

AVTRON ENCODERS

Nidec Industrial Solutions Makes the Most Reliable Encoders in the World

8901 E. PLEASANT VALLEY ROAD • INDEPENDENCE, OHIO 44131-5508

TELEPHONE: (1) 216-642-1230 • FAX: (1) 216-642-6037

E-MAIL: tachs@nidec-industrial.com • WEB: www.avtronencoders.com

Encoder Instructions

MODEL AV4

Incremental Magnetic
1/4", 3/8" Solid Shaft Encoder
6mm, 10mm

DESCRIPTION

The Avtron Model AV4 Incremental Encoder is a light mill duty speed and position transducer (also known as tachometer or rotary pulse generator), allowing operation down to zero RPM. The AV4 employs Hall Effect magnetic sensing technology, and when coupled to a motor or machine the encoder outputs a specific number of electrical Pulses Per Revolution (PPR) that is directly proportional to shaft position (pulse count) or speed (pulse rate).

Mechanically the AV4 mounts using industry standard 2.650" square flanges, as well as servo mount 2.500" or 2.625" round flanges. The AV4 can also be mounted using an optional industry standard face mount bolt pattern.

The AV4 incremental encoder offers 2Ø outputs (A, B) 90° apart for direction sensing. Optional complements (A/, B/) and marker pulse and complement (Z, Z/) are available; see channel options.

MECHANICAL DRIVE INSTALLATION INSTRUCTIONS

The AV4 may be driven via a contact/friction wheel provided the axial spring force is modest, less than 25% of the 100 lb maximum radial load, or (preferably) the AV4 can be coupled to the load. The following means of coupling are acceptable when properly installed: Direct Coupling, Timing Belt/Pulleys.

With a direct drive, use a flexible, insulated disc coupling and align the shafts as accurately as possible. The encoder should not be subjected to any axial thrust. Overhung loads should also be minimized. Installations using timing belts/pulleys should have just enough belt tension to eliminate belt sag. Excessive tension will shorten belt and bearing service life. If a rubber slinger disc is used, position it on the shaft so it will rotate freely.

CAUTION

Do not force or drive the coupling onto the shaft or damage to the bearings may result. The coupling should slide easily on the shaft. Remove nicks and burrs if necessary. Consider driving shaft endplay when positioning coupling

Equipment Needed for Installation

Provided	Optional	Not Provided
AV4 Encoder	Mating MS Cable Connector	AV4 Face Mounting Screws (see table below and drawing on last page for sizes) Thread Locker (Loctite 242 recommended) Anti-Seize Adapter Flange Shaft Coupling (Insulated Style recommended) Dial Indicator Gauge

MODEL	PPR	LINE DRIVER	SHAFT SIZE	CONNECTOR*	CONNECTOR EXIT	FLANGE STYLE	HOUSING SIZE	SEALS	CHANNEL	MOD CODE
AV4	BA - 30 AA - 32 AK - 80 BC - 100 AH - 120 AC - 128 AM - 200 AL - 240 AN - 256 AE - 360 AG - 400 AB - 480 AQ - 500 AR - 512 AS - 600 AP - 720	AJ - 960 AW - 1000 AY - 1024 AZ - 1200 AV - 1440 AU - 1800 A3 - 2000 A4 - 2048 AT - 3072 A6 - 3600 AD - 4096 A8 - 4800 A9 - 5000 CA - 12700 CB - 10000	1 - 5-30V In & Out 4 - 5-30V In / 5V Out	A - 0.25" OD x 0.625" Long with Flat B - 0.375" OD x 0.625" Long with Flat C - 10mm OD x 20mm Long with Flat R - 10mm OD x 20mm Long w/o Flat T - 6mm OD x 10mm Long w/o Flat	See Connector Codes table for compatible Connector & Housing	A - Axial (end) R - Radial (side)	See Chart Below 3 - 36mm 4 - 42mm (SST) 5 - 58mm	A - IP65 Seals, Alum Housing G - IP67 Seals, Alum Housing J - IP67 Seals, SST Housing K - IP69K Seals, SST Housing (with "4" housing size only)	A - All Channels (A, A/, B, B/, Z, Z/) B - A, A/, B, B/, No Marker E - A, B, Z, No Compliments	000 - NONE 905 - 5' [2m] cable 915 - 15' [5m] cable 933 - 33' [10m] cable

