AVTRON™ ENCODERS

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ENCODER INSTRUCTIONS

XR45 SMARTSafe™

**5/8" to 1-1/8" (16-30mm)
HOLLOW SHAFT FOR HAZARDOUS APPLICATIONS**

DESCRIPTION

The Avtron Model XR45, SMARTSafe™ is a **heavy duty** incremental encoder for hazardous atmosphere applications (also known as tachometer or rotary pulse generator). Its output is directly proportional to shaft position (pulse count) or speed (pulse rate). The XR45 operates down to zero speed and can be used for both control and instrumentation applications.

CAUTION
The XR45 is designed for use in hazardous applications which require protection from gas or dust ignition for safe operation. Proper selection, wiring and installation procedures are essential to ensuring safe conditions.

When mounted to a machine shaft, the XR45 design eliminates the need for shaft couplings, adapter flanges, or accessory mounting faces. The high clamping-force collar holds the XR45 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 XR45 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 XR45 electronics are potted, providing full protection against liquids. The outputs are protected against short circuits and wiring errors.

Each XR45 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 XR45 has a diagnostic package that includes Adaptive Electronics and a Fault-Check output and red/green LED for local indication. With this package, the XR45 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 XR45 by constantly monitoring and correcting duty cycle and edge separation over time.

INSTALLATION

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.

Refer to the following attached installation drawings for installation information appropriate for specific hazardous locations:
D53008: ATEX / IECEx Zone 1, 21
D52353: ATEX / IECEx Zone 2, 22
D52354: US and Canada Class I Division 1 Encoder
D52355: US and Canada Class I Division 2

NOTE:
The equipment is intended for a fixed installation and should be mounted so as to avoid electrostatic charging. The XR45 is not considered as a safety device and is not suitable for connection into a safety system.

The XR45 construction materials contain less than 7.5% in total by mass of magnesium, titanium and zirconium. These materials are not considered as able to trigger an explosion in normal operating modes. These materials are not known to react with any explosive atmospheres to which the XR45 may be subject. It is however the responsibility of the end user to ensure that the XR45 is selected correctly for the potentially explosive atmosphere in which the equipment is to be put into service.

The XR45 installation is similar to HS45.

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

The hollow shaft XR45 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. Shaft Total Indicated Runout (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 XR45 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 XR45 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 XR45.

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 burrsand 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 XR45. Use a wrench on the external flats if necessary. Tighten 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 XR45 can be modified in the field to easily adapt to new applications.

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

Refer to the attached installation drawings referenced above for wiring diagrams. Use the drawing appropriate for the encoder's installation location. Information on specific connector pin-outs and phasing can be found on labels on the encoders and in the tables included in these instructions.

The XR45 can be wired for single phase or two phase, either with or without complements, with or without markers. For bidirectional operation, in most cases Phase A channel typically leads phase B channel for clockwise shaft rotation as viewed from the anti-drive or accessory end of the motor. See pinout and phasing tables for exceptions.

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 with B
   - **b) Differential 2 Phase Wiring** (see wiring diagram) Exchange **either** A with $\overline{A}$ in the phase A pair OR B with $\overline{B}$ 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.

Interconnection cables specified in the wire selection chart are based on typical applications. Cable must be selected and installed in accordance with regional standards. Typical interconnection cable is 4 twisted pair + overall shield. Recommended cable is Avtron B37178. Alternates are Belden P/N 1064A or Rockbestos 04P-18 I/S-OS. Actual cables should be picked based on specific application requirements such as abrasion, temperature, tensile strength, solvents, etc. General electrical requirements are: stranded copper, 20 through 16 AWG, twisted wire pairs, braid or foil individual shields or over-all shield with drain wire, .03uF of maximum total mutual or direct capacitance and outer sheath insulator. 20 AWG wire should not be used for DC power to the encoder for runs greater than 200 feet and 22AWG should not be used for runs greater than 100 ft. This is to minimize voltage drop between the encoder and the XRB3 isolator. The smaller conductors are acceptable for the signal lines.

FAULT-CHECK

After power-up and the rotor position is checked by the sensor, the Fault-Check LED will turn green.

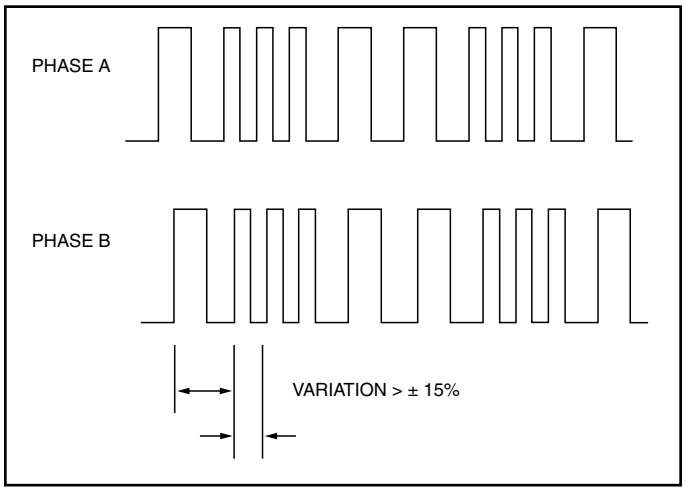
If the adaptive electronics reach their adjustment limit for any reason, the Fault-Check alarm and LED will notify the drive and operator of an impending failure. The LED will turn red if the Adaptive Electronics reach their adjustment limit. This output occurs before an actual failure, allowing steps to be taken to replace the unit before it causes unscheduled downtime. Fault-Check annunciation is available as an “alarm” output through the connector (zone 2 and Division 2 configurations only) and as an integral LED.

TROUBLESHOOTING

If the drive indicates a loss of encoder/tach fault and the XR45 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 XR45. 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 XR45 and the rotor is properly located, replace the XR45.

An oscilloscope can also be used to verify proper output of the XR45 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 below), replace any magnetized material nearby with non-magnetic material (aluminum, stainless) (shafts, etc). If variations persist, consider replacing with super-shielded models, option -004.



XR45 PART NUMBERS AND AVAILABLE OPTIONS

Model	Bore Size		Left Output PPR	Right Output PPR	Line Driver	Connector Options	Tether	Channels	Modifications
XR45	**Clamping Collar Mount U.S.** **C-** 5/8" **D-** 3/4" **E-** 7/8" **F-** 1" **G-** 1 1/8 **U-** All US Sizes **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)	**AF-** 60 **AG-** 100 **AH-** 120 **AA-** 128 **AL-** 240 **AN-** 256 **AP-** 300 **AE-** 360 **AB-** 480 **AQ-** 500 **AR-** 512 **AS-** 600 **AV-** 900 **AJ-** 960 **AW-** 1000 **AY-** 1024 **AZ-** 1200 **CX-** 1500 **A3-** 2000 **A4-** 2048 **A5-** 2500 **AD-** 4096 **A8-** 4800 **A9-** 5000 **A0-** Special	**XX-** None **AF-** 60 **AG-** 100 **AH-** 120 **AA-** 128 **AL-** 240 **AN-** 256 **AP-** 300 **AE-** 360 **AB-** 480 **AQ-** 500 **AR-** 512 **AS-** 600 **AV-** 900 **AJ-** 960 **AW-** 1000 **AY-** 1024 **AZ-** 1200 **CX-** 1500 **A3-** 2000 **A4-** 2048 **A5-** 2500 **AD-** 4096 **A8-** 4800 **A9-** 5000 **A0-** Special	**See Line Driver / Connector Options Chart**	**See Line Driver / Connector Options Chart**	**X- None** **Flat Styles:** **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)	**A-** $\overline{A}$,A, $\overline{B}$,B, $\overline{Z}$,Z (req'd for 8, 10 pin connectors) **B-** A,B,A,B (no marker) **E-** A,B,Z (single ended) **F-** A,B (single ended, no marker) **D-** A,A (Diff Phase)	**000-** None **001-** Ceramic Bearings **004-** Super Magnetic Shielding **018-** Add Isolator **4xx-** Special PPR (see chart) **9xx-** Specify cable length xx=feet max 33ft (use w/ Option "Q","W", "Z")

Equipment Needed for Installation		
Provided	**Optional**	**Not Provided**
XR45 Encoder Shaft Sizing Insert for all clamp style models For 16mm center-bolt style ONLY: centering (tapered) ring Model XRB3 Isolator for Division 1, Zone 0, 1, 20 and 21 applications (Sold Separately)	Anti-Rotation Arm Kit Thread Locker (blue)	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

			Line Driver Options				
		Description	ATEX / IECEx Zone1 & 21	ATEX / IECEx Zone 2 & 22	Class I Div. 1 & Zone 0	Class I Div. 2 Listed	Class I Div. 2 Recognized
		Voltage In / Out	5-7 / 5	5-24 / 5-24	5-7 / 5	5-24 / 5-24	5-24 / 5-24
		Line Driver Code	H	7	F	G	R
	Code	Required Isolator	XRB3	None	XRB3	None	None
45 Series Connector Options	A	10 Pin MS W/O Plug Std Phasing	✓	✓	✓		✓
	B	10 Pin MS W/O Plug Reverse Phasing	✓	✓	✓		✓
	C	10 Pin MS W/Plug Std Phasing	✓	✓	✓		✓
	D	10 Pin MS W/Plug Reverse Phasing	✓	✓	✓		✓
	4	10 Pin MS W/Plug Large Encoder Pinout	✓	✓	✓		✓
	E	6 Pin MS W/Plug Std Phasing	✓	✓	✓		
	F	6 Pin MS W/Plug Reverse Phasing	✓	✓	✓		
	J	7 Pin MS W/Plug Std Phasing	✓	✓	✓		✓
	K	7 Pin MS W/Plug Reverse Phasing	✓	✓	✓		✓
	T	8 Pin M12 Global Pinout	✓	✓	✓		
	U	8 Pin M12 USA Pinout	✓	✓	✓		
	2	12 Pin M23, Leine & Linde Pinout	✓	✓	✓		
	3	12 Pin M23, Hubner Pinout	✓	✓	✓		
	P	Small Industrial Style Std Phasing & Plug	✓	✓	✓		
	G	Small Industrial Style Northstar Pinout	✓	✓	✓		
	R	10 Pin mini Twist Lock with Plug	✓	✓	✓		
	W	Flexible Cable with Sealing Gland	✓	✓	✓		
	H	Conduit Box, Terminal Block & 1/2" NPT	✓	✓	✓	✓	
	L	Conduit Box, Terminal Block, 1/2" NPT+Cord	✓	✓	✓		
	M	Conduit Box, Terminal Block & 3/4" NPT	✓	✓	✓	✓	
	N	Conduit Box, Terminal Block & 1" NPT	✓	✓	✓	✓	
	8	Conduit Box, Terminal Block and 25mm	✓	✓	✓	✓	

SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

A. Operating Power (Vin)
   1. Volts See line driver table
   2. Current (No Load)
      Encoder 100mA
      Encoder + Isolator 150mA
B. Output Format
   1. 2O/ & 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 ..... O/ A leads O/ B 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 ..... 0 to 165,000 Hz
G. PPR 8-5000
H. Line Driver Specs: ..... See table
I. Connectors: ..... See connector options

MECHANICAL

A. Shaft Inertia 0.0041 lb-in-sec2
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.

ENVIRONMENTAL

Solid cast aluminum stator and rotor. Less than 6% magnesium by mass.
Fully potted electronics, protected against oil and water spray.
Operating Temperature: -40°C to +80°C.

