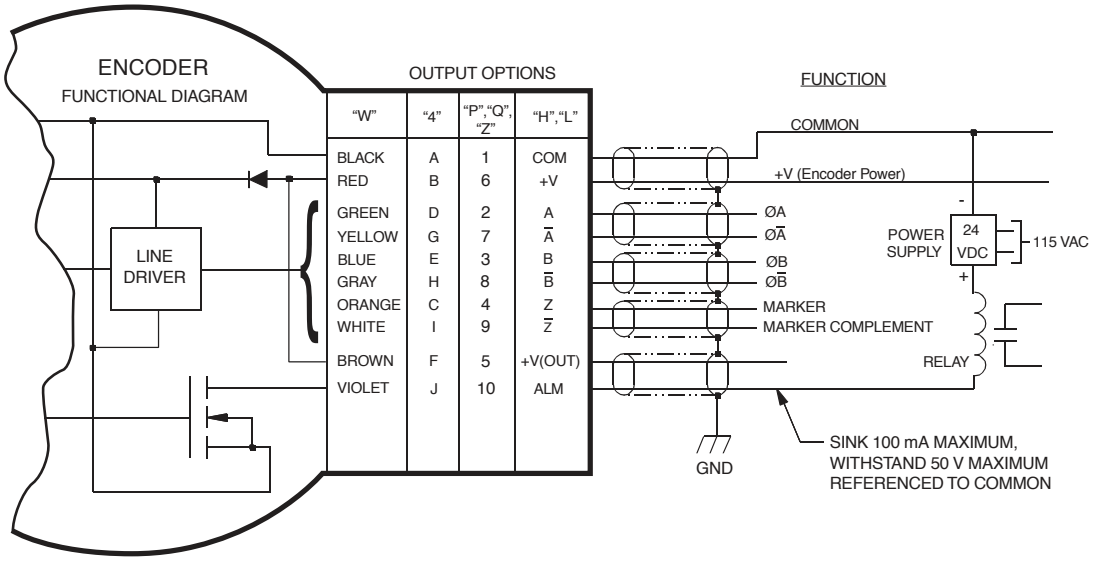
Avtron HS45 encoders provide an alarm signal if maintenance is required under specific circumstances. Following are application examples provided to help install the alarm output.

Example 1. Alarm output using +V(OUT). +V(OUT) is equal to +V, the encoder power supply.

NOTE: Alarm output is “low true”; i.e., goes to OV when active.



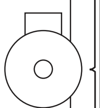
Example 2. Alarm Output Using Separate 24 VDC Power Supply and Relay.



WIRING DIAGRAMS

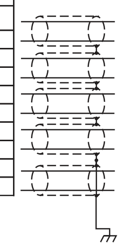
Avtron standard warranty applies. Copies available upon request.
Specifications subject to change without notice.

DIFFERENTIAL TWO PHASE WIRING APPLICATIONS



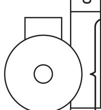
	PINOUT													
CONNECTOR	OPTION "W" (CABLE)	OPTIONS "A", "B", "C", "D" (10 PIN MS)		OPTIONS "J", "K" (7 PIN MS)	OPTIONS "E", "F" (6 PIN MS)	OPTIONS "T" (8 PIN M12)	OPTIONS "U" (8 PIN M12)	OPTIONS "P", "Q<<", "Z<<" (10 PIN INDUSTRIAL)	OPTIONS "R", "S<<" (10 PIN TWIST-LOCK)	OPTIONS "G" (10 PIN INDUSTRIAL)	OPTIONS "4" (10 PIN MS)	OPTIONS "H", "L" CONDUIT BOX	OPTIONS "2" (12 PIN M23)	OPTIONS "3" (12 PIN M23)
CHANNELS	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	B ØA, ØĀ ØB, ØB̄	B ØA, ØĀ ØB, ØB̄	B ØA, ØĀ ØB, ØB̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄
BLACK	F	F	F	A	1	7	1	F	1	A	1	10	10	
RED	D	D	D	B	2	2	6	D	6	B	6	12	12	
GREEN	A	A	A	E	3	1	2	A	2	D	2	8	6	
YELLOW	H	C	C	C	4	3	7	H	7	G	7	1	5	
BLUE	B	B	B	D	5	4	3	B	3	E	3	5	8	
GRAY	I	E	E	F	6	5	8	J	8	H	8	6	1	
ORANGE	C	NC	NC	NC	7	6	4	C	4	C	4	3	3	
WHITE	J	NC	NC	NC	8	8	9	K	9	I	9	4	4	
BROWN	NC	NC	NC	NC	NC	NC	5	NC	NC	F	5	2	NC	
VIOLET	NC	NC	NC	NC	NC	NC	10	NC	NC	J	10	7	NC	

* NC ON CHANNEL OPTION "B"
<< CONNECTED ON 18" CABLE



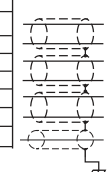
REF SIGNAL		
COM	GND	0V
+V	+Ub	+E
ØA	K1-	1+
ØĀ	K1+	1̄-
ØB	K2+	2+
ØB̄	K̄2-	2̄-
Z	K0+	0+
Z̄	K̄0-	0̄-
ALM+	ALM+	ALM+
ALM	ALM	ALM

SINGLE ENDED TWO PHASE WIRING APPLICATIONS, WITH OR WITHOUT MARKER I NOT RECOMENDED FOR OUTPUT OPTION "8"



	PINOUT												
CONNECTORS	OPTION "W" (CABLE)	OPTIONS "A", "B", "C", "D" (10 PIN MS)	OPTIONS<< "J", "K", "M", "N" (7 PIN MS)	OPTIONS<< "E", "F", "G", "H" (6 PIN MS)	OPTIONS<< "T" (8 PIN M12)	OPTIONS<< "U" (8 PIN M12)	OPTIONS "P", "V", "Z<<" (10 PIN INDUSTRIAL)	OPTIONS "R", "S<<" (10 PIN TWIST-LOCK)	OPTIONS "G" (10 PIN INDUSTRIAL)	OPTIONS "4" (10 PIN MS)	OPTIONS "H", "L" CONDUIT BOX	OPTIONS "2" (12 PIN M23)	OPTIONS "3" (12 PIN M23)
CHANNELS	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	E, F ØA, ØB, ØZ	E, F ØA, ØB, ØZ	E, F ØA, ØB, ØZ	A ØA, ØĀ ^ ØB, ØB̄ ^ ØZ, ØZ̄ ^	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄	A ØA, ØĀ ØB, ØB̄ ØZ, ØZ̄
RED	D	D	B	2	2	6	D	6	B	6	12	12	
BLUE	B	B	D	5	4	3	B	3	E	3	5	8	
GREEN	A	A	E	3	1	2	A	2	D	2	1	6	
BLACK	F	F	A	1	7	1	F	1	A	1	10	10	
ORANGE *	C*	C*	C*	7	6	4	C	4	C	4	3	3	
BROWN	NC	NC	NC	NC	NC	5	NC	NC	F	5	2	NC	
VIOLET	NC	NC	NC	NC	NC	10	NC	NC	J	10	7	NC	

