AVTRON™ ENCODERS

www.avtronencoders.com

Nidec Industrial Solutions
243 Tuxedo Avenue | Cleveland, Ohio 44131

encoderhelpdesk@nidec-industrial.com
+1 216-642-1230

ENCODER INSTRUCTIONS

XR685 SMARTSafe™

1 1/8" HOLLOW SHAFT MODULAR FOR HAZARDOUS APPLICATIONS

DESCRIPTION

The Avtron Model XR685 SMARTSafe™ is a severe duty incremental encoder for use in hazardous locations (also known as tachometer or rotary pulse generator). Its output is directly proportional to shaft position (pulse count) or speed (pulse rate). The XR685 operates down to zero speed and can be used for both control and instrumentation applications.

CAUTION
The XR685 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 XR685 design eliminates the need for shaft couplings, adapter flanges, or accessory mounting faces. The unit employs a keyless shaft mount to lock the XR685's rotor to a 1.125" diameter shaft. An anti-rotation arm prevents housing rotation while allowing for shaft end float.

The XR685 utilizes magnetoresistive sensors. This proven technology is ideal for rugged environments since it is immune to many contaminants that cause optical encoders to fail. These factors make the XR685 ideal for demanding industries like paper, metals, and chemical processing.

The outputs are protected against short circuits and wiring errors. An Avtron XR685 SMARTSafe encoder is equipped with one or two XR5 sensor modules. Each module 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.

Output resolution on the XR685 is determined by the sensor only. Unlike older models, any PPRs can be mixed and matched. Selection of the rotor is based only on the shaft mounting requirements (and not PPR).

The XR5 removable sensor assembly has a diagnostic package that includes Adaptive Electronics and a Fault-Check output.

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 XR685 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 XR685 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 XR685 may be subject. It is however the responsibility of the end user to ensure that the XR685 is selected correctly for the potentially explosive atmosphere in which the equipment is to be put into service.

Equipment needed for installation

Supplied:
1. XR685 Encoder
2. Anti-Rotation Arm Kit
3. Thread Locker (blue)
4. Synthetic Grease
5. Anti-Seize (copper)

Not Supplied:
- 1-3/4" Clator Nut Wrench (484017)
- 2-1/2" Locking Nut Wrench (484018)
- 7/16" Wrench
- 1/2" Wrench
- Dial Indicator
- Model XRB3 Isolator for Division 1, Zone 0,1, 20 and 21 applications (Sold Separately)

The hollow shaft XR685 design eliminates the potential for bearing and coupling failures from misalignment, however, excessive housing movement (wobble) may cause undesirable vibrations. The higher the RPM, the more severe the vibration will be from housing movement. In a typical installation a housing movement of 0.007" TIR or less (as measured at the outside diameter of the main encoder body) will not have an adverse effect.

MACHINE SHAFT PREPARATION

Preparing the machine shaft prior to encoder installation is essential in providing an adequate barrier against environmental contamination. In some cases, a separate stub shaft (1.125" D x 4.5" long) will be installed on the motor. To prepare the machine shaft that the XR685 is to be installed on, conduct the following procedures (see figures):

1) Remove from the XR685 the four 1/4-20 UNC machine screws which hold the end cap on the cover plate.
2) Remove the end cap, O-Ring, and wave spring, noting the location of each to assist in re-assembly.

Caution
Spanner wrenches must be used during the following procedures. Using a substitute can distort the 1-3/4" nut and damage the unit. Do not try to remove the larger 2-1/2" bearing locknut at any time. This locknut is factory adjusted for optimum XR685 performance.

NOTE
Two spanner wrenches, which are required for XR685 installation, accommodate the 1-3/4" and 2-1/2" nuts found under the cap.

3) Holding the 2-1/2" bearing locknut, remove the 1-3/4" dia. clamping nut and slide out the internal compression sleeve.
4) Verify that the compression sleeve can be installed by hand on the shaft where the unit is to be installed. File any burrs that obstruct sleeve installation and lightly oil the shaft.
5) If a keyway or flat exists on the shaft, provide a sealing medium, or true the shaft back to round using metal putty or equal.
6) Return the compression sleeve to the XR685 hub.
7) Thread the 1-3/4" clamping nut onto the XR685 by hand until resistance is felt. DO NOT TIGHTEN at this time.