			Line Driver Specifications				Isolator Specifications	
		Code	H	7	F	G	XRB3	
Description		Symbol	ATEX / IECEx Zone 1 & 21(ia)	ATEX / IECEx Zone 2 & 22	Class I Div. 1 & Zone 0	Class I Div. 2 Listed	ATEX/IECEx Zone 1&21(ia) + Class I Div 1&Zone 0	Units
Line Driver			7272	7272	7272	7272	IXDF604	
Input Voltage (Nominal)		V_{IN} / V_S	5-7	5-24	5-7	5-24	12-24	V_{DC}
Input Voltage (Max Safe)		U_M	N/A	N/A	N/A	N/A	30	V
Input Current (no load)		I_{IN} / I_S	80	80	80	80	150	mA
Input Current (Typical)		I_{IN} / I_S	100	200	100	200	450	mA
Input Current (Max.)		I_{IN} / I_S	140	300	140	300	900	mA
Output Voltage (nominal)		V_H	N/A	N/A	N/A	N/A	6.8	V_{DC}
Output Voltage Min.(@140mA)		V_H	N/A	N/A	N/A	N/A	5	V_{DC}
Output Voltabe Max(No Load)		V_H	N/A	N/A	N/A	N/A	7.14	V_{DC}
Output Current (@6.8V)		I_H	N/A	N/A	N/A	N/A	115	mA
Output Current (@5V)		I_H	N/A	N/A	N/A	N/A	140	mA
Output Current (short circuit)		I_H	N/A	N/A	N/A	N/A	420	mA
Voltage Output High (Nominal)		V_{OH}	5	V_{IN}-1	5	V_{IN}-1	V_S-1	V_{DC}
Voltage Output Low (Nominal)		V_{OL}	.5	.5	.5	.5	.4	V_{DC}
Signal Current (Continuous)		I_{OH} / I_{OL}	100	100	100	100	2580	mA
Signal Current (Peak)		I_{OH} / I_{OL}	1500	1500	1500	1500	3000	mA
Output Resistance Ω		R_{OH} / R_{OL}	15	15	15	15	7	Ω
Cable Drive			500	5-15Vin=500 24Vin = 250	500	5-15Vin=500 24Vin = 250	1000	ft.
Protection	Reverse Voltage		Yes	Yes	Yes	Yes	Yes	
	Short Circuit		Best	Good	Best	Good	Best	
	Transient		Good	Good	Good	Good	Best	
Alarm	+Vout		no	Yes	no	Yes	no	
	Alarm		no	Yes	no	Yes	no	
	LED		Yes	Yes	Yes	Yes	Yes	
	+Vout		Reverence Signal for Alarm Circuit, Output Voltage = Input Voltage					
	Alarm		Open Collector, normally off, goes low on alarm, sink 100mA max, See Connector Pinouts for Availability					
	LED		Green = Power On, Red = Alarm					

See the following Installation Drawings for Wiring Information

D53008: ATEX / IECEx Zone 1 & 21

D52353: ATEX / IECEx Zone 2 & 22

D52354: Division 1

D52355: Division 2

NOTE: Remote alarm is not functional for Division 1, Zone 0 or Zone 1

Phasing is defined as the direction of rotation for which phase A leads B as viewed from the back of the Encoder	Option Code	Channel Code	Phasing	Signal	0V Gnd	A+	B+	Z+	* Alm+	+Vin	$\overline{\text{A-}}$	$\overline{\text{B-}}$	$\overline{\text{Z-}}$	* Alm
10 Pin MS (Standard Phasing)	A, C	A	CW	Pin #	F	A	B	C	NC	D	H	I	J	NC
10 Pin MS (Reverse Phasing)	B, D	A	CCW	Pin #	F	A	B	C	NC	D	H	I	J	NC
10 Pin MS (M3/M4 Pinout)	4	A	CW	Pin #	A	D	E	C	NC	B	G	H	I	NC
10 Pin MS Mini Twist Lock	R	A	CW	Pin #	F	A	B	C	NC	D	H	J	K	NC
10 Pin, Mini Industrial, Avtron Pinout	P	A	CW	Pin #	1	2	3	4	5	6	7	8	9	10
10 Pin, Mini Industrial, Northstar Pinout	G	A	CW	Pin #	1	2	3	4	NC	6	7	8	9	NC
10 Wire Cable	W	A	CW	Color	BLK	GRN	BLU	ORG	BRN	RED	YEL	GRA	WHT	VIO

Phasing is defined as the direction of rotation for which phase A leads B as viewed from the back of the Encoder	Option Code	A1	Phasing	Signal	0V Gnd	1+	2+	0+	NC	+E	$\overline{\text{1-}}$	$\overline{\text{2-}}$	$\overline{\text{0-}}$	NC	NC	NC
	Option Code	A2	Phasing	Signal	0V Gnd	K1+	K2+	K0+	NC	+Ub	$\overline{\text{K1-}}$	$\overline{\text{K2-}}$	$\overline{\text{K0-}}$	NC	NC	NC
	Option Code	Channel Code	Phasing	Signal	0V Gnd	A+	B+	Z+	* Alm+	+Vin	$\overline{\text{A-}}$	$\overline{\text{B-}}$	$\overline{\text{Z-}}$	* Alm	NC	NC
12 Pin M23, Leine Linde Pinout	2	A1	CW	Pin #	10	8	5	3	NC	12	1	6	4	NC	2	7
12 Pin M23, Hubner Pinout	2	A2	CCW	Pin #	10	5	8	2	NC	12	6	1	4	NC	2	7
12 Pin M23, Leine Linde Pinout, Inverted	3	A2	CW	Pin #	10	8	5	3	NC	12	1	6	4	NC	2	7
Conduit Box W/10 Pin Terminal Strip	H,L,M,N,8	A	CW	Pin #	1	2	3	4	5	6	7	8	9	10		
Conduit Box W/10 Pin Terminal Strip	H,L,M,N,8	A1	CW	Pin #	1	2	3	4	5	6	7	8	9	10		
Conduit Box W/10 Pin Terminal Strip	H,L,M,N,8	A2	CCW	Pin #	1	7	3	4	5	6	2	8	9	10		

***** Remote alarm function not available with line driver options “H”, “7” or “F” (Zone 0, Zone 1 or Class I Div I)

Pinouts and Phasing

Phasing is defined as the direction of rotation for which phase A leads B as viewed from the back of the Encoder

	Option Code	Channel Code	Phasing	Signal	0V Gnd	A+	B+	Z+	+Vin	A-	B-	Z-
6 Pin MS, Standard Phasing	E	B	CW	Pin #	A	E	D	NC	B	C	F	NC
6 Pin MS, Standard Phasing	E	D	CW	Pin #	A	E	NC	NC	B	NC	NC	NC
6 Pin MS, Standard Phasing	E	E	CW	Pin #	A	E	D	C	B	NC	NC	NC
6 Pin MS, Standard Phasing	E	F	CW	Pin #	A	E	D	NC	B	NC	NC	NC
6 Pin MS, Reverse Phasing	F	B	CCW	Pin #	A	E	D	NC	B	C	F	NC
6 Pin MS, Reverse Phasing	F	D	CCW	Pin #	A	E	NC	NC	B	NC	NC	NC
6 Pin MS, Reverse Phasing	F	E	CCW	Pin #	A	E	D	C	B	NC	NC	NC
6 Pin MS, Reverse Phasing	F	F	CCW	Pin #	A	E	D	NC	B	NC	NC	NC
7 Pin MS, Standard Phasing	J	B	CW	Pin #	F	A	B	NC	D	C	E	NC
7 Pin MS, Standard Phasing	J	D	CW	Pin #	F	A	NC	NC	D	NC	NC	NC
7 Pin MS, Standard Phasing	J	E	CW	Pin #	F	A	B	C	D	NC	NC	NC
7 Pin MS, Standard Phasing	J	F	CW	Pin #	F	A	B	NC	D	NC	NC	NC
7 Pin MS, Reverse Phasing	K	B	CCW	Pin #	F	A	B	NC	D	C	E	NC
7 Pin MS, Reverse Phasing	K	D	CCW	Pin #	F	A	NC	NC	D	NC	NC	NC
7 Pin MS, Reverse Phasing	K	E	CCW	Pin #	F	A	B	C	D	NC	NC	NC
7 Pin MS, Reverse Phasing	K	F	CCW	Pin #	F	A	B	NC	D	NC	NC	NC
8 Pin M12 Global Pinout	T	A	CW	Pin #	1	3	5	7	2	4	6	8
8 PIN M12 USA Pinout	U	A	CW	Pin #	7	1	4	6	2	3	5	8

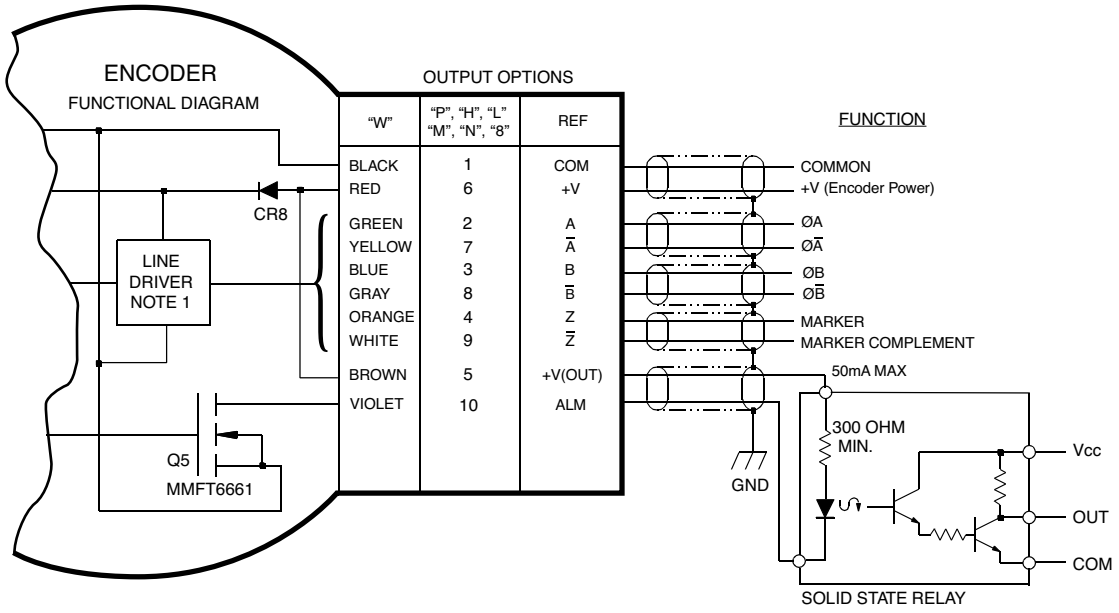
XR45
Remote Alarm

Applies to Model XR45 Zone 2 and Division 2 Encoders with connector styles “P”, “W”, “H”, L”, “M”, “N” “8”. Remote Alarm not available for Zone 1 or Division 1.

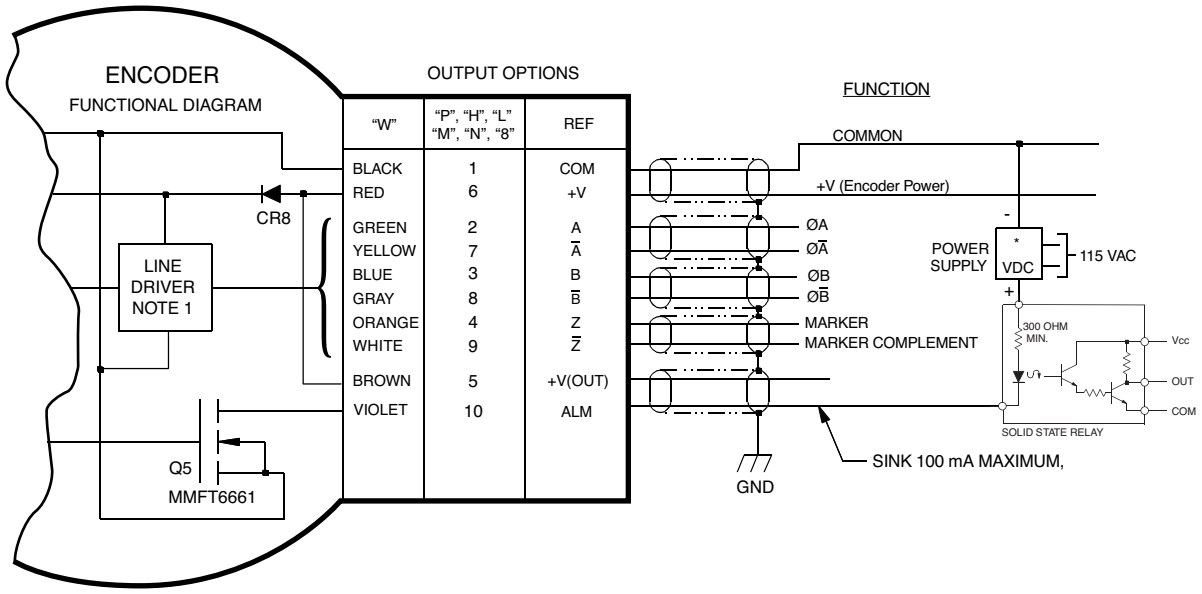
ALARM OUTPUT CONNECTION

Avtron XR45 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.