* NC ON CHANNEL OPTION "F"
^ COMPLEMENTS INCLUDED BUT NOT USED
<< CONNECTED ON 18" CABLE



REF SIGNAL		
+V	+Ub	+E
ØB	K2+	2+
ØA	K̄1-	1+
COM	GND	0V
OZ	K0+	0+
ALM+	ALM+	ALM+
ALM	ALM	ALM

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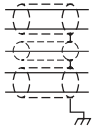
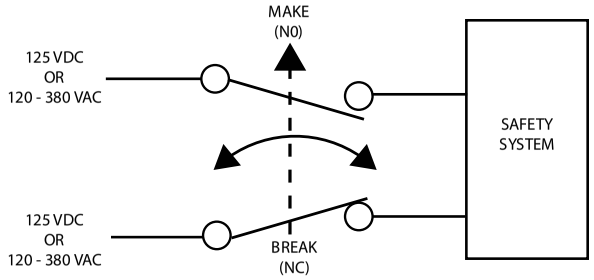
SINGLE ENDED SINGLE PHASE WIRING APPLICATIONS I NOT RECOMENDED FOR OUTPUT OPTION "8"

PINOUT													
CONNECTORS	OPTION "W" (CABLE)	OPTIONS "A", "B", "C", "D" (10 PIN MS)	OPTIONS<< "J", "K", "M", "N" (7 PIN MS)	OPTIONS<< "E", "F", "G", "H" (6 PIN MS)	OPTIONS<< "T" (8 PIN M12)	OPTIONS<< "U" (8 PIN M12)	OPTIONS "P", "V", "Z<<" (10 PIN INDUSTRIAL)	OPTIONS "R", "S<<" (10 PIN TWIST-LOCK)	OPTIONS "G" (10 PIN INDUSTRIAL)	OPTIONS "4" (10 PIN MS)	OPTIONS "H","L" CONDUIT BOX	OPTIONS "2" (12 PIN M23)	OPTIONS "3" (12 PIN M23)
CHANNELS	A (ØA, ØB, ØB, ØZ, ØZ INCLUDED BUT NOT USED)	D ØA (ØA INCLUDED BUT NOT USED)	D ØA (ØA INCLUDED BUT NOT USED)	D ØA (ØA INCLUDED BUT NOT USED)	A ØA, ØB, ØB, ØZ, ØZ	A ØA, ØB, ØB, ØZ, ØZ	A ØA, ØA ØB, ØB ØZ, ØZ	A ØA, ØA ØB, ØB ØZ, ØZ	A ØA, ØA ØB, ØB ØZ, ØZ	A ØA, ØA ØB, ØB ØZ, ØZ	A ØA, ØA ØB, ØB ØZ, ØZ	A ØA, ØA ØB, ØB ØZ, ØZ	A ØA, ØA ØB, ØB ØZ, ØZ
BLACK	F	F	A	1	7	1	F	1	A	1	10	10	
RED	D	D	B	2	2	6	D	6	B	6	12	12	
GREEN	A	A	E	3	1	2	A	2	D	2	1	6	
BROWN	NC	NC	NC	NC	NC	5	NC	NC	F	5	2	NC	
VIOLET	NC	NC	NC	NC	NC	10	NC	NC	J	10	7	NC	



REF SIGNAL		
COM	GND	0V
+V	+Ub	+E
0A	$\overline{K1}$	1+
ALM+	ALM+	ALM+
ALM	ALM	ALM

MECHANICAL OVERSPEED SWITCH WIRING APPLICATIONS



CAUTION
Be careful not to damage clamping fingers of hollow shaft during handling. Do not tighten clamping collar before installation onto motor shaft.
WARNING
Installation should be performed only by qualified personnel. Safety precautions must be taken to ensure machinery cannot rotate and all sources of power are removed during installation.

INSTALLATION

Refer to the back page of these instructions for outline and mounting dimensions.

Equipment needed for installation
Supplied:
HS45 Encoder
Shaft Sizing Insert for all clamp style models
For 16mm center-bolt style ONLY: centering (tapered) ring

Optional:
Anti-Rotation Arm Kit
Thread Locker (blue)

Not Supplied:
Open Wrenches
"G", "P", "T", "U"-Tether: 9mm, 10mm
"D", "E","F","H","M","U"-Tether: 7/16",1/2", 9/16", 3/4"
M5" T-handle hex wrenches or torque wrench with M5 bits (Torque wrench required for Center Bolt Mounting Style).
Dial Indicator Gauge
Caliper Gauge

The hollow shaft HS45 design eliminates the potential for coupling failures from misalignment, however, excessive housing movement (wobble) may cause undesirable vibrations and bearing damage. The higher the RPM, the more severe the vibration will be from housing movement. In a typical installation a housing movement of 0.007" [0.18mm] TIR or less (as measured at the outside diameter of the main encoder body) will not have an adverse effect. For overspeed applications, TIR should be < 0.002" [0.05mm].

1) Disconnect power from equipment and encoder cable.

2) Use caliper gauge to verify motor shaft is proper diameter and within allowable tolerances: +0.000", -0.0005" [+0.00, -0.013mm].

3) Clean machine shaft of any dirt and remove any burrs.

4) Use dial indicator gauge to verify the motor shaft: Total Indicated Runout (TIR) <0.002" [0.05mm].

5) Install the anti-rotation bracket tether to the face of the encoder using M6 Hex screws and lock washers, included with the tether. Tighten to 65 in-lbs [7.5n-m]

5a) (optional) For non-through-shaft (end of shaft) applications, the optional rear cover may be installed for optimum performance against dirt, liquid sprays and impacts.

For Clamp Collar Mounting Style:

6) Loosen clamping collar screws.

NOTE
These screws have factory applied thread locker, no further thread locker application is required.

7) Test Fitting: carefully slide the encoder onto the shaft to verify fit. Ensure a minimum of 1/8" [2mm] between encoder and mounting surface. DO NOT FORCE. Encoder should slide on easily. If the encoder does not fit easily, remove it, verify shaft size, and check for burrs and shaft damage.

8a) For end of shaft applications using the clamping collar system, place the HS45 at least 2" onto the shaft. (For larger bore shafts 1" [25mm] or larger, minimum shaft engagement is 1.75" [45mm]; for overspeed applications the minimum engagement is 2.65" [67mm]) Ensure the stub shaft does not contact the rear cover.

8b) For thru-shaft applications using the clamping collar system, remove the rear shaft cover (screws are retained by the cover) and position the HS45 as required. Thru-shaft installation is not available in overspeed applications.

9) Tighten screws on clamping collar evenly until snug, then tighten each screw as follows:
For bore sizes up to 1" [25mm] 38 in-lb [4.3 Nm]
For bore sizes >1" [25mm] 66 in-lb [7.5 Nm]
DO NOT USE A STANDARD RIGHT ANGLE WRENCH. Use only a T-handle hex wrench or torque wrench with hex bit.