ENCODER INSTALLATION

Installing the XR685 and Anti-Rotation Arm:

1) The free end of the anti-rotation arm must be secured by the customer to a stationary member such as the floor or machine frame. Refer to "Anti-Rotation Arm Mounting Guidelines" on the last page for general requirements.
2) Based on the location of the stationary point and the guidelines on page 6, attach the 1/4" thick mounting board to one of two places on the XR685. Use two 1/4-20 UNC by 3/4" long machine screws provided.
3) Apply anti-seize (copper), provided, to machine shaft. A packet of silicone grease is provided to lubricate the following shaft seals: First, ALL XR685 types have an O-Ring inside their hollow shafts at the motor end. In addition, in THRU-SHAFT types, the clamping nut has an O-Ring on the inside, plus the outside of the clamping nut requires lubrication for the radial lip seal per step 8b. Slide the XR685 onto the machine shaft, mounting the board first. Ideally, the XR685 housing will be 1/2" to 1" from the motor or machine housing, but this may vary depending on the machine profile and the anti-rotation arm clearance requirements. Consider shaft end float when positioning the XR685.

4a) FOR END-of-SHAFT APPLICATIONS, place the XR685 3.38" to 4.13" onto the shaft. The end of the machine shaft must extend completely through the XR685 compression sleeve and be approximately flush with the end of the 1-3/4" clamping nut.
4b) FOR THRU SHAFT APPLICATIONS, position the XR685 as required.

5) Attach free end of the anti-rotation arm to the 1/4" mounting board using the shoulder bolt provided.
6) Remove 1-3/4" clamping nut and apply liquid thread locker to the threads. (Locktite grade 242, supplied, should be used in most applications.)
7) Replace 1-3/4" clamping nut and tighten so the gap is less than or equal to 0.09", as shown in CLAMPING NUT sketch (approx. 15-20 ft-lbs.), holding the 2-1/2" bearing locknut in place. Spanner wrenches are required for this operation.

8a) FOR END-of-SHAFT INSTALLATIONS, replace the end cap with the wave spring (loading spring) against the bearing and the O-ring located in the cap groove. Secure the end cap with the four 1/4-20 UNC machine screws previously removed. Apply the thread locker to the screws when assembling.
8b) FOR THRU SHAFT APPLICATIONS, prior to replacing the end cap per step 8a, apply a small amount of silicone grease (provided) to the seal surface on the 1-3/4" clamping nut. The radial lip seal in the end cap will seal on this surface.

ENVIRONMENTAL CONSIDERATIONS

Special attention is to be given to conduit runs, interconnection wiring and NEMA type enclosure mounting. In those applications where ambient temperatures are controlled within 20° C and high humidity/ washdown are not present, position the flexible conduit with a slight sag to prevent any condensation from entering the encoder via conduit.

In harsh environments, which include temperature extremes, high humidity, equipment washdown or atmosphere contamination, extra care is required. Follow these steps to reduce potential problems:

1) Always mount connection points, conduit couplings, junction boxes, etc., lower than actual encoder.
2) For washdown areas, shroud or otherwise cover the encoder to prevent direct water spray. Do not attach the shroud directly to the encoder.
3) Keep conduit outputs and axis of rotation horizontal.
4) Avtron recommends sealed and/or remote connector styles for these applications. These include options (A-J, M-N, R-T, W, Y).

ANTI-ROTATION ARM MOUNTING GUIDELINES

The anti-rotation arm stabilizes the encoder and keeps it from rotating as the machine shaft rotates. To get the best performance, minimize generator movement by following these anti-rotation arm mounting guidelines as closely as possible.

1) Mount XR685 with conduit entry ports positioned horizontally.
2) Fasten the 1/4" thick mounting board to the inboard side of the XR685 in one of the two positions shown. Use the two 1/4-20 UNC x 3/4" long fasteners.
3) Mount anti-rotation arm perpendicular to motor shaft axis of rotation. Arm mounting bolts and associated rod bearings should be parallel to motor shaft also (top view).
4) Mount anti-rotation arm approx. 90° to a line established between the mounting board mounting hole and shaft centerline (viewed from end).
5) Mount XR685 as close as possible to the motor with the mounting board closest to the motor.
6) Establish a stationary (static) mounting point for the free end of the anti-rotation arm, using the guidelines above. Use the bolt provided to fasten arm to stationary point.
7) The anti-rotation arm is fully threaded and can be adjusted in length. The recommended length is 8 to 12".

WIRING INSTRUCTIONS

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 XR685 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.

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.

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.

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.