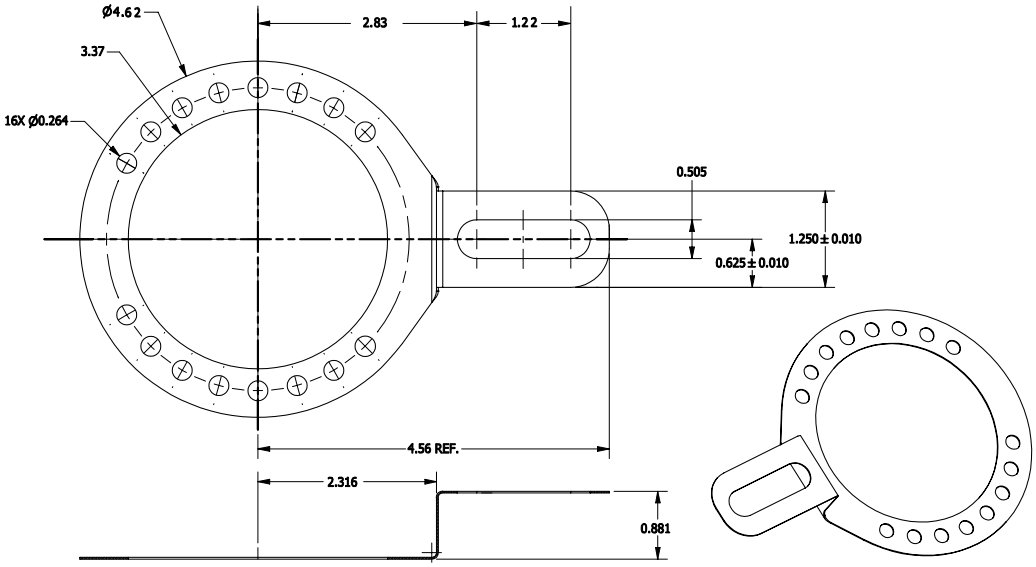


Example 2. Alarm output using Separate *VDC Power Supply

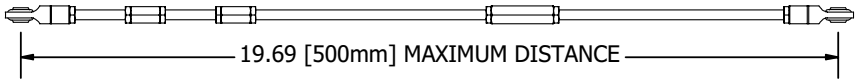


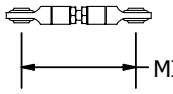
*See specifications for Power supply limits

TETHER OPTION: D and F

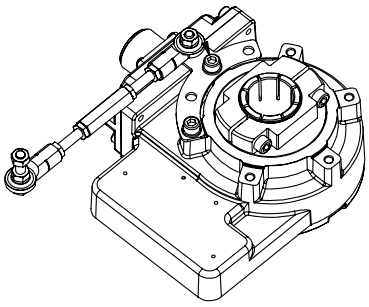


TETHER OPTIONS: G, P, T and U

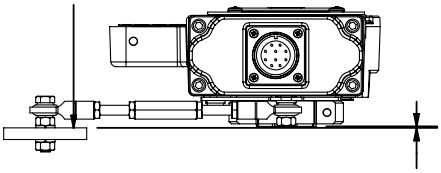




USE 5mm HEX
TORQUE TO
65 IN-LBS. [7.5 N-M]

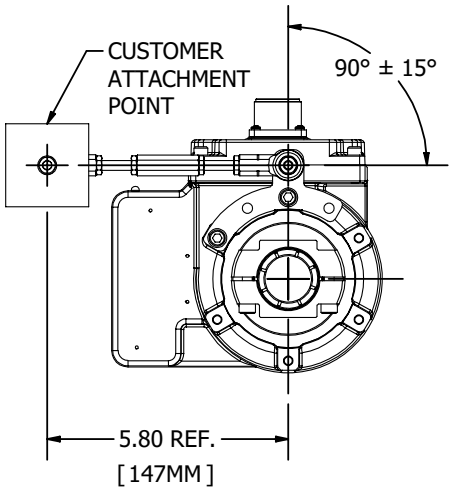


0.28 [7mm] MAX. THICKNESS
FOR THRU HOLE MOUNTING



±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.

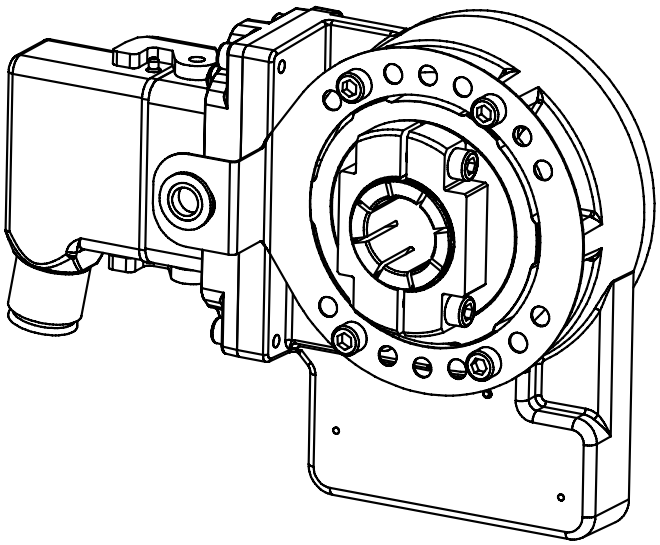
SELECT THE APPROPRIATE THREADED ROD LENGTHS (ITEMS 7, 10, 11). USE COUPLING NUTS (ITEMS 8, 9) TO JOIN RODS.

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.

CLAMP STYLE

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



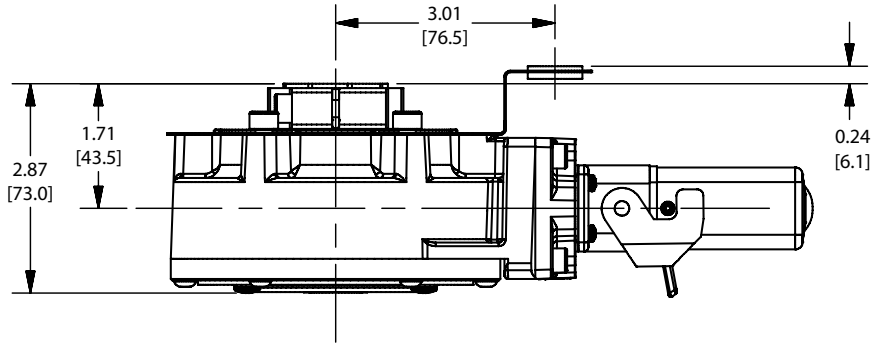
SHAFT ENGAGEMENT:

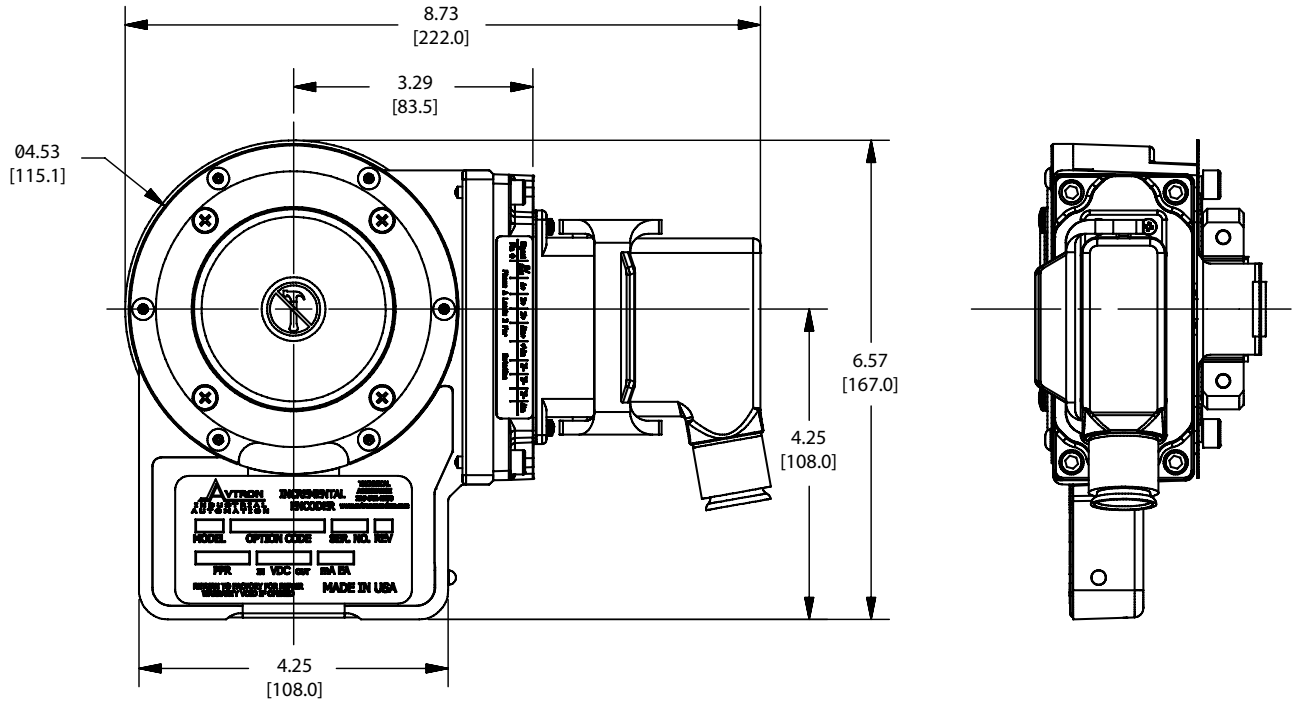
Minimum:

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]

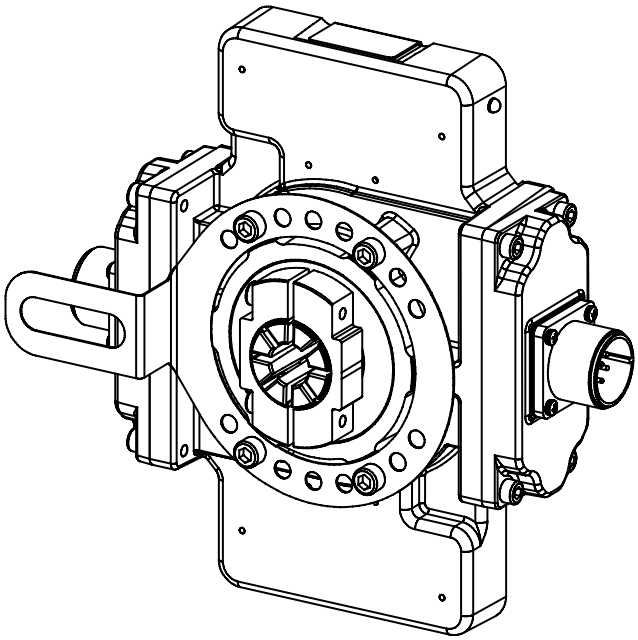




Features and specifications subject to change without notice.
Avtron standard warranty applies. All dimensions are in inches [mm].