SHAFT OPTION	HOUSING	SEALS (IP RATING)
A	3, 5	A, G
B	3, 5	A, G
C	All (3, 4*, 5)	A, G, J, K
R	3, 5	A, G, J
T	3, 5	A, G, J

CONNECTOR CODES	HOUSING	CONNECTOR EXIT
A, B, C, D, E, F, G, H, J, K, M, N, R	3 - 36mm 5 - 58MM	R - Radial (side) ONLY A - Axial (end) ONLY
2, 3, 5, T, U, W	3, 4, 5	A, R

CONNECTOR CODES	CHANNEL
A, B, C, D, R, T, U, 2, 3, 7, W	A
E, F, G, H, J, K, M, N	B, E
5	E

FLANGE STYLE		
1 - 58mm w/36mm Pilot, 3x M3 & M4 on 48mm BC	5 - 2.63" Round Flange, 2.50" Pilot, 3x 10-32 on 1.88 BC & 4x 4-40 on 1.27 BC	8 - 2.63" Square Flange, 1.25" Pilot + 3x 10-32 on 1.875" BC
2 - 58mm w/50mm Pilot, 3x M4 on 42mm BC	6 - 36.5mm HD Round Flange, 30mm Pilot, 4xM4 on 24mm BC	9 - 2.50" Round Flange, 1.25" Pilot, 3x 10-32 & 8-32 on 1.88 BC, 3x 6-32 & 4x 4-40 on 2.00 BC
3 - 36.5mm Mini-Flange w/33mm Pilot, 4xM3 on 26mm BC	7 - 42mm HD 316 SST Round Flange, 42mm Pilot, 4x M4 on 35mm BC	A - 2.06" Square Flange, 1.25" Pilot, 4x 0.16 on 1.75" SQ
4 - 2.63" Square Flange, 1.25" Pilot, 4x 0.22 on 2.06 Sq.		

*4" Housing only available with "K" seals

CONNECTOR

A - 10 pin MS w/o Plug, Avtron/BEI Pinout B - 10 pin MS w/o Plug, Dynapar HS35 Pinout (Rev Phasing) C - 10 pin MS with Plug, Avtron/BEI Pinout D - 10 pin MS with Plug, Dynapar HS35 pinout (Rev Phasing)	E - 6 pin MS w/o Plug, BEI/Avtron HS35 pinout F - 6 pin MS w/o Plug, Dynapar HS35 Pinout (Rev Phasing) G - 6 pin MS with Plug, BEI/Avtron HS35 pinout H - 6 pin MS with Plug, Dynapar HS35 Pinout (Rev Phasing)	J - 7 pin MS w/o Plug, Avtron/BEI HS35 Pinout K - 7 pin MS w/o Plug, Dynapar HS35 Pinout (Rev Phasing) M - 7 pin MS with Plug, Avtron/BEI HS35 Pinout N - 7 pin MS with Plug, Dynapar HS35 Pinout (Rev Phasing)	R - 10 Pin Mini Twistlock with Plug T - M12-8 pin w/o Plug, Global Pinout 7 - M12-8 pin w/o Plug, Global Pinout (Rev Phasing) U - M12-8 pin w/o Plug, USA Pinout	2 - M23-12 Pin w/o Plug, Leine & Linde and Hubner pinout 3 - M23-12 Pin w/o Plug, Inverted Hubner Signals 5 - M12-5 Pin w/o Plug W - 3.2ft [1m] Cable (also use with special mod 9XX)
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- 1) Apply anti-seize compound to inner circumference of coupling (both motor and encoder side).
- 2) Loosen set screws in coupling and apply thread locker to set screws.
- 3) Place coupling on motor/load shaft, inserting to depth per manufacturer's instructions.
- 4) Attach coupling to motor/load shaft using set screws per manufacturer's instructions.
- 5) Slide encoder shaft into other side of coupling.
DO NOT FORCE.
- 6) Ensure face on mounting flange matches and aligns with encoder face precisely.
- 7) Apply thread locker to face mounting screws or flange mounting bolts.
- 8) Align bolt holes of encoder and flange, thread in screws.
- 9) Tighten set screws on encoder side of coupling. (is there a torque spec?)