Or For End of Shaft Center Bolt Mount Style:

6) Remove the rear cover from the HS45.

7a) For 17mm taper shaft mount: Carefully slide the encoder onto the shaft to verify fit. DO NOT FORCE. Encoder should slide on easily. If the encoder does not fit easily, remove it, verify shaft size, and check for burrs and shaft damage.

7b) For 16mm center bolt shaft mount: Slide the centering ring over the motor shaft. Carefully slide the encoder onto the shaft to verify fit. **DO NOT FORCE.** Encoder should slide on easily. If the encoder does not fit easily, remove it, verify shaft size, and check for burrs and shaft damage.

8) Insert center mounting screw (M6 provided) through the body of the encoder into the stub shaft tapped hole and tighten to 66 in-lbs [7.5n-m]

9a) Replace rear cover onto the HS45. Use a wrench on the external flats if necessary. Tighten the cover screws.

10a) For threaded rod tethers, adjust to proper length by selecting combinations of short and long piece as required and thread together for final length adjustment. Attach free end of the anti-rotation arm to the bracket tether using the shoulder bolt provided.

11) Secure free end of the anti-rotation bracket to frame using bolt or T-bolt provided. The bracket should be parallel to the encoder face, 90 degrees to the shaft to avoid encoder bearing damage. Use additional washers as needed to ensure the tether is parallel to the encoder face.

12) An M8 threaded hole is provided in the encoder shaft to permit a M8 jack bolt for removal

MODIFICATION

The HS45 can be modified in the field to easily adapt to new applications.

TO CHANGE ELECTRICAL CONNECTOR STYLE:

1) Remove electrical power and disconnect the mating plug.

2) Unscrew the (4) M5 screws (4mm hex).

3) Pull the connector header away from the encoder gently.

4) Disconnect the ribbon connector to the encoder body.

5) Connect the ribbon connector to the new connector header

6) Attach the new connector header to the encoder using the (4) M5 screws. Tighten to 30 in-lbs [3.4n-m]. Be sure the ribbon connector fits in the open pocket under the header and is not crushed or pinched by the connector header.

TO CHANGE BORE SIZE INSERT:

1) Remove electrical power.

2) Remove the encoder from any existing mounting.

3) Remove the rear encoder cover (if present) (4 screws are retained)

4) Remove the retaining snap-ring around the insert.

5) Remove the insert from the encoder bore. The insert should slide out easily. **DO NOT** hammer on the insert to remove it.

6) Slide new insert inside encoder shaft.

7) Reinstall the retaining snap ring over the insert.

8) Reinstall the rear encoder cover as required.

WIRING

CAUTION
Be sure to remove power before wiring the encoder. Be sure to ground the cable shield: At the drive end. See note below for Danaher/Northstar wiring.

Refer to the wiring diagrams for specific information on each option.

The AV45 can be wired for single phase or two phase, either with or without complements, with or without markers. For bidirectional operation, Phase A channel leads phase B channel for clockwise shaft rotation as viewed from the anti-drive or accessory end of the motor (AV45 mounting end).

CAUTION
Be sure to observe maximum current limits for mechanical overspeed switch option. Exceeding these limits can cause arcing and cause switch failure; this may result in property damage, injury or even death.

NOTE
Wiring option "G" provides a pinout compatible with Northstar™ encoders, with a cable shield connection on pin 10. Note that this option does not ground the shield; Avtron still recommends grounding the shield at the drive end of the cable for all wiring options.

CORRECTIVE ACTION FOR PHASE REVERSAL

1) Remove Power.
2) Exchange wires on cable, either at encoder cable end, or at speed controller end (but not both).
   a) Single Ended 2 Phase Wiring (see wiring diagram) Exchange A and B at the use end of the wires.
   b) Differential 2 Phase Wiring (see wiring diagram) Exchange either A with A– in the phase A pair OR B with B– in the phase B pair but NOT both.
3) Apply Power.
4) Verify encoder feedback is correct, using hand rotation of shaft, or jog mode of the speed controller.

Interconnecting cables specified in the wire selection chart are based on typical applications. Physical properties of cable such as abrasion,

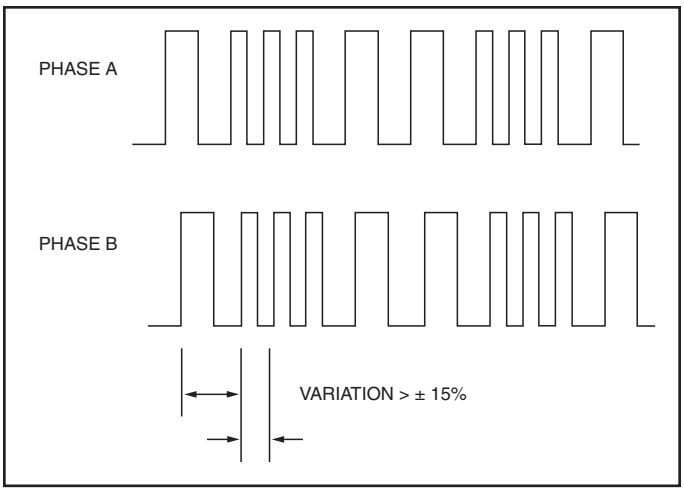


FIGURE 5

temperature, tensile strength, solvents, etc., are dictated by the specific application. General electrical requirements are: stranded copper, 22 through 16 AWG (Industrial EPIC connector type options can use 14 AWG), each wire pair individually shielded with braid or foil with drain wire, .05 uf of maximum total mutual or direct capacitance, outer sheath insulator. See specifications for maximum cable length. Stranded 22 AWG wire should not be used for cable runs greater then 61 meters. If 22 AWG is used with EPIC type connector options the wire ends should be tinned.

FAULT-CHECK

After power-up and the rotor position is checked by the sensor, the Fault-Check LED will turn green.
If the adaptive electronics reach their adjustment limit for any reason, the Fault-Check alarm and LED will notify the drive and operator of an impending failure. The LED will turn red if the Adaptive Electronics reach their adjustment limit. This output occurs before an actual failure, allowing steps to be taken to replace the unit before it causes unscheduled downtime. Fault-Check annunciation is available as an "alarm" output through the connector and as an integral LED.