CLAMP STYLE

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



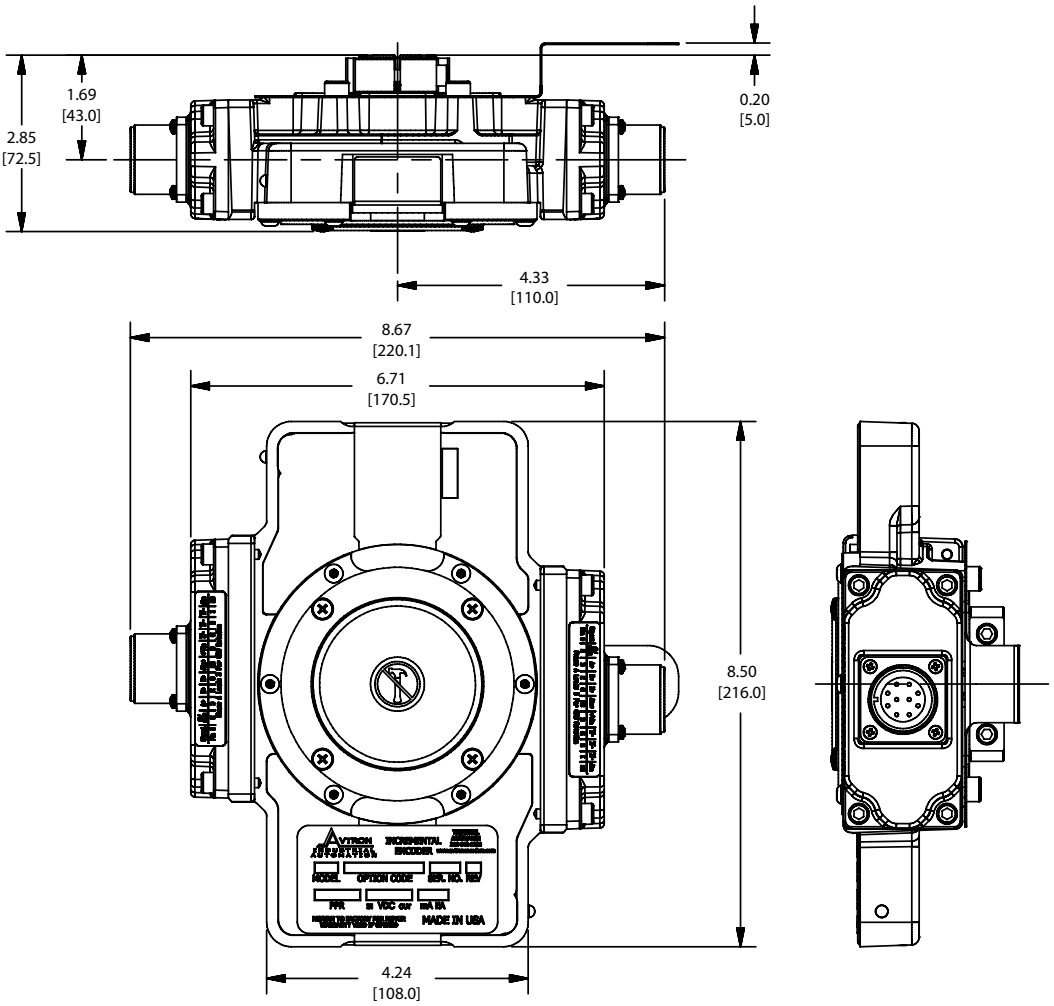
SHAFT ENGAGEMENT:

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]



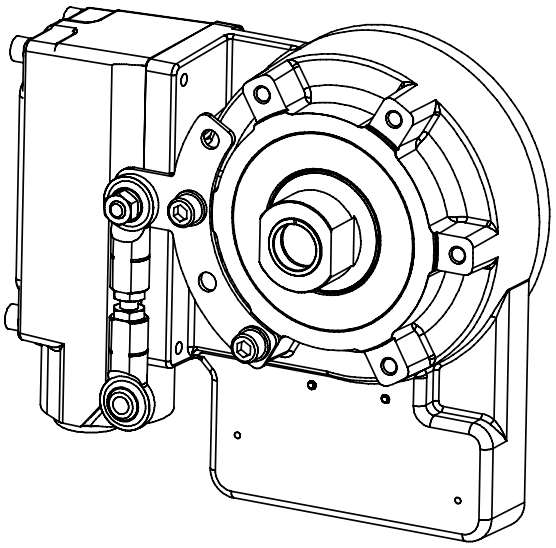
Features and specifications subject to change without notice.
Avtron standard warranty applies. All dimensions are in inches [mm].

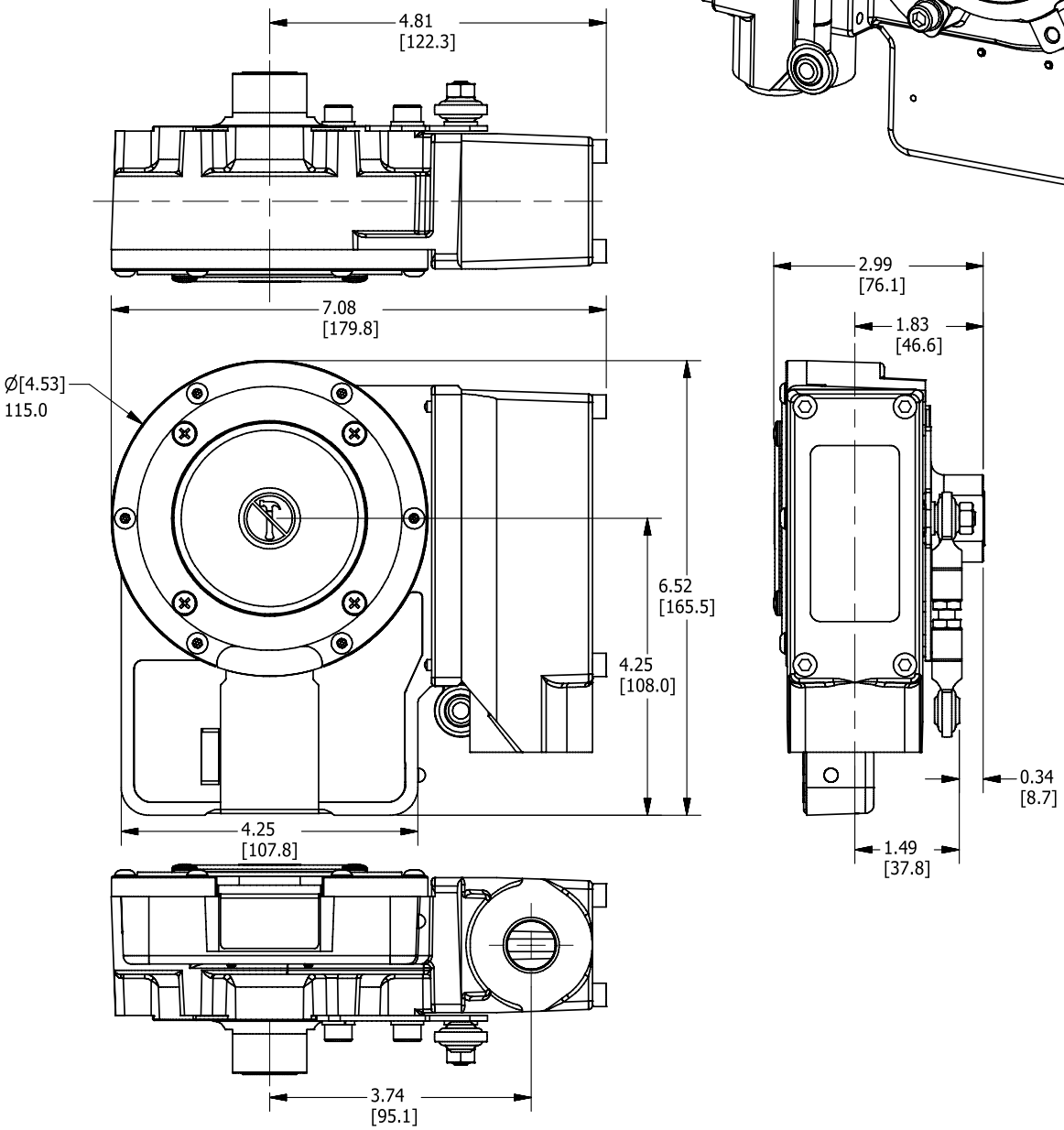
16mm CENTER BOLT STYLE

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

SHAFT ENGAGEMENT:
Minimum: .....1.73” [44mm]

Maximum: .....2.09” [53mm]



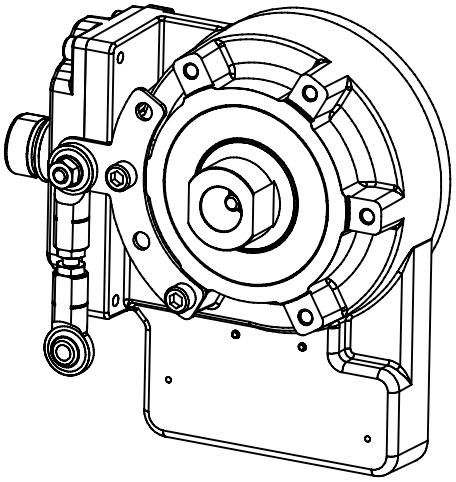


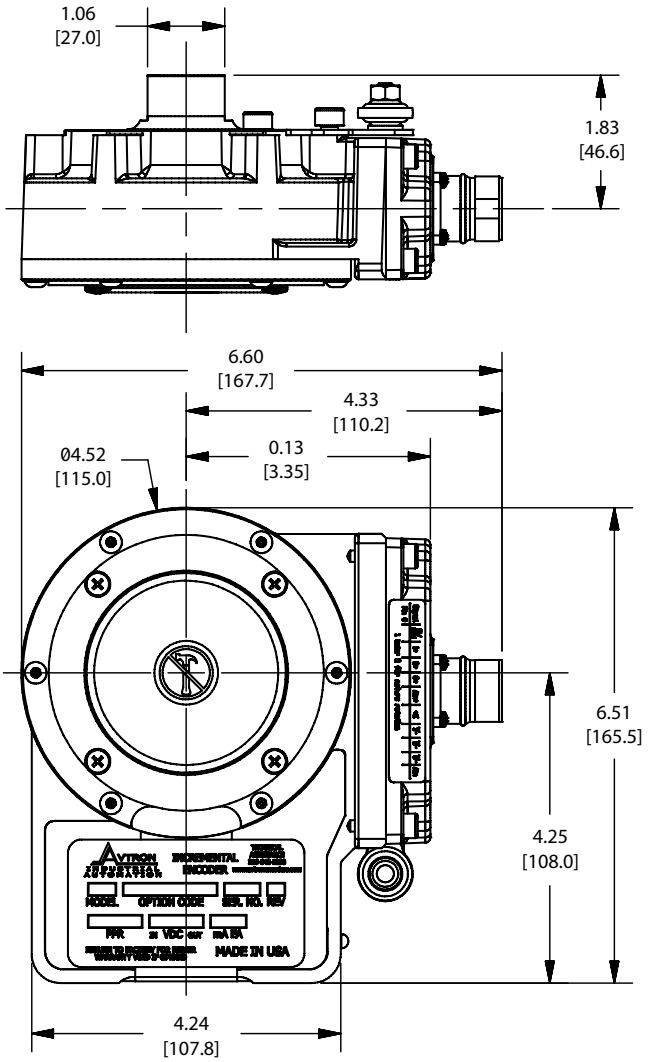
Features and specifications subject to change without notice. Avtron standard warranty applies. All dimensions are in inches [mm].

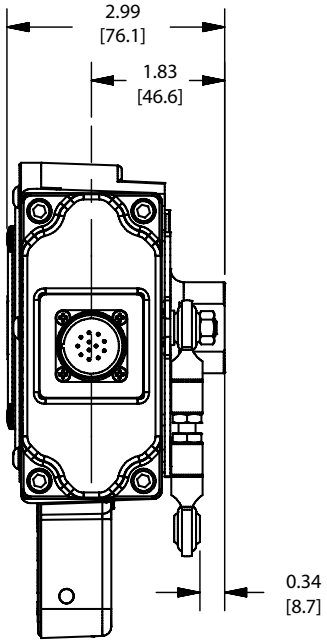
17mm CENTER BOLT STYLE

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

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







These instructions have been reviewed and the product evaluated as suitable for our application.