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 user 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 below are based on typical applications. Refer to the system drawing for specific cable requirements where applicable. Physical properties of cable such as abrasion, temperature, tensile strength, solvents, etc., are dictated by the specific application. General electrical requirements are: stranded copper, 22 thru 16 gauge, each wire pair individually shielded with braid or foil with drain wire, 0.05 uF maximum total mutual or direct capacitance, outer sheath insulator. See Wire Selection Chart below for some suggested cables. *Maximum cable length (and line driver selection) is limited by several factors: line driver protection, maximum RPM, PPR, output voltage and cable capacitance.

WIRING INSTRUCTIONS

CAUTION

Be sure to remove power before wiring the AV4 Encoder. Be sure to ground the cable shield: It can be connected to case ground at the encoder, or grounded at the receiving device, but should not be grounded on both ends.

If necessary, case ground can also be provided through a separate wire. (Not available for 6-pin connectors: options "E", "F", "G", "H"). Be certain not to ground the case ground wire if the encoder is already grounded by mechanical mounting or coupling. For bidirectional operation of the AV4 Encoder, proper phasing of the two output channels is important. For models with A and B output channels Phase A leads Phase B for clockwise shaft rotation as viewed from the rear of the encoder for the standard wiring options. Follow instructions under corrective installation as needed to reverse the direction of output or purchase AV4 with reverse phasing (options "B", "D", "F", "H", "K", "N").

ELECTRICAL

- A. Operating Power (Vin)
1. Volts See Line Driver Options
 2. Current ≤140mA @ 5V DC, ≤70mA @ 10V DC, ≤40mA @ 24V DC
- B. Output Format
1. 2Ø & Comp See Channel Options (A, A/, B, B/, Z, Z/ available)
- C. Signal Type Incremental, Square Wave 90° ± 4.5° electrical
- D. Direction Sensing Phasing with respect to rotation as viewed from the back of the encoder (non-shaft side).
- Connector options "A", "C", "E", "G", "J", "M", "R", "T", "U", "W", "2", "5"
ØA leads ØB for CW rotation (Std. phasing).
- Connector options "B", "D", "F", "H", "K", "N", "U", "3"
ØA leads ØB for CCW rotation (Reverse phasing).
- E. Max Frequency Response 1MHz
- F. PPR 1-16,384

MECHANICAL

- A. Speed 3,000-12,000 Max RPM (consult factory)
- B. Max Shaft Load Axial 40 N, Radial 110 N
- C. Shaft Diameter 1/4", 3/8", 6mm, 10mm
- D. Starting Torque ≤5 Ncm @ 20°C (7.1 oz-in @ 68° F)
- E. Weight 320g nom (varies by configuration)
- F. Length 55mm nom (varies by configuration)

ENVIRONMENTAL

- A. Operating Temperature -40 °C (-40 °F) - +85 °C (+185 °F)
- B. Humidity 98% RH, non-condensing
- C. Shock Resistance ≤ 100 g
..... (half sine 6 ms, EN 60068-2-27)
- D. Permanent Shock ≤ 10 g
..... (half sine 16 ms, EN 60068-2-29)
- E. Vibration Resitance ≤ 10 g
..... (10 Hz – 1000 Hz, EN 60068-2-6)

OUTPUT OPTIONS

		1	4
Output Type		Differential Line Driver	Differential Line Driver, 5V fixed
Line Driver		IC-HD2	IC-HD2
Voltage Input (Vin)		5-30V in & out	5-30V in / 5V out
Protection	Reverse Polarity	yes	yes
	EMC: Emitted Interference	DIN EN 61000-6-4	DIN EN 61000-6-4
	EMC: Noise Immunity	DIN EN 61000-6-2	DIN EN 61000-6-2
	Short Circuit	yes	yes
Max Cable Length		5V 500' [150m] 12V 250' [75m] 24V 100' [30]	500' [150m]

WIRING DIAGRAMS

Line Driver (Output Option 1, 4)