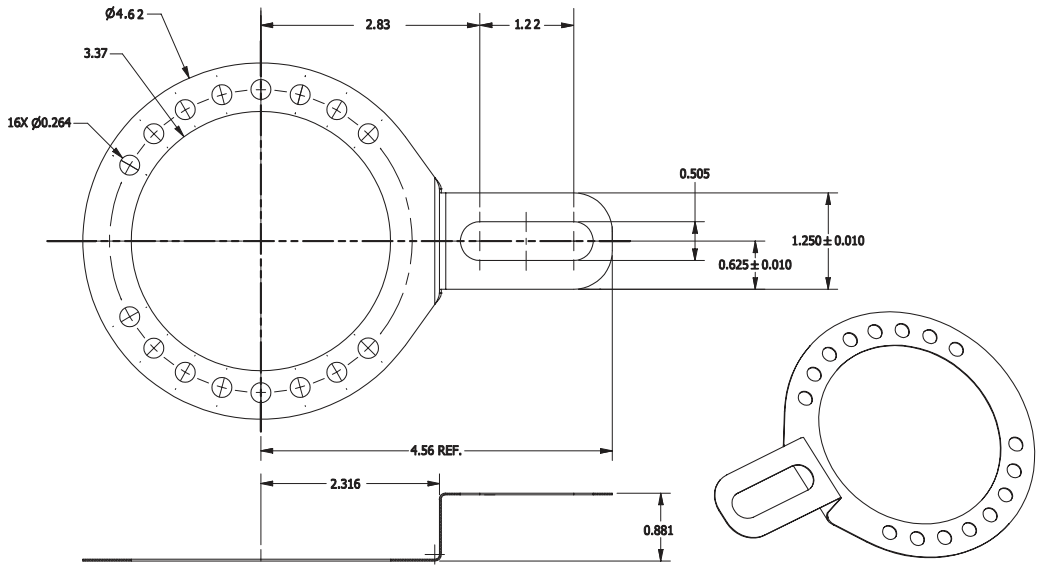
TROUBLESHOOTING

If the drive indicates a loss of encoder/tach fault and the HS45 fault-check LED is not illuminated, check the encoder power supply. If power is present, check polarity; one indicator of reversed power supply is that all outputs will be high at the same time. If the drive indicates encoder fault, but the LED shows GREEN, then check the wiring between the drive and the encoder. If the wiring appears correct and in good shape, test the wiring by replacing the HS45. If the new unit shows GREEN, and the drive still shows encoder loss/tach fault, then the wiring is faulty and should be repaired or replaced.

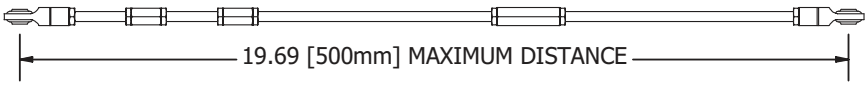
If the alarm output and/or LED indicate a fault (RED) on a properly mounted HS45 and the rotor is properly located, replace the HS45.

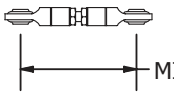
An oscilloscope can also be used to verify proper output of the HS45 encoder at the encoder connector itself and at the drive/controller cabinet. If the outputs show large variations in the signals at steady speed (jitter or "accordion effect", see figure 5 above), replace any magnetized material nearby with non-magnetic material (aluminum, stainless) (shafts, etc). If variations persist, consider replacing with super-shielded models, option -004.

TETHER OPTION: D,F

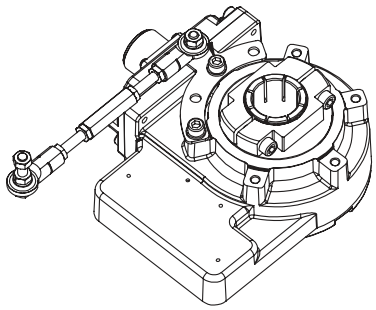


TETHER OPTIONS: G, P, T, U

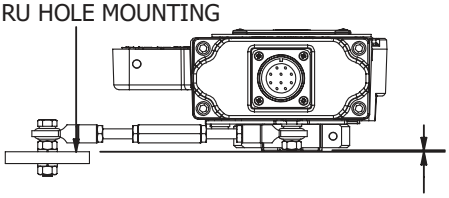




USE 5mm HEX
TORQUE TO
65 IN-LBS. [7.5 N-M]

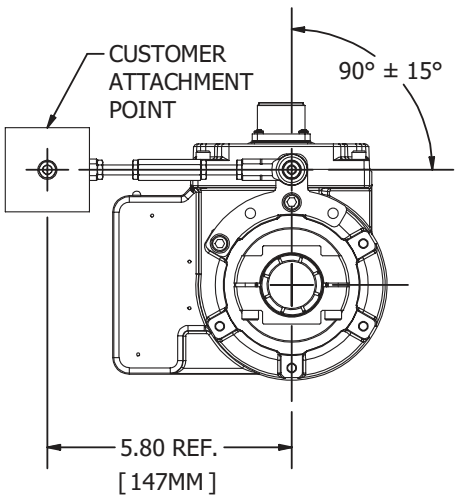


0.28 [7mm] MAX. THICKNESS
FOR THRU HOLE MOUNTING



±1.50 [38mm] OFFSET FOR
12 IN. [305MM] ROD END CENTERS

TORQUE TO
65 IN-LBS. [7.5 N-M]



ATTACH ARM TO ENCODER USING M6 SCREWS. SELECT THE SCREW HOLES THAT PROVIDE THE DESIRED ORIENTATION. THE ROD END ATTACHED TO THE BRACKET IS PERMANENTLY ASSEMBLED AND SHOULD NOT BE REMOVED.