Company Name _____

Authorized Company Representative _____

Title _____ Date _____

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

Nidec Industrial Solutions | 243 Tuxedo Avenue | Cleveland, Ohio 44131 | encoderhelpdesk@nidec-industrial.com
+1 216-642-1230 | **www.avtronencoders.com**

REVISIONS				
ECN NO.	REV	DESCRIPTION	DATE	APPROVED

XRYYY XXXX5XXX XXX

- LINE DRIVER OPTION CODE FOR: XR850, XR125, XR485, XR685 (5 = ib, H = ia)
- CONNECTOR OPTION CODE LOCATION FOR: XR56A, XR56S XR67A, XR85A, XR115, XR850, XR125, XR485, XR685
- CONNECTOR OPTION CODE LOCATION FOR: XR45, XR47, XR4F
- LINE DRIVER OPTION CODE LOCATION FOR: XR56A, XR56S XR67A, XR85A, XR115, XR45, XR47, XR4F, (5 = ib, H = ia)
- MODEL # CODES: 56A, 56S, 67A, 85A, 115, 45, 47, 4F, 850, 125, 485, 685
- HAZARDOUS LOCATION CODE

CONNECTOR OPTION CODES = A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, T, U, V, W, Y, Z, 2, 3, 4, 5, 6, 7, 8
LINE DRIVER OPTION CODE = H FOR ZONE I & 21 (ia) 5 FOR ZONE 1 & 21 (ib)

XRYY 5 X X XXX

- CONNECTOR OPTION CODE LOCATION FOR: XR5, XR12, XR97
- LINE DRIVER OPTION CODE LOCATION FOR: XR5, XR12, XR97
- MODEL # CODES: 5, 12, 97
- HAZARDOUS LOCATION CODE

CONNECTOR OPTION CODES = A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, T, U, V, W, Y, Z, 2, 3, 4, 5, 6, 7, 8
LINE DRIVER OPTION CODE = H FOR ZONE I & 21 (ia) 5 FOR ZONE 1 & 21 (ib)
ALL OTHER CODE LOCATIONS ARE NOT RELEVANT TO INTRINSIC SAFETY. SEE INSTRUCTION SHEETS FOR DEFINITIONS

THE XR____ FAMILY OF ENCODERS HAS BEEN EVALUATED TO BE COMPLIANT WITH:

IEC60079-0:2011
EN60079-0:2012/A11:2013
IEC60079-11:2011
EN60079-11:2012
BSEN61000-6-4:2007 AND BSEN61000-6-2:2005
CERTIFICATES OF CONFORMITY ExVeritas 20ATEX0676X, IECEx EXV 20.0029X

THE XR____ FAMILY OF ENCODERS IS CERTIFIED FOR USE IN:

GROUP II, CATEGORY 2 (ZONE 1) GAS GROUP IIC WHEN MARKED CE 0539 ⟨Ex⟩ II 2 GD Ex ia IIC T4 Gb AND USED WITH AN ISOLATOR XRB3 MARKED CE 0539 ⟨Ex⟩ II (2) GD [Ex ia IIC Gb]

GROUP II, CATEGORY 2 (ZONE 21) DUST GROUP IIIC WHEN MARKED CE 0539 ⟨Ex⟩ II 2 GD Ex ia IIIC T200°C Db AND USED WITH AN ISOLATOR XRB3 MARKED CE 0539 ⟨Ex⟩ II (2) GD [Ex ia IIIC Db]

GROUP II, CATEGORY 2 (ZONE 1) GAS GROUP IIC WHEN MARKED CE 0539 ⟨Ex⟩ II 2 GD Ex ib IIC T4 Gb AND USED WITH AN ISOLATOR XRB3 MARKED CE 0539 ⟨Ex⟩ II (2) GD [Ex ia IIC Gb]

GROUP II, CATEGORY 2 (ZONE 21) DUST GROUP IIIC WHEN MARKED CE 0539 ⟨Ex⟩ II 2 GD Ex ib IIIC T200°C Db AND USED WITH AN ISOLATOR XRB3 MARKED CE 0539 ⟨Ex⟩ II (2) GD [Ex ia IIIC Db]

MAXIMUM SAFE AREA VOLTAGE = 30V, $-40°C \leq Tamb \leq +80°C$

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. EQUIPMENT AVAILABLE AS A SYSTEM ONLY INCLUDING: XR___ ENCODER WITH LINE DRIVER OPTION "H" OR "5" AND AN AVTRON ISOLATOR MODULE AS LISTED ABOVE. THE ISOLATOR IS SUPPLIED AS A SEPARATE MODULE FOR LOCATION IN A SAFE AREA AND MUST BE INSTALLED IN AN ENCLOSURE.

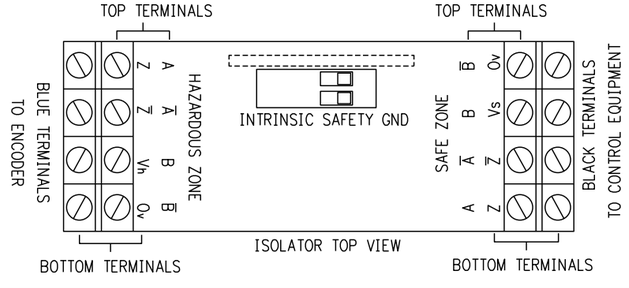
SYSTEM PARAMETERS ARE:

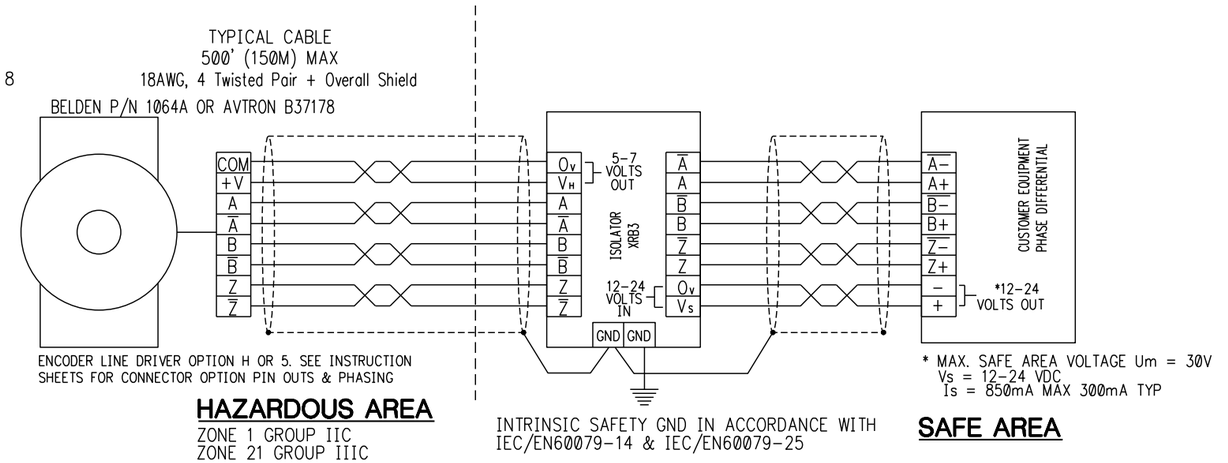
Um (MAXIMUM SAFE AREA VOLTAGE) = 30V
Uo (OPEN CIRCUIT VOLTAGE) = 7.14 VDC
Io (SHORT CIRCUIT CURRENT) = 420 mA
Co (SYSTEM CAPACITANCE) = 13.5 uF MAX.
Lo (SYSTEM INDUCTANCE) = .15 mH MAX.

PARAMETER	ISOLATOR	ENCODER
Um	30V	-
Ui	-	7.14V
Ii	-	420mA
Pi	-	1.4W
Ci	-	11.9uF
Li	-	0mH
Uo	7.14V	-
Io	420mA	-
Po	1.4W	-
Lo	.15mH	
Co	13.5uF	
Lo/Ro	-	
ZONE 1 TABLE OF ENTITY PARAMETERS		

UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY

THIS DRAWING IDENTIFIES CHARACTERISTICS REQUIRED FOR EQUIPMENT USED IN HAZARDOUS LOCATIONS AND MAY NOT BE CHANGED WITHOUT THIRD PARTY APPROVAL. THIRD PARTIES MUST BE IDENTIFIED FROM EQUIPMENT ID LABELS





CABLE CHARACTERISTICS AND INSTALLATION IN ACCORDANCE WITH THE LATEST EDITION OF IEC/EN60079-14/IEC/EC60079-25.

THE XR___ ENCODERS ARE NOT CONSIDERED AS SAFETY DEVICES AND ARE NOT SUITABLE FOR CONNECTION INTO A SAFETY SYSTEM.
THE XR___ ENCODER CONSTRUCTION MATERIALS CONTAIN NO MORE THAN 7.5% IN TOTAL BY MASS OF MAGNESIUM, TITANIUM AND ZIRCONIUM.
THE CONSTRUCTION MATERIALS ARE NOT CONSIDERED AS ABLE TO TRIGGER AN EXPLOSION IN NORMAL OPERATING MODES. THESE MATERIALS ARE KNOWN TO REACT WITH EXPLOSIVE ATMOSPHERES TO WHICH THE ENCODERS MAY BE SUBJECT. THE CONSTRUCTION MATERIALS DO INCLUDE ALUMINUM. AS SUCH, CARE SHOULD BE TAKEN TO AVOID THE POSSIBILITY OF IGNITION FROM IMPACT OR FRICTION. IT IS THE RESPONSIBILITY OF THE END USER TO ENSURE THAT THE ENCODER IS SELECTED CORRECTLY FOR THE POTENTIALLY EXPLOSIVE ATMOSPHERE IN WHICH THE EQUIPMENT IS TO BE PUT IN SERVICE.

SPECIAL CONDITIONS FOR SAFE USE:

ENCODER:

1. WHEN ENCODER IS MARKED AS "ia Gb" OR "ib Gb" IT MUST ONLY BE USED WITH THE CORRESPONDING ISOLATORS LISTED IN THIS CERTIFICATE. THE ISOLATORS, ENCODERS AND CABLE MUST BE SELECTED AND INSTALLED IN ACCORDANCE WITH IEC/EN 60079-14 AND IEC/EN 60079-25.
2. WHEN THE ENCODER IS MARKED AS "ic" THE POWER SUPPLY SITUATED IN THE SAFE AREA MUST BE LIMITED TO THE LEVELS LISTED ON THIS CERTIFICATE AND CABLE MUST BE SELECTED AND INSTALLED IN ACCORDANCE WITH IEC/EN 60079-14 AND IEC/EN 60079-25
3. THE EQUIPMENT SHOULD BE MOUNTED SO AS TO AVOID ELECTROSTATIC CHARGING.

ISOLATORS: MUST BE INSTALLED INSIDE OF AN ENCLOSURE WITH AN APPROPRIATE MECHANICAL STRENGTH AND MINIMUM DEGREE OF PROTECTION, IP20 FOR INDOOR LOCATIONS AND IP54 FOR OUTDOOR LOCATIONS OR INDOOR WET LOCATIONS.

MAINTENANCE: CONTACT NIDEC INDUSTRIAL SOLUTIONS, CLEVELAND, OH, USA.

CAUTION: BE SURE TO REMOVE POWER BEFORE WIRING THE ENCODER. GROUND THE CABLE SHIELD AT THE ISOLATOR. THE CABLE SHOULD NOT BE GROUNDED MULTIPLE PLACES. AN INTRINSIC SAFETY GROUND IS REQUIRED AT THE XRB1 OR XRB2 ISOLATOR MODULE. ENCODERS INCLUDE A LOCAL GROUND LUG FOR CUSTOMER CONVENIENCE AND ENCODER FRAME GROUNDING IF REQUIRED TO MEET LOCAL ELECTRIC CODE FOR SITE OPERATOR PROTECTION STANDARDS. THIS IS NOT THE REQUIRED FOR INTRINSIC SAFETY GROUND CONNECTION REQUIRED FOR HAZARD PROTECTION AGAINST IGNITION OF EXPLOSIVE ATMOSPHERES.