DIFFERENTIAL TWO PHASE WIRING APPLICATIONS, With or Without Marker

Pinout									
Connector	Option "W" (Cable)	Option "A", "B", "C", "D" (10-Pin MS)	Option "E", "F", "G", "H" (6-Pin MS)	Option "J", "K", "M", "N" (7-Pin MS)	Option "R" (mini Twist-lock)	Option "2", "3" (M23-12 Pin)	Option "T" (M12-8 Pin)		
Channels	A A, A/ B, B/ Z, Z/	A A, A/ B, B/ Z, Z/	B A, A/ B, B/	B A, A/ B, B/	A A, A/ B, B/ Z, Z/	A A, A/ B, B/ Z, Z/	A A, A/ B, B/ Z, Z/	A A, A/ B, B/ Z, Z/	Ref Signal
Encoder Wiring	GREEN	A	E	A	A	5	3	A	
	YELLOW	H	C	C	H	6	4	A/	
	GRAY	B	D	B	B	8	5	B	
	PINK	I	F	E	J	1	6	B/	
	BLUE	C	-	-	C	3	7	Z	
	RED	J	-	-	K	4	8	Z/	
	BROWN	D	B	D	D	12	2	+V	
	WHITE	F	A	F	F	10	1	COM/GND	
SHIELD									

Line Driver (Output Option 1, 4)

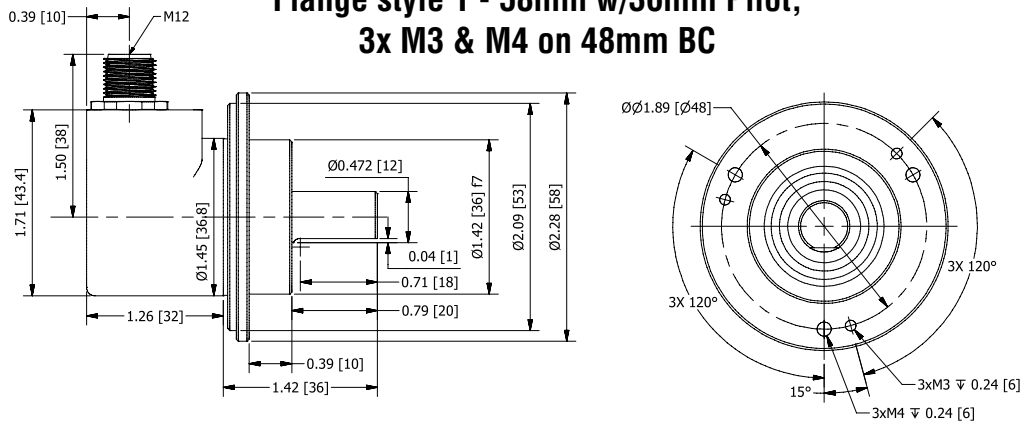
SINGLE ENDED TWO PHASE WIRING APPLICATIONS, WITH OR WITHOUT MARKER

Pinout					
Connector	Option "W" (Cable)	Option "E", "F", "G", "H" (6-Pin MS)	Option "J", "K", "M", "N" (7-Pin MS)	Option "5" (M12-5 Pin)	
Channels	A A, A/ B, B/ Z, Z/	E A, B, Z	E A, B, Z	E A, B, Z	Ref Signal
Encoder Wiring	GREEN	A	A	4	A
	YELLOW				A/
	GRAY	B	B	2	B
	PINK				B/
	BLUE	C	C	5	Z
	RED				Z/
	BROWN	D	D	1	+V
	WHITE	F	F	3	COM/GND
SHIELD					