NOTE
When using the industrial connector ("G" and "P" options), the minimum wire size is 20 gauge, and 20 gauge (only) wire ends must be tinned with solder before connection at the screw terminals.

MAINTENANCE

GENERAL

This section describes routine maintenance for the Avtron XR685 Encoder. For support, contact Avtron's field service department at 216-642-1230. For emergency after hours service contact us at 216-641-8317.

FAULT-CHECK

After power-up and the internal 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 configurations only) and as an integral LED.

TROUBLESHOOTING:

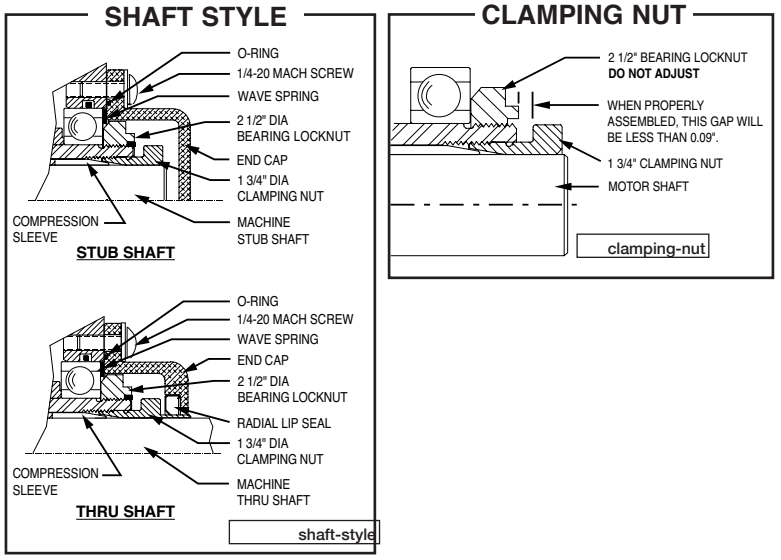
If the drive indicates a loss of encoder/tach fault and the XR685 fault-check LED is not illuminated, check the encoder power supply. If power is present, check polarity: one indicator of reversed power supply is that all outputs will be high at the same time. If the drive indicates encoder fault, but 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 XR5 sensor module. If the new module shows GREEN, and the drive still shows encoder loss/tach fault, then the wiring is faulty and should be repaired or replaced.

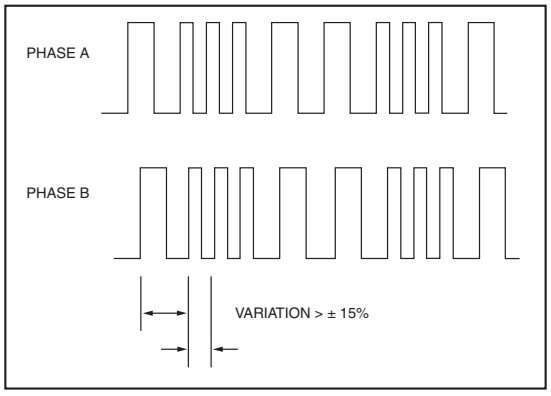
If the alarm output and/or LED indicate a fault (RED):

1. Remove an end sensor plate or the second sensor, and use the built-in gauge to check the location of the rotor (see Figure 1).
2. Remove the XR5 sensor from the housing. Clean the housing mounting surface for the XR5 sensor and the XR685 housing. If the alarm output and/or LED indicate a fault (RED) on a properly mounted XR5 sensor and the rotor is properly located, replace the XR5 sensor.

An oscilloscope can also be used to verify proper output of the XR5 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), check rotor position. If the rotor position is correct, the motor or shaft may be highly magnetized. Replace any magnetized shafts with non-magnetic material (stainless/aluminum). Consider replacing the sensors with super-shielded models, option -004.