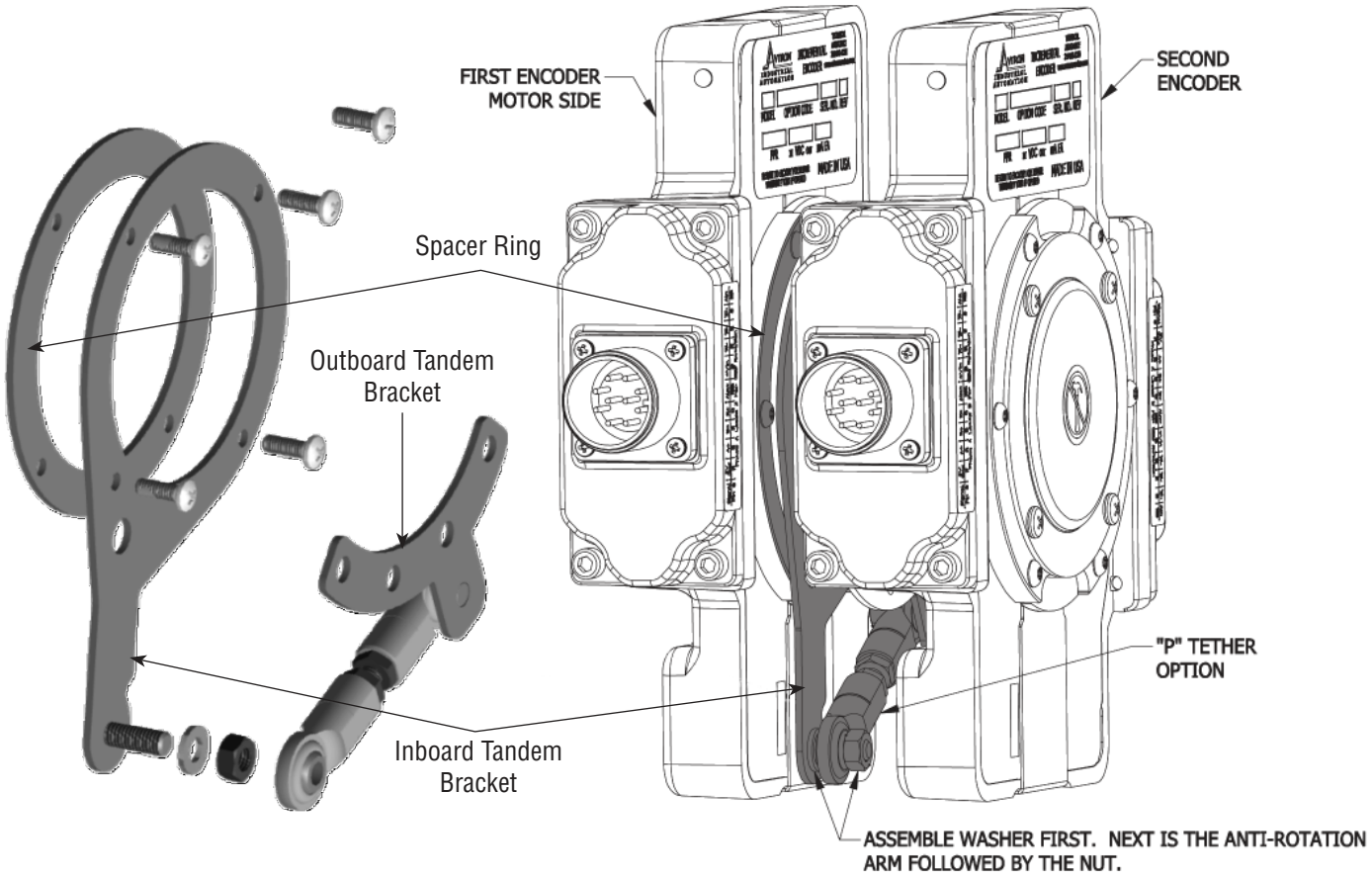
SELECT THE APPROPRIATE THREADED ROD LENGTHS (ITEMS 7, 10, 11). USE COUPLING NUTS (ITEMS 8, 9) TO JOIN RODS.

TWO M6 SPLIT LOCKWASHERS (ITEM 3) AND NUTS (ITEM 12) ARE PROVIDED FOR THROUGH HOLE INSTALLATION. A LOCKWASHER IS NEEDED ON EACH SIDE OF THE THROUGH HOLE.

THE FREE END MAY BE OFFSET BY ±1.50 INCHES [38mm] WITH THE ROD AT 12 IN. [305mm] BETWEEN CENTERS. IF THE O.A.L. OF THE ARM IS LENGTHENED OR SHORTENED, THEN THE ALLOWABLE OFFSET IS CHANGED BY THE SAME PROPORTION. MOUNT FREE END OF ANTIROTATION ARM AT 90°±15° ANGLE.

TETHER OPTION: Y

TANDEM MOUNT



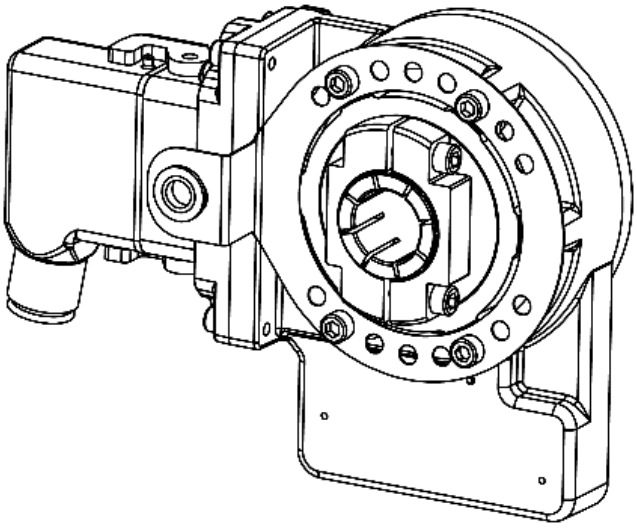
Apply tether kit (any style) to inboard encoder to tether motor.

Refer to prior tether options for dimensions and assembly instructions.

NOTE
Do not use tandem bracket assembly to tether the encoder to the motor.

CLAMP STYLE

SHOWN: SINGLE OUTPUT, 1" BORE, INDUSTRIAL CONNECTOR, 4.5" C-FACE TETHER



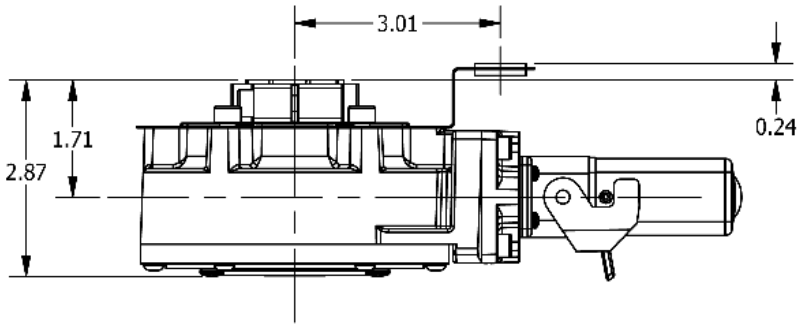
SHAFT ENGAGEMENT:

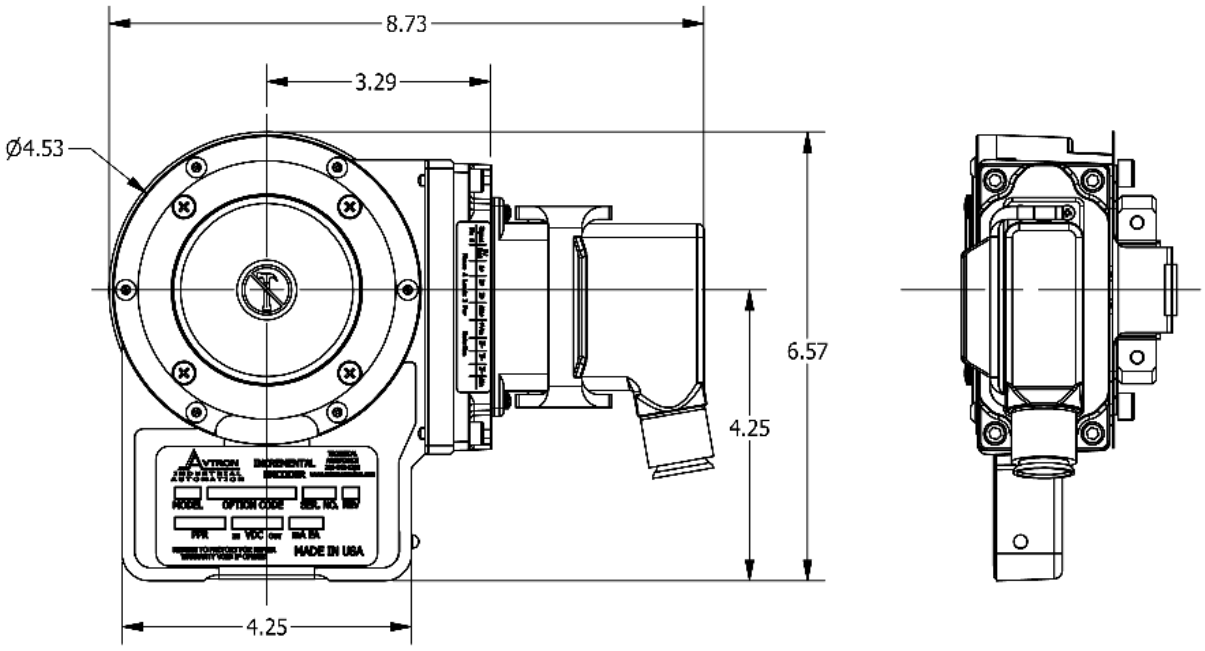
Minimum:

5/8"-7/8" bore	2" [51mm]
16-20mm bore	51mm
1"- 1 1/8" bore	1.75" [45mm]
25-30mm bore	45mm
with overspeed switch	2.65" [68mm]

Maximum (With Cover or Overspeed):

All bore sizes	2.70" [68.6mm]

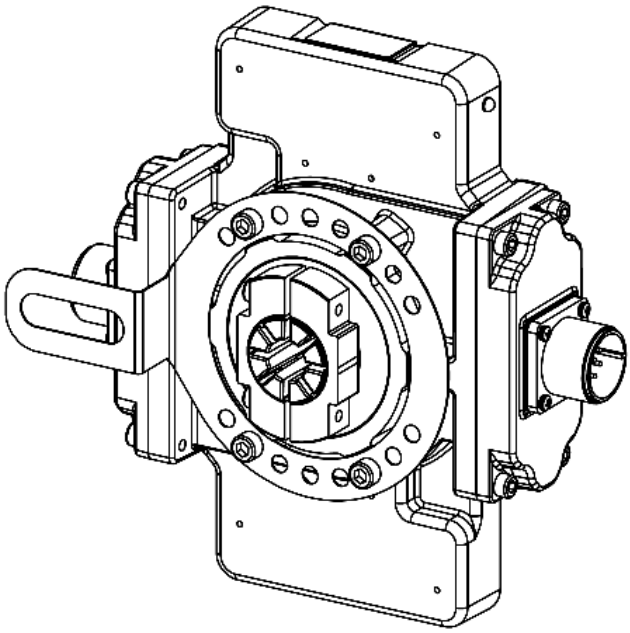




Features and specifications subject to change without notice.
Avtron standard warranty applies. All dimensions are in inches [mm].

CLAMP STYLE

SHOWN: DUAL OUTPUT, 5/8” BORE, 10 PIN MS CONNECTORS, 8.5” C-FACE TETHER



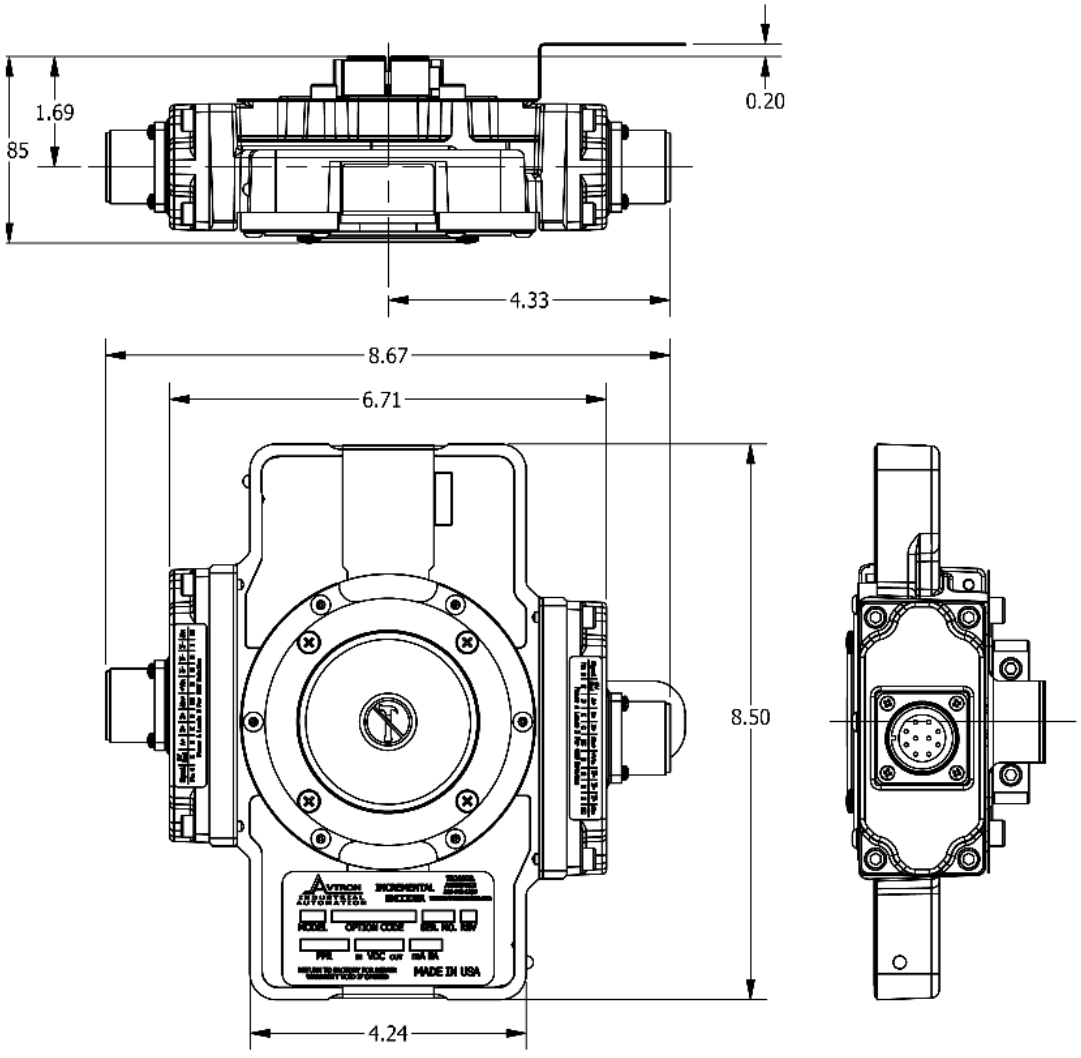
SHAFT ENGAGEMENT:

Minimum:

5/8”-7/8” bore	2” [51mm]
16-20mm bore	51mm
1”- 1 1/8” bore	1.75” [45mm]
25-30mm bore	45mm
with overspeed switch	2.65” [68mm]