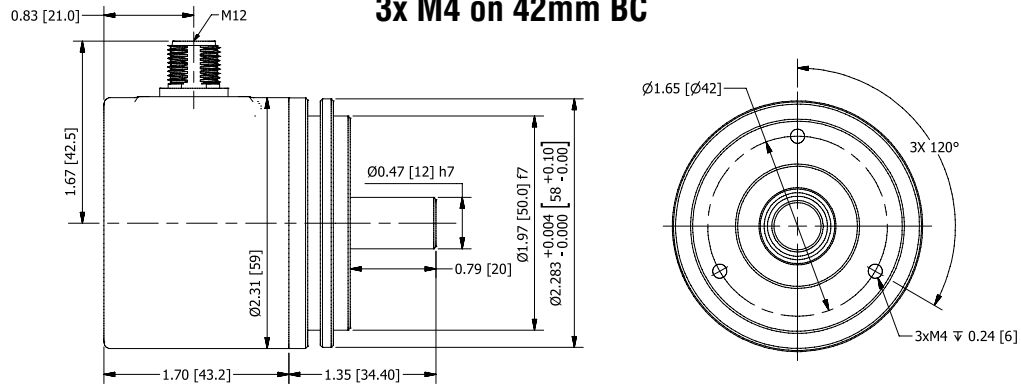
^ Marker N/A

OUTLINE DRAWING

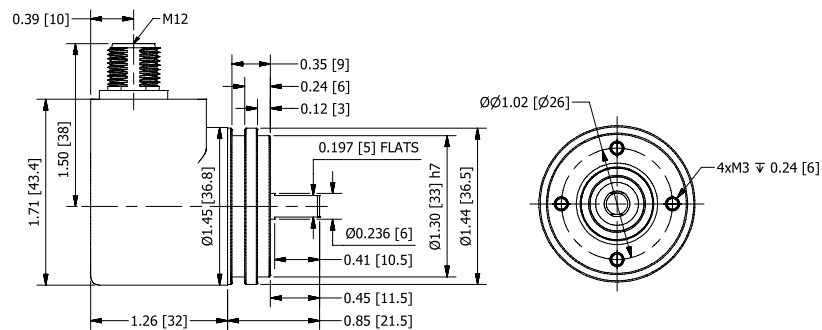
**Flange style 1 - 58mm w/36mm Pilot,
3x M3 & M4 on 48mm BC**



**Flange style 2 - 58mm w/50mm Pilot,
3x M4 on 42mm BC**

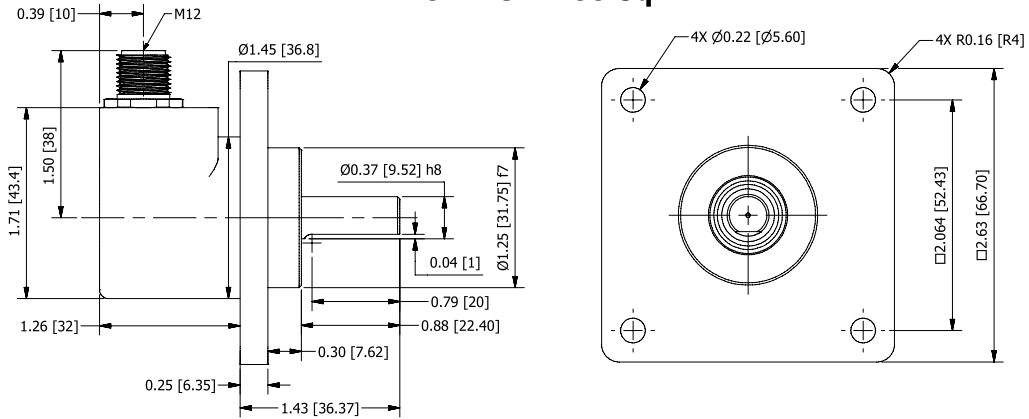


**Flange style 3 - 36.5mm Mini-Flange w/33mm Pilot,
4x M3 on 26mm BC**

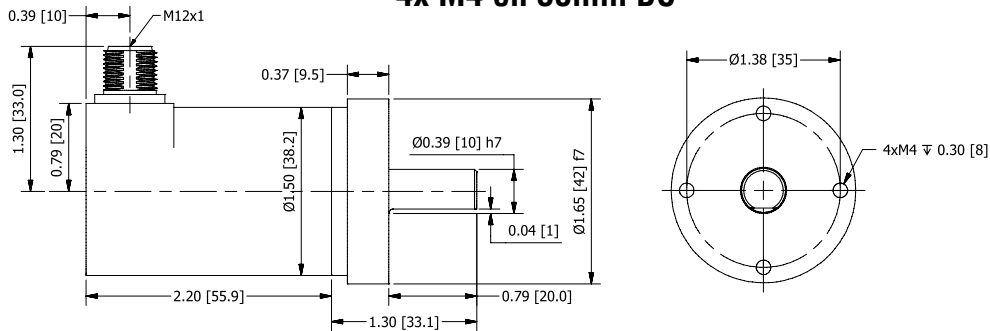


OUTLINE DRAWING

**Flange style 4 - 2.63" Square Flange, 1.25" Pilot,
4x 0.22 on 2.06 Sq.**



**Flange style 7 - 42mm HD 316 SST Round Flange, 42mm Pilot,
4x M4 on 35mm BC**



DIMENSIONS IN INCHES
[MILLIMETERS]

ALL DIMENSIONS ARE
APPROXIMATE



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Features and specifications subject to change without notice.
Avtron standard warranty applies. All dimensions are in millimeters approx.

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