INTERCONNECTION CABLES SPECIFIED ABOVE ARE BASED ON TYPICAL APPLICATIONS. PHYSICAL PROPERTIES OF CABLE SUCH AS ABRASION, TEMPERATURE, TENSILE STRENGTH, SOLVENTS, ETC., ARE DICTATED BY THE SPECIFIC APPLICATION. GENERAL ELECTRICAL REQUIREMENTS ARE: STRANDED COPPER, 20 THROUGH 16 AWG (INDUSTRIAL EPIC CONNECTOR TYPE OPTIONS CAN USE 14 AWG), TWISTED WIRE PAIRS, BRAID OR FOIL INDIVIDUAL SHIELDS OR OVER ALL SHIELD WITH DRAIN WIRE, 0.03uF OF MAXIMUM TOTAL MUTUAL OR DIRECT CAPACITANCE, OUTER SHEATH INSULATOR, MAXIMUM CABLE LENGTH = 500 FT.. 20 AWG WIRE SHOULD NOT BE USED FOR CABLE RUNS GREATER THAN 61 METERS. IF 20 AWG IS USED WITH EPIC TYPE CONNECTORS THEN THE WIRE ENDS SHOULD BE TINNED.

REFER TO THE WIRING DIAGRAMS ON THE ENCODER AND IN THE SPECIFIC MODEL INSTRUCTION SHEETS FOR SPECIFIC CONNECTOR PIN OUTS AND PHASING TABLES FOR EACH CONNECTOR STYLE OPTION.

XXXXXX	XXXXXX
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES: ANGLES±1° DECIMALS .XX± .03 .XXX± .015
FINISH
PAINT PER PS
PLATE PER
COAT PER PS
ANODIZED PER
OTHER

DRAWN	ZIVKOVIC	7/21/20
CHECKED	SIRACKI	7/21/20
ENG APVD	WOLFF	7/21/20
APVD PROD		

Nidec Industrial Solutions
243 TUXEDO AVENUE
BROOKLYN HEIGHTS, OH 44131

ATEX / IECEx, ZONE 1 & 21 INSTALLATION DRAWING

IMF ☒ PSF ☐

SIZE	CAGE NO.	DWG. NO.	REV
D	0FMV7	D53008	–

SCALE 1/1 | MODEL N/A | SHEET 1 OF 1

REVISIONS				
ECN NO.	REV	DESCRIPTION	DATE	APPROVED
EA0878	A	ADD SPECIAL CONDITIONS FOR SAFE USE PATTON	6/24/15	SHADDUCK

XRYYY XXXX7XXX XXX

- LINE DRIVER OPTION CODE FOR XR850, XR125, XR485, XR685
- CONNECTOR OPTION CODE LOCATION FOR: XR56A, XR56S XR67A, XR85A, XR115, XR850, XR125, XR485, XR685
- CONNECTOR OPTION CODE LOCATION FOR: XR45, XR47, XR4F
- LINE DRIVER OPTION CODE LOCATION FOR: XR56A, XR56S XR67A, XR85A, XR115, XR45, XR47, XR4F
- MODEL # CODES: 56A, 56S, 67A, 85A, 115, 45, 47, 4F, 850, 125, 485, 685
- HAZARDOUS LOCATION CODE
  CONNECTOR OPTION CODES = A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, T, U, V, W, Y, Z, 2, 3, 4, 5, 6, 7, 8
  LINE DRIVER OPTION CODE = 7 FOR ZONE 2 & 22

XRYY 7 X X XXX

- CONNECTOR OPTION CODE LOCATION FOR: XR5, XR12, XR97
- LINE DRIVER OPTION CODE LOCATION FOR: XR5, XR12, XR97
- MODEL # CODES: 5, 12, 97
- HAZARDOUS LOCATION CODE
  CONNECTOR OPTION CODES = A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, T, U, V, W, Y, Z, 2, 3, 4, 5, 6, 7, 8
  LINE DRIVER OPTION CODE = 7 FOR ZONE 2 & 22
  ALL OTHER CODE LOCATIONS ARE NOT RELEVANT TO INTRINSIC SAFETY
  SEE INSTRUCTION SHEETS FOR DEFINITIONS

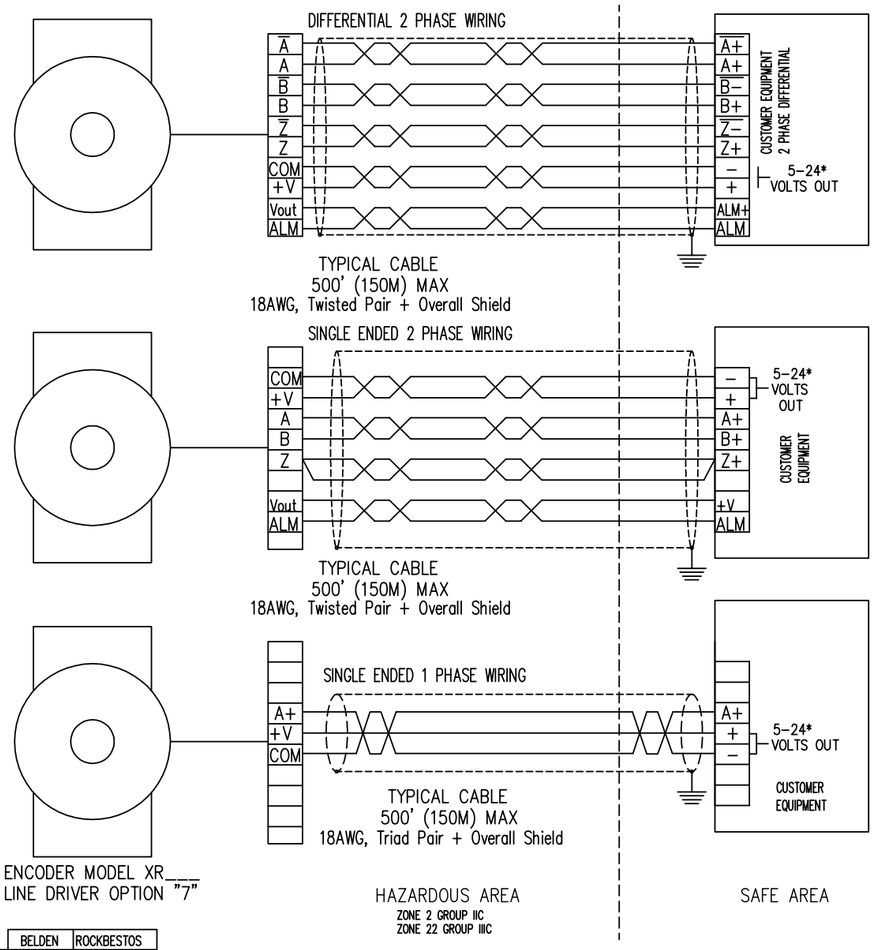
THE XR --- FAMILY OF ENCODERS HAS BEEN EVALUATED TO BE COMPLIANT WITH:
IEC60079-0:2011, EN60079-0:2012/A11:2013
IEC60079-11:2011, EN60079-11:2012
BSEN61000-6-4:2007 AND BSEN61000-6-2:2005
CERTIFICATES OF CONFORMITY TRAC12ATEX0003X, IECEx TRC12.0009X

THE XR --- FAMILY OF ENCODERS IS CERTIFIED FOR USE IN:
GROUP II, CATEGORY 3 (ZONE 2) GAS GROUP IIC WHEN MARKED CE Ex II 3 GD Ex ic IIC* T4 Gc AND
USED WITH A SELV OR EQUIVILENT POWER SUPPLY THAT LIMITS VOLTAGE AND CURRENT PER THE FOLLOWING CHART.
GROUP II, CATEGORY 3 (ZONE 22) DUST GROUP IIIC WHEN MARKED CE Ex II 3 GD Ex ic IIIC T200°C Dc

$-40°C \leq Tamb \leq +80°C$

TABLE 1: ZONE 2 POWER SUPPLY LIMITS			
Ii	Ui		Ci
	IIC	IIB	
250mA	15V	25V	1.8uF
1A		15V	
5A		12V	

THIS DRAWING IDENTIFIES CHARACTERISTICS REQUIRED FOR EQUIPMENT USED IN HAZARDOUS LOCATIONS AND MAY NOT BE CHANGED WITHOUT THIRD PARTY APPROVAL. THIRD PARTIES MUST BE IDENTIFIED FROM EQUIPMENT ID LABELS



	BELDEN	ROCKBESTOS
3 CONDUCTOR	9365	01T18I/S-OS
TYPICAL EXAMPLES		

	BELDEN	ROCKBESTOS
2 PAIR	1063A	02P18I/S-OS
4 PAIR	1064A	04P18I/S-OS
5 PAIR		05P18I/S-OS
8 PAIR	1065A	08P18I/S-OS
TYPICAL EXAMPLES		

SEE INSTRUCTION SHEETS FOR CONNECTOR OPTION PIN OUTS AND PHASING

CABLE CHARACTERISTICS AND INSTALLATION IN ACCORDANCE WITH THE LATEST EDITION OF IEC/EN60079-14/IEC/EC60079-25.

REFER TO THE WIRING DIAGRAMS ON THE ENCODER AND IN THE SPECIFIC MODEL INSTRUCTION SHEETS FOR SPECIFIC CONNECTOR PIN OUTS AND PHASING TABLES FOR EACH CONNECTOR STYLE OPTION.

* ENERGY LIMITED POWER SUPPLY SEE TABLE 1.

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.
THE XR___ ENCODERS ARE NOT CONSIDERED AS SAFETY DEVICES AND ARE NOT SUITABLE FOR CONNECTION INTO A SAFETY SYSTEM.
THE XR___ ENCODER CONSTRUCTION MATERIALS CONTAIN NO MORE THAN 7.5% IN TOTAL BY MASS OF MAGNESIUM, TITANIUM AND ZIRCONIUM.
THE CONSTRUCTION MATERIALS ARE NOT CONSIDERED AS ABLE TO TRIGGER AN EXPLOSION IN NORMAL OPERATING MODES. THESE MATERIALS ARE KNOWN TO REACT WITH EXPLOSIVE ATMOSPHERES TO WHICH THE ENCODERS MAY BE SUBJECT. THE CONSTRUCTION MATERIALS DO INCLUDE ALUMINUM. AS SUCH CARE SHOULD BE TAKEN TO AVOID THE POSSIBILITY OF IGNITION FROM IMPACT OR FRICTION. IT IS THE RESPONSIBILITY OF THE END USER TO ENSURE THAT THE ENCODER IS SELECTED CORRECTLY FOR THE POTENTIALLY EXPLOSIVE ATMOSPHERE IN WHICH THE EQUIPMENT IS TO BE PUT IN SERVICE.

SPECIAL CONDITIONS FOR SAFE USE:

ENCODER:
1. WHEN THE ENCODER IS MARKED AS "ic" THE POWER SUPPLY SITUATED IN THE SAFE AREA MUST BE LIMITED TO THE LEVELS LISTED ON THIS CERTIFICATE AND CABLE MUST BE SELECTED AND INSTALLED IN ACCORDANCE WITH IEC/EN 60079-14 AND IEC/EN 60079-25
2. THE EQUIPMENT SHOULD BE MOUNTED SO AS TO AVOID ELECTROSTATIC CHARGING.

MAINTENANCE: CONTACT NIDEC AVTRON AUTOMATION CORPORATION, 8901 EAST PLEASANT VALLEY ROAD, INDEPENDENCE, OHIO 44131

CAUTION: BE SURE TO REMOVE POWER BEFORE WIRING THE ENCODER. GROUND THE CABLE SHIELD. THE CABLE SHIELD SHOULD NOT BE GROUNDED MULTIPLE PLACES. ENCODERS INCLUDE A LOCAL GROUND LUG FOR CUSTOMER CONVENIENCE AND ENCODER FRAME GROUNDING WITH 14 AWG WIRE IF REQUIRED TO MEET LOCAL ELECTRIC CODE FOR SITE OPERATOR PROTECTION STANDARDS.