Maximum (With Cover or Overspeed):

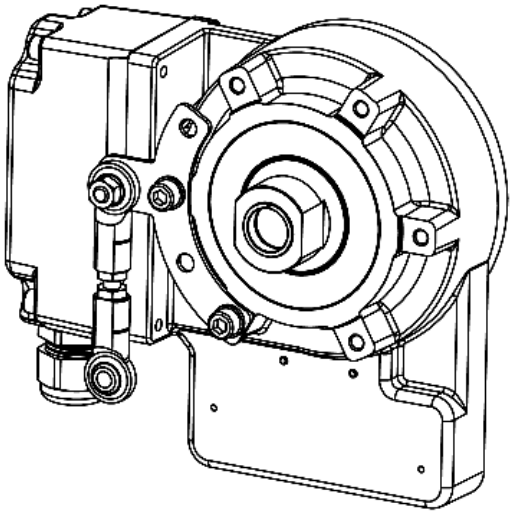
All bore sizes	2.70” [68.6mm]



Features and specifications subject to change without notice.
Avtron standard warranty applies. All dimensions are in inches [mm].

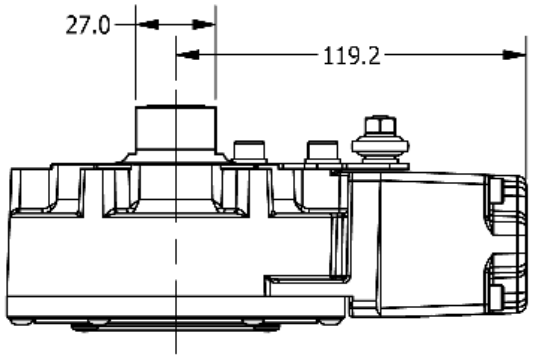
16mm CENTER BOLT STYLE

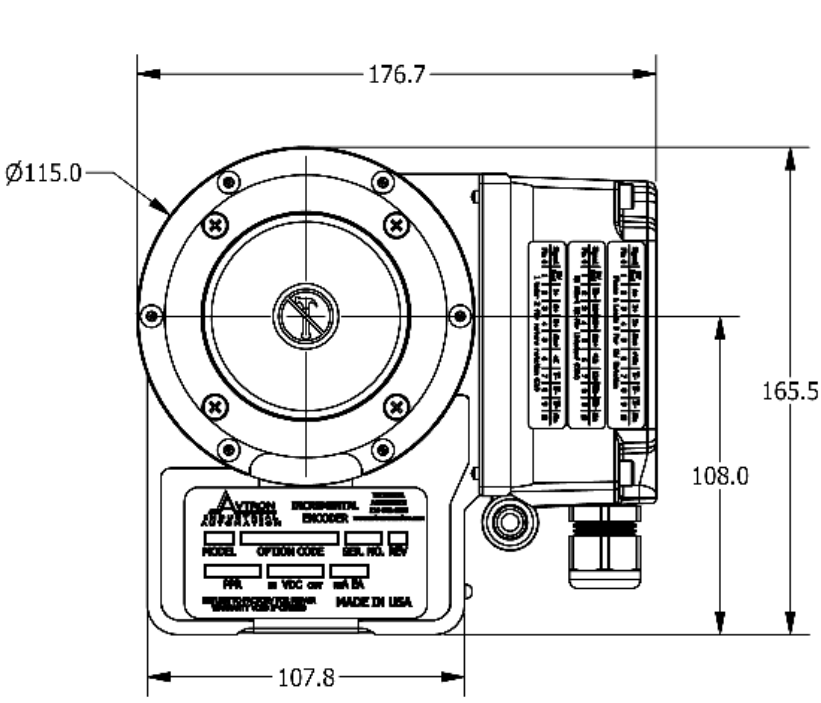
SHOWN: SINGLE OUTPUT, CONDUIT BOX,
ANTI-ROTATION ARM OPTION “P”

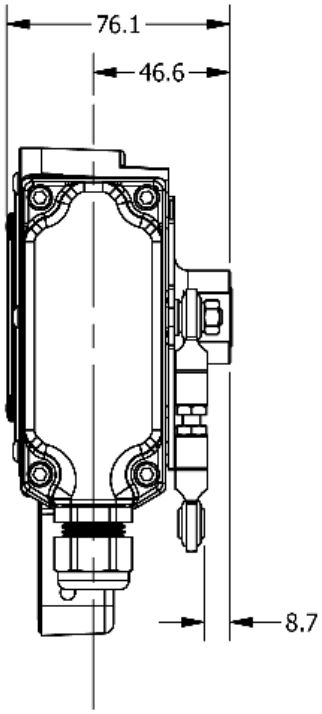


SHAFT ENGAGEMENT:

Minimum:	1.73”	[44mm]
Maximum:	2.09”	[53mm]





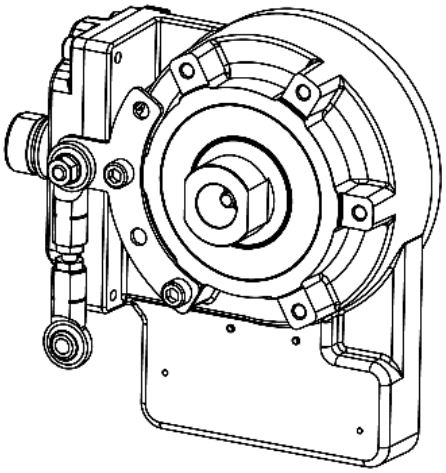


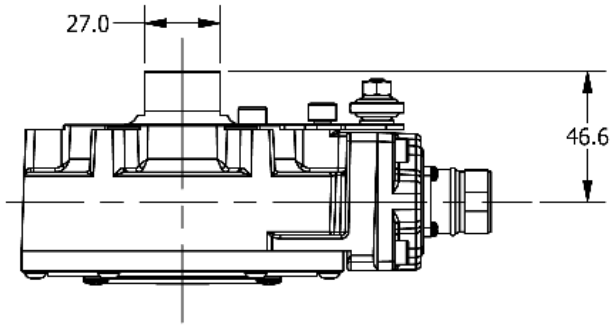
Features and specifications subject to change without notice.
Avtron standard warranty applies. All dimensions are in inches [mm].