INTERCONNECTION CABLES SPECIFIED ARE BASED ON TYPICAL APPLICATIONS. CABLE MUST BE SELECTED AND INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND CANADIAN ELECTRICAL CODE. PHYSICAL PROPERTIES OF CABLE SUCH AS ABRASION, TEMPERATURE, TENSILE STRENGTH, SOLVENTS, ETC., ARE DICTATED BY THE SPECIFIC APPLICATION. GENERAL ELECTRICAL REQUIREMENTS ARE: STRANDED COPPER, 20 THROUGH 16 AWG (INDUSTRIAL EPIC CONNECTOR TYPE OPTIONS CAN USE 14 AWG), TWISTED WIRE PAIRS, BRAID OR FOIL INDIVIDUAL SHIELDS OR OVER ALL SHIELD WITH DRAIN WIRE, 0.05uF OF MAXIMUM TOTAL MUTUAL OR DIRECT CAPACITANCE, OUTER SHEATH INSULATOR, MAXIMUM CABLE LENGTH =500 FT.. 20 AWG WIRE SHOULD NOT BE USED FOR CABLE RUNS GREATER THAN 61 METERS. IF 20 AWG IS USED WITH EPIC TYPE CONNECTORS THEN THE WIRE ENDS SHOULD BE TINNED.

UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY

XXXXXX	XXXXXX
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES: ANGLES±1° DECIMALS .XX± .03 .XXX± .015
FINISH
PAINT PER PS
PLATE PER
COAT PER PS
ANODIZED PER
OTHER

		DATE
DRAWN	NICKOLI	1/13/14
CHECKED	PATTON	3/24/15
ENG APVD	SHADDUCK	3/24/15
APVD PROD		

Nidec Avtron Automation
8901 E.PLEASANT VALLEY ROAD
INDEPENDENCE, OH 44131-5529

ATEX / IECEx ZONE 2, 22 INSTALLATION DRAWING

IMF ☒ PSF ☐

SIZE	CAGE NO.	DWG. NO.	REV
D	0FMV7	D52353	A
SCALE 1/1	MODEL N/A	SHEET 1 OF 1	

REVISIONS				
ECN NO.	REV	DESCRIPTION	DATE	APPROVED
EA0759	A	IS "XXX" 2X, WAS "000" 2X, REMOVED 5, 12, 97 FROM MODEL CODES, IS XR5, XR12 & XR97, WAS XR45 FOR CONNECTOR OPTION CODE LOCATION	8/27/14 NICKOLI	SHADDUCK
EA1779	B	DEL NAME AND ADDRESS FROM LABEL ZIVKOVIC	5/6/20	WOLFF
EA1658	C	UPDATED FOR XRB3 ZIVKOVIC	9/2/20	WOLFF

XRYYY XXXXFXXX XXX

- CONNECTOR OPTION CODE LOCATION FOR: XR56A, XR56S, XR67A, XR85A, XR115, XR850, XR125, XR485, XR685
- CONNECTOR OPTION CODE LOCATION FOR: XR45, XR47, XR4F
- LINE DRIVER OPTION CODE LOCATION FOR: XR56A, XR56S, XR67A, XR85A, XR115, XR45, XR47, XR4F, XR850, XR125, XR485, XR685
- MODEL # CODES: 56A, 56S, 67A, 85A, 115, 45, 47, 4F, 850, 125, 485, 685
- HAZARDOUS LOCATION CODE

CONNECTOR OPTION CODES = A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, T, U, V, W, Y, Z, 2, 3, 4, 5, 6, 7, 8
LINE DRIVER OPTION CODE =F FOR CLASS I DIVISION 1 AND ZONE 0

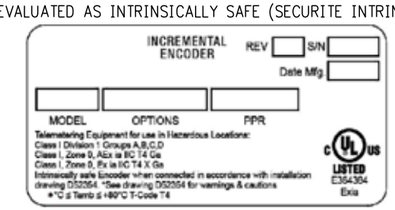
XRYY F X X XXX

- CONNECTOR OPTION CODE LOCATION FOR: XR5, XR12, XR97
- LINE DRIVER OPTION CODE LOCATION FOR: XR5, XR12, XR97
- MODEL # CODES: 5, 12, 97
- HAZARDOUS LOCATION CODE

CONNECTOR OPTION CODES = A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, T, U, V, W, Y, Z, 2, 3, 4, 5, 6, 7, 8
LINE DRIVER OPTION CODE = F FOR CLASS I DIVISION 1 AND ZONE 0
ALL OTHER CODE LOCATIONS ARE NOT RELEVANT TO INTRINSIC SAFETY
SEE INSTRUCTION SHEETS FOR DEFINITIONS

TABLE 1

THE XR --- FAMILY OF ENCODERS HAS BEEN EVALUATED AS INTRINSICALLY SAFE (SECURITE INTRINSEQUE) AND COMPLIANT WITH:
UL913 8TH EDITION
UL 60079-0 6TH EDITION
UL 60079-11 6TH EDITION
CSA/CAN C22.2 No. 157 REAFFIRMED 2012
CSA/CAN C22.2 No. 60079-0:11
CSA/CAN C22.2 No. 60079-11:14



* −20°C OR −40°C SEE PRODUCT MARKING

1. INTRINSICALLY SAFE DEVICE INPUT ENTITY PARAMETERS (TERMINALS V(in) & COM):

TERMINAL NUMBERS	Ui (V)	Ii (mA)	Pi (W)	GAS GROUP	Ci (uF)	Li (mH)
V(in) & COM	7.14	416	1.41	A, B, C, D (IIC)	11.88	0

THESE DEVICES HAVE THE FOLLOWING OUTPUT ENTITY PARAMETERS:

TERMINAL NUMBERS	Uo (V)	Io (mA)	Po (W)	GAS GROUP	Co (uF)	Lo (uH)
A & A/ B & B/ Z & Z/	7.14	416	1.41	A & B (IIC)	11.89	2
				C & D (IIB)	11.91	100

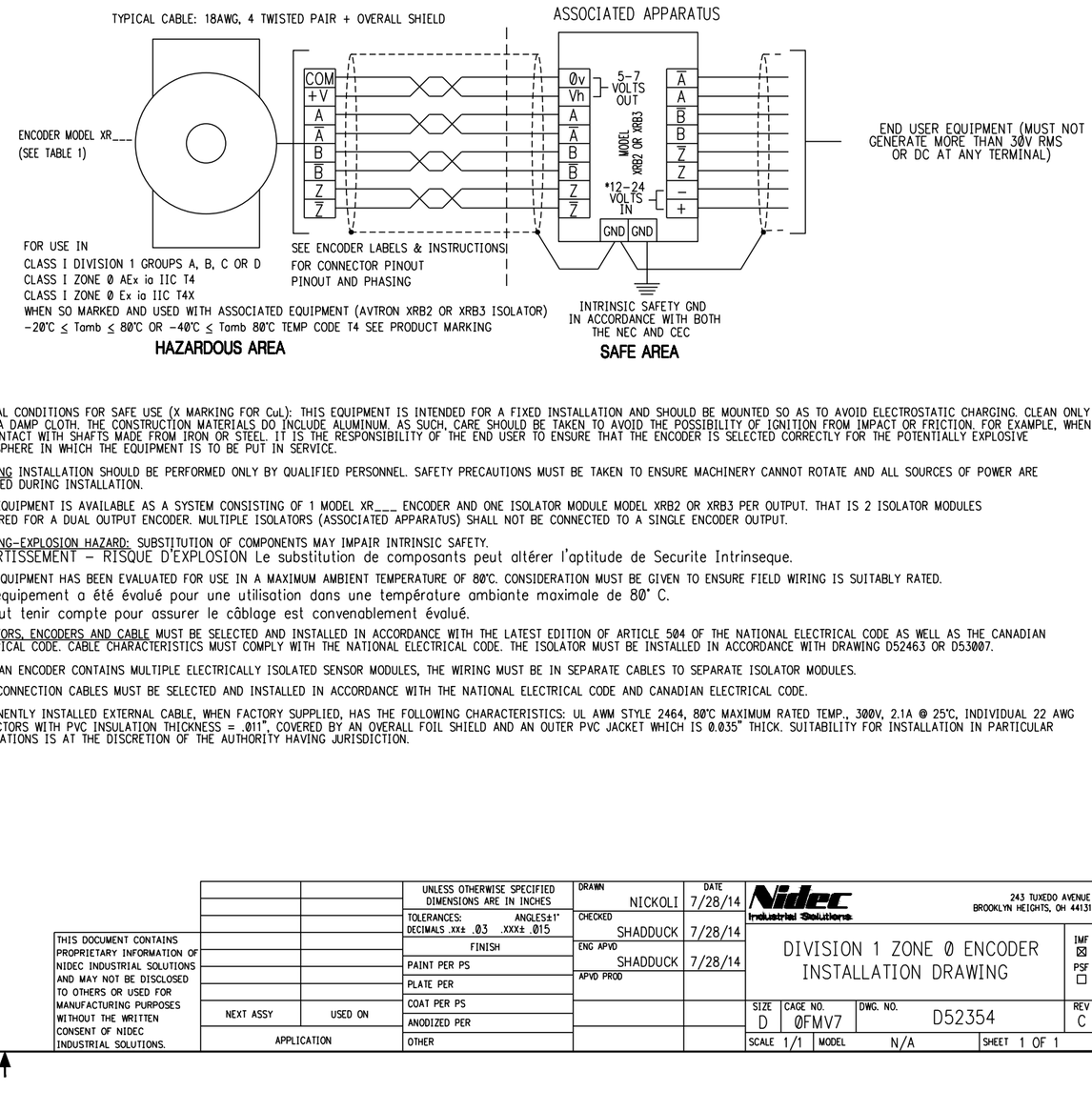
2. CAPACITANCE AND INDUCTANCE CONNECTED TO THE OUTPUT TERMINALS MUST BE ADDED TO Ci AND Li OF THE INPUT TERMINALS OF THE ENCODER WHEN DETERMINING THE MAXIMUM CAPACITANCE AND INDUCTANCE APPARENT AT THE INPUT TERMINALS. WHERE THE CABLE CAPACITANCE AND INDUCTANCE PER FOOT ARE NOT KNOWN, THE FOLLOWING VALUES SHALL BE USED: Ccable = 60 pF/Ft., Lcable = 0.2 uH/Ft.
WHEN MAKING CONNECTIONS TO A SUITABLE ASSOCIATED APPARATUS, THE FOLLOWING GUIDELINES MUST BE FOLLOWED:

I.S. EQUIPMENT		ASSOCIATED APPARATUS
Ui	≥	Voc OR Vt (OR Uo)
Ii	≥	Isc OR It (OR Io)
Pi	≥	Po
Ci + Ccable	≤	Ca (OR Co)
Li + Lcable	≤	La (OR LO)

IF Po OF THE ASSOCIATED APPARATUS IS NOT KNOWN, IT MAY BE CALCULATED USING THE FORMULA Po = (Voc * Isc)/4 = (Uo * Io)/4

THIS DRAWING IDENTIFIES CHARACTERISTICS REQUIRED FOR EQUIPMENT USED IN HAZARDOUS LOCATIONS AND MAY NOT BE CHANGED WITHOUT THIRD PARTY APPROVAL. THIRD PARTIES MUST BE IDENTIFIED FROM ID LABELS.

UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY



3.) SPECIAL CONDITIONS FOR SAFE USE (X MARKING FOR CuL): THIS EQUIPMENT IS INTENDED FOR A FIXED INSTALLATION AND SHOULD BE MOUNTED SO AS TO AVOID ELECTROSTATIC CHARGING. CLEAN ONLY WITH A DAMP CLOTH. THE CONSTRUCTION MATERIALS DO INCLUDE ALUMINUM. AS SUCH, CARE SHOULD BE TAKEN TO AVOID THE POSSIBILITY OF IGNITION FROM IMPACT OR FRICTION. FOR EXAMPLE, WHEN IN CONTACT WITH SHAFTS MADE FROM IRON OR STEEL. IT IS THE RESPONSIBILITY OF THE END USER TO ENSURE THAT THE ENCODER IS SELECTED CORRECTLY FOR THE POTENTIALLY EXPLOSIVE ATMOSPHERE IN WHICH THE EQUIPMENT IS TO BE PUT IN SERVICE.

4.) 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.

5.) THIS EQUIPMENT IS AVAILABLE AS A SYSTEM CONSISTING OF 1 MODEL XR___ ENCODER AND ONE ISOLATOR MODULE MODEL XRB2 OR XRB3 PER OUTPUT. THAT IS 2 ISOLATOR MODULES REQUIRED FOR A DUAL OUTPUT ENCODER. MULTIPLE ISOLATORS (ASSOCIATED APPARATUS) SHALL NOT BE CONNECTED TO A SINGLE ENCODER OUTPUT.

6.) WARNING-EXPLOSION HAZARD: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
AVERTISSEMENT – RISQUE D'EXPLOSION Le substitution de composants peut altérer l'aptitude de Securite Intrinseque.

7.) THIS EQUIPMENT HAS BEEN EVALUATED FOR USE IN A MAXIMUM AMBIENT TEMPERATURE OF 80°C. CONSIDERATION MUST BE GIVEN TO ENSURE FIELD WIRING IS SUITABLY RATED.
Cet équipement a été évalué pour une utilisation dans une température ambiante maximale de 80° C.
IL faut tenir compte pour assurer le câblage est convenablement évalué.

8.) ISOLATORS, ENCODERS AND CABLE MUST BE SELECTED AND INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF ARTICLE 504 OF THE NATIONAL ELECTRICAL CODE AS WELL AS THE CANADIAN ELECTRICAL CODE. CABLE CHARACTERISTICS MUST COMPLY WITH THE NATIONAL ELECTRICAL CODE. THE ISOLATOR MUST BE INSTALLED IN ACCORDANCE WITH DRAWING D52463 OR D53007.

9.) WHEN AN ENCODER CONTAINS MULTIPLE ELECTRICALLY ISOLATED SENSOR MODULES, THE WIRING MUST BE IN SEPARATE CABLES TO SEPARATE ISOLATOR MODULES.

10.) INTERCONNECTION CABLES MUST BE SELECTED AND INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND CANADIAN ELECTRICAL CODE.

11.) PERMANENTLY INSTALLED EXTERNAL CABLE, WHEN FACTORY SUPPLIED, HAS THE FOLLOWING CHARACTERISTICS: UL AWM STYLE 2464, 80°C MAXIMUM RATED TEMP., 300V, 2.1A @ 25°C, INDIVIDUAL 22 AWG CONDUCTORS WITH PVC INSULATION THICKNESS = .011", COVERED BY AN OVERALL FOIL SHIELD AND AN OUTER PVC JACKET WHICH IS 0.035" THICK. SUITABILITY FOR INSTALLATION IN PARTICULAR APPLICATIONS IS AT THE DISCRETION OF THE AUTHORITY HAVING JURISDICTION.

NEXT ASSY | USED ON
APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES: ANGLES±1° DECIMALS .XX± .03 .XXX± .015
FINISH
PAINT PER PS
PLATE PER
COAT PER PS
ANODIZED PER
OTHER

		DATE
DRAWN	NICKOLI	7/28/14
CHECKED	SHADDUCK	7/28/14
ENG APVD	SHADDUCK	7/28/14
APVD PROD		

Nidec Industrial Solutions
243 TUXEDO AVENUE
BROOKLYN HEIGHTS, OH 44131

DIVISION 1 ZONE Ø ENCODER INSTALLATION DRAWING

IMF ☒ PSF ☐

SIZE	CAGE NO.	DWG. NO.	REV
D	ØFMV7	D52354	C

SCALE 1/1 | MODEL N/A | SHEET 1 OF 1

REVISIONS				
ECN NO.	REV	DESCRIPTION	DATE	APPROVED
EA0698	A	UPDATED ENCODER PARAMETERS NICKOLI	5/8/14	SHADDUCK

XRYYY-X-X---

- CONNECTOR OPTION CODES
  LINE DRIVER OPTION G: H, M, N & 8
  LINE DRIVER OPTION R: A, B, C, D, E, F, J, K, S, T, U, & V
- G - CLASS 1 DIV. 2 LISTED
  R - CLASS 1 DIV. 2 RECOGNIZED — LINE DRIVER CODE
- MODEL #
- HAZARDOUS LOCATION CODE

SEE INSTRUCTION SHEET FOR EACH MODEL FOR EXACT P/N BREAKDOWN

THE XR --- FAMILY OF ENCODERS HAS BEEN EVALUATED TO BE COMPLIANT WITH:

CSA 22.2 NO. 14-13
CSA C22.2 NO. 213-M1987
ISA 12.12.01 NONINCENDIVE ELECTRICAL EQUIPMENT FOR USE IN CLASS 1 DIVISION 2 HazLoc
UL508 STANDARD FOR INDUSTRIAL CONTROL EQUIPMENT

THE XR --- FAMILY OF ENCODERS IS SUITABLE FOR USE IN HAZARDOUS LOCATIONS:
CLASS I DIV 2 GROUPS A, B, C OR D, OR NON - HAZARDOUS LOCATIONS ONLY.

Cet équipement est adapté à une utilisation en Classe 1, Division 2, Groupes A, B, C et D ou des locations non dangereux.

WHEN SO MARKED AS ABOVE
-40°C<Tamb<+80°C TEMP CODE T4

WARNING: EXPLOSION HAZARD 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. SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1 DIVISION 2. DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN REMOVED OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

AVERTISSEMENT-RISQUE D'EXPLOSION Le remplacement de composants peut altérer l'aptitude de Classe 1, Division 2.
AVERTISSEMENT-RISQUE D'EXPLOSION Ne pas déconnector l'équipement à moins que l'alimentation est coupée ou que la zone est connue pour être non dangereux.

ENCODERS PARAMETERS ARE:

	INPUT	OUTPUT
VOLTAGE	5-24VDC	5-24VDC
CURRENT	100mA Nom. 355mA Max.	100mA Max. ea Output

FOR LISTED ENCODERS AND CABLE MUST BE SELECTED AND INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF ARTICLE 504 OF THE NATIONAL ELECTRICAL CODE AS WELL AS THE CANADIAN ELECTRICAL CODE. CABLE CHARACTERISTICS MUST COMPLY WITH THE NATIONAL ELECTRICAL CODE (600V INSTRUMENT TRAY CABLE). INTERCONNECTION CABLES SPECIFIED ABOVE ARE BASED ON TYPICAL APPLICATIONS. CABLE MUST BE SELECTED AND INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND CANADIAN ELECTRICAL CODE. PHYSICAL PROPERTIES OF CABLE SUCH AS ABRASION, TEMPERATURE, TENSILE STRENGTH SOLVENTS, ECT., ARE DICTATED BY SPECIFIC APPLICATION. GENERAL ELECTRICAL REQUIREMENTS ARE: STRANDED COPPER, 18 THROUGH 14 AWG TWISTED WIRE PAIRS, BRAID OR FOIL SHIELDS WITH DRAIN WIRE, .05uF OF MAXIMUM TOTAL MUTUAL OR DIRECT CAPACITANCE, OUTER SHEATH INSULATOR, MAXIMUM CABLE LENGTH = 500 FT.. 20 AWG WIRE SHOULD NOT BE USED FOR CABLE RUNS GREATER THAN 61 METERS. IF 20 AWG IS USED WITH THE EPIC TYPE CONNECTOR THE WIRE ENDS SHOULD BE TINNED.

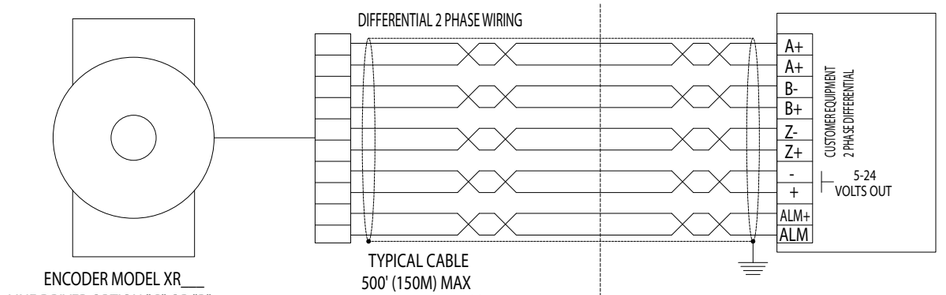
RECOGNIZED MODELS ARE INTENDED TO BE FACTORY WIRED IN ACCORDANCE WITH ISA 12.12.01 CLAUSE 8.8.1.

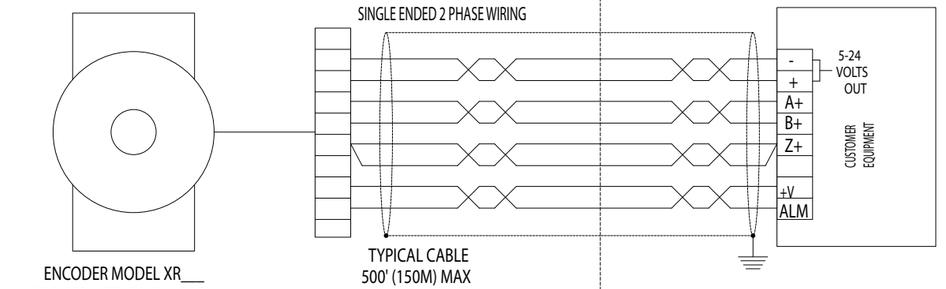
THIS EQUIPMENT HAS BEEN EVALUATED FOR USE IN A MAXIMUM AMBIENT TEMPERATURE OF 80°C.
CONSIDERATION MUST BE GIVEN TO ENSURE FIELD WIRING IS SUITABLY RATED.

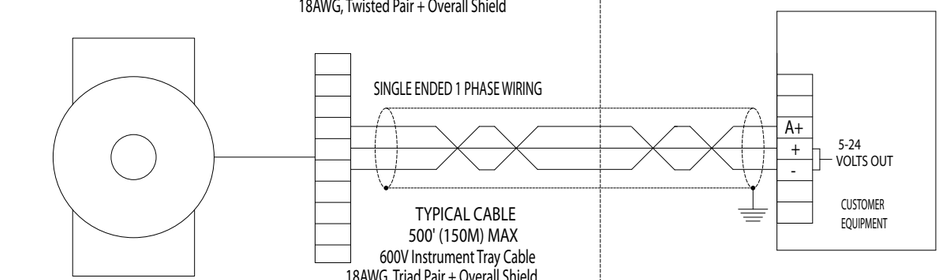
Cet équipement a été évalué pour une utilisation dans une température ambiante maximum de 80 ° C.
Il faut tenir compte pour assurer le câblage est convenablement clasé.

REFER TO THE WIRING DIAGRAMS ON THE ENCODER AND IN SPECIFIC MODEL INSTRUCTION SHEETS FOR SPECIFIC CONNECTOR PIN OUTS AND PHASING TABLES FOR EACH CONNECTOR STYLE OPTION.

UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY







	BELDEN	ROCKBESTOS
3 CONDUCTOR	1121A	01T18I/S-OS
TYPICAL EXAMPLES		

	BELDEN	ROCKBESTOS
2 PAIR	1063A	02P18I/S-OS
4 PAIR	1064A	04P18I/S-OS
5 PAIR		05P18I/S-OS
8 PAIR	1065A	08P18I/S-OS
TYPICAL EXAMPLES		

HAZARDOUS AREA
CLASS I DIVISION 2 GROUP A, B, C OR D

SAFE AREA

SEE INSTRUCTION SHEETS FOR CONNECTOR OPTION PIN OUTS AND PHASING

INSTALLATION IN ACCORDANCE WITH THE NEC AND IN ACCORDANCE WITH THE CEC

XXXXXX	XXXXXX
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES: ANGLES±1°
DECIMALS .XX± .03 .XXX± .015
FINISH
PAINT PER PS
PLATE PER
COAT PER PS
ANODIZED PER
OTHER

		DATE
DRAWN	NICKOLI	1/8/14
CHECKED	SHADDUCK	1/9/14
ENG APVD	SHADDUCK	1/9/14
APVD PROD		

Nidec
Nidec Avtron Automation
8901 E.PLEASANT VALLEY ROAD
INDEPENDENCE, OH 44131-5529

DIVISION 2
INSTALLATION DRAWING

IMF ☒
PSF ☐

SIZE	CAGE NO.	DWG. NO.	REV
D	0FMV7	D52355	A

SCALE	MODEL	SHEET
1/1	N/A	1 OF 1