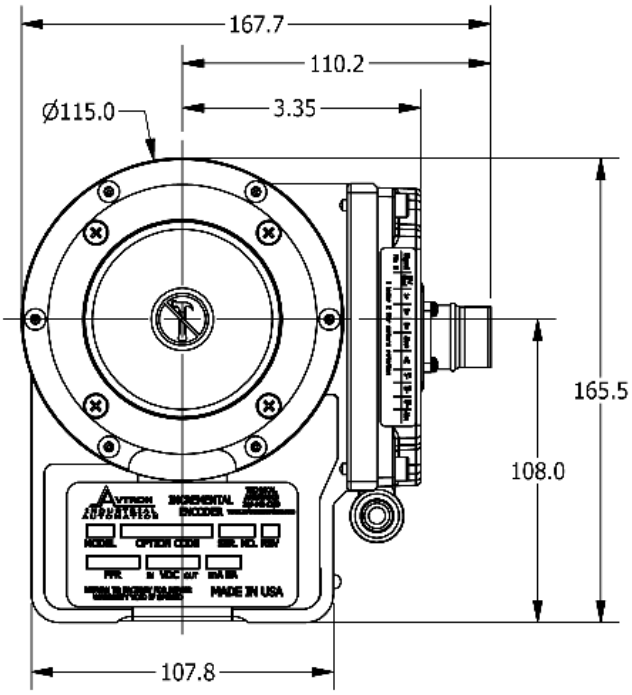
17mm CENTER BOLT STYLE

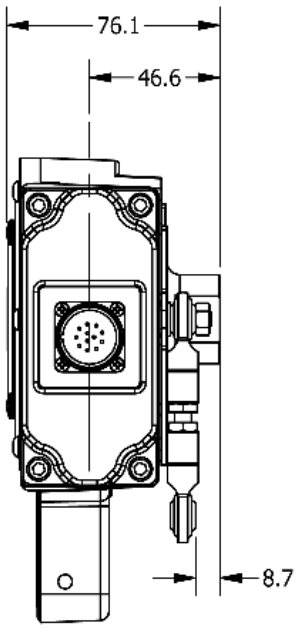
SHOWN: SINGLE OUTPUT, M23 CONNECTOR, ANTI-ROTATION ARM OPTION “P”

SHAFT ENGAGEMENT:
20mm +/-0.1mm
Shaft shall be 17mm diameter with 10:1 taper





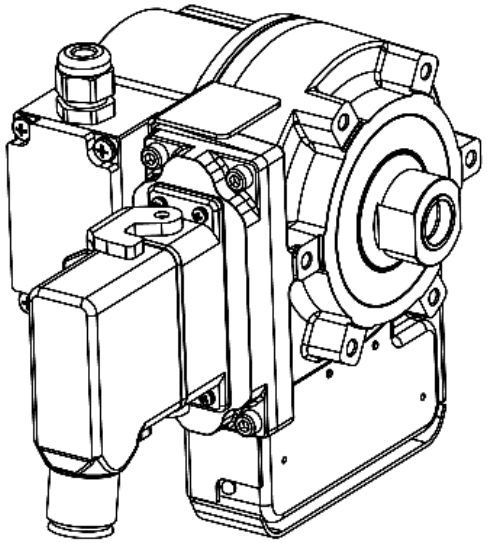




Features and specifications subject to change without notice.
Avtron standard warranty applies. All dimensions are in inches [mm].

HS45 WITH OVERSPEED SWITCH

SHOWN: 16MM CENTER-BOLT MOUNT, SINGLE OUTPUT, M23 INDUSTRIAL CONNECTOR



SHAFT ENGAGEMENT:

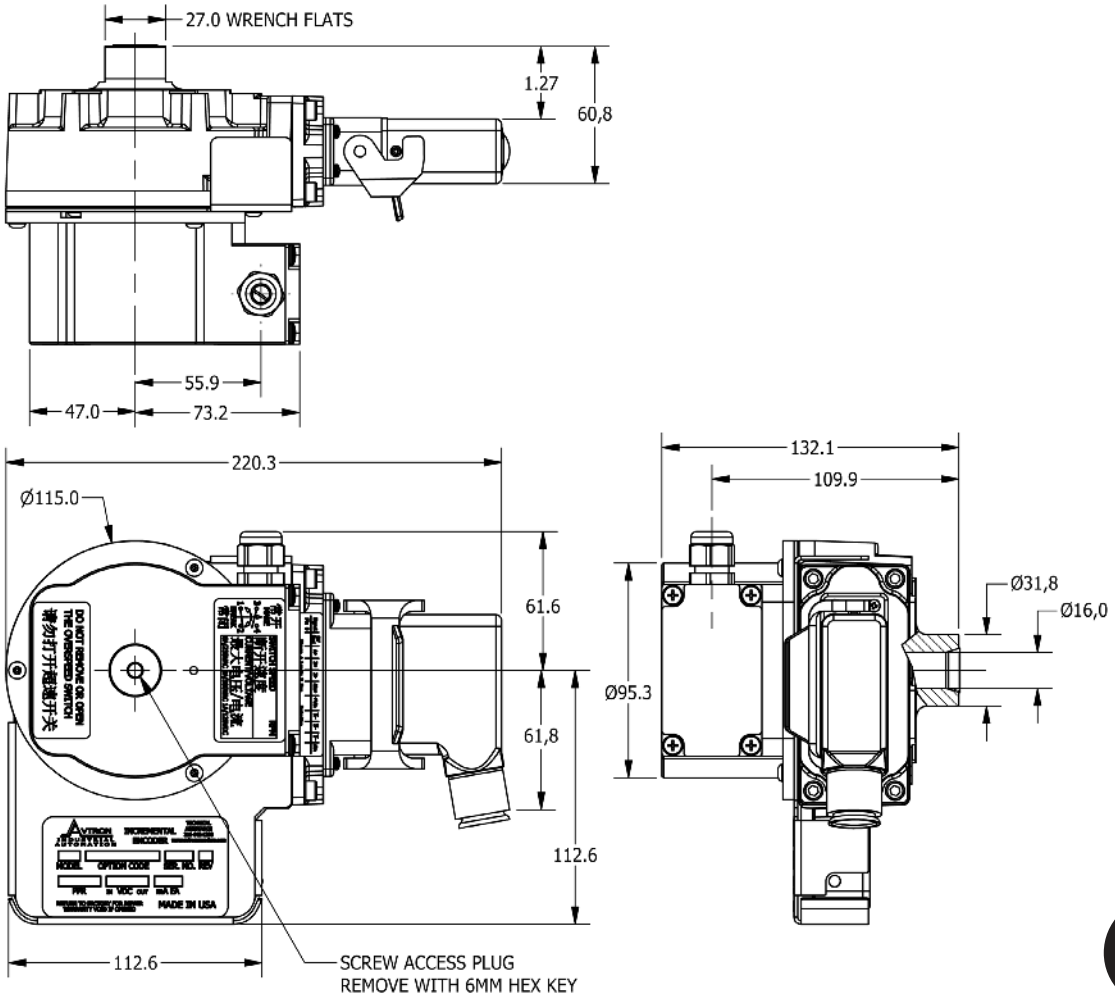
Clamp Style:

Minimum:	2.65" [68mm]
Maximum:	2.70" [68.6mm]

17mm Center-Bolt Style
20mm +/-0.1mm
Shaft shall be 17mm diameter with 10:1 taper

16mm Center-Bolt Style

Minimum:	1.73" [44mm]
Maximum:	2.09" [53mm]



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