XR685 PART NUMBERS AND AVAILABLE OPTIONS INCLUDING AV5 SENSORS

Model	Temp Rating	Tether	Style	Left Module		Right Module		Connector Options	Modifications
				Line Driver	PPR	Line Driver	PPR		
XR685	**N-** -20°C to 80°C **C-** -40°C to 80°C	**X-** none **1-** B21958 threaded rod	**E-** standard (EOS) **T-** through shaft	**See Line Driver / Connector Options Chart**	**X-** none **F-** 60 **G-** 100 **H-** 120 **A-** 128 **L-** 240 **N-** 256 **P-** 300 **E-** 360 **B-** 480 **Q-** 500 **R-** 512 **S-** 600 **V-** 900 **J-** 960 **Y-** 1024 **Z-** 1200 **6-** 1800 **3-** 2000 **4-** 2048 **5-** 2500 **D-** 4096 **8-** 4800 **9-** 5000 **0-** special	**See Line Driver / Connector Options Chart**	**X-** none **C*-** 50 **F-** 60 **G-** 100 **H-** 120 **A-** 128 **B*-** 150 **L-** 240 **N-** 256 **P-** 300 **E-** 360 **B-** 480 **Q-** 500 **R-** 512 **S-** 600 **V-** 900 **J-** 960 **Y-** 1024 **Z-** 1200 **A*-** 1270 **6-** 1800 **3-** 2000 **4-** 2048 **5-** 2500 **D-** 4096 **8-** 4800 **9-** 5000 **0-**special	**See Line Driver / Connector Options Chart**	**000-** none **004-** Super Magnetic Shielding **005-** Special 97mm Rotor **400-** Special PPR (see table) **018-** Includes isolator **900-** Special Cable Length (xx=ff/0.3m)

Spare sensors and accessories can be ordered separately. See Table 2.

XR5 Sensor Part Numbers

Model	Line Driver	PPR	Connector Options	Modifications
XR5-	See Line Driver Connection Option Chart	**X-** none **F-** 60 **G-** 100 **H-** 120 **A-** 128 **L-** 240 **N-** 256 **P-** 300 **E-** 360 **B-** 480 **Q-** 500 **R-** 512 **S-** 600 **V-** 900 **J-** 960 **Y-** 1024 **Z-** 1200 **3-** 2000 **4-** 2048 **5-** 2500 **D-** 4096 **8-** 4800 **9-** 5000 **0-**special	See Line Driver Connection Option Chart	**000-** none **004-** Super Magnetic Shielding **005-** Special 97mm Rotor (see special manual) **4xx-** Special PPR (see table) **9xx-** Special Cable Length (xx=ff/0.3m)

SPECIAL PPR OPTION CODES		
OPTION CODE	LEFT PPR	RIGHT PPR
401	1270	None
402	150	None
403	50	None
404	512	16
405	16	None
406	6000	None

			Line Driver Options				
		Description	ATEX / IECEx Zone 1 & 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
SMARTach Connector Options	A	10 Pin MS W/O Plug	✓	✓	✓		✓
	B	10 Pin MS With Plug	✓	✓	✓		✓
	E	7 Pin MS W/Plug A-quad-B Std. Phasing	✓	✓	✓		✓
	F	7 Pin MS W/Plug A, A\ Std. Phasing	✓	✓	✓		✓
	J	7 Pin MS W/Plug A, B, Z Std. Phasing	✓	✓	✓		✓
	K	7 Pin MS W/Plug A, A\, B,B\ Std. Phasing	✓	✓	✓		✓
	S	7 Pin MS W/Plug A-quad-B Dyn. Phasing	✓	✓	✓		✓
	T	7 Pin MS W/Plug A, A\ Dyn. Phasing	✓	✓	✓		✓
	U	7 Pin MS W/Plug A, B, Z Dyn. Phasing	✓	✓	✓		✓
	V	7 Pin MS W/Plug A, A\, B,B\ Dyn. Phasing	✓	✓	✓		✓
	P	Large Industrial Style Std. Pinout & Plug	✓	✓	✓		
	G	Large Industrial Style Northstar Pinout & Plug	✓	✓	✓		
	R	10 Pin mini Twist Lock with Plug	✓	✓	✓		
	W	Flexible Cable with Sealing Gland	✓	✓	✓		
	4	Conduit Box, Terminal Block & 1/2" NPT	✓	✓	✓	✓	
	5	Conduit Box, Terminal Block, 3/4" NPT+Cord	✓	✓	✓	✓	
	6	Conduit Box, Terminal Block & 1" NPT	✓	✓	✓	✓	
	7	Conduit Box, Terminal Block & 25mm	✓	✓	✓	✓	

SPECIFICATIONS

ELECTRICAL

A. Operating Power (Vin)
1. Volts.....See Line Driver Option Chart
2. Current.....Each output, 100mA Nom. 355mA Max.
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.....Ø A leads Ø B for CW rotation as viewed from the back of the tach looking at the non-drive end of the motor.
E. Phase 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 on page 1
J. Integral LED Indicator.....GREEN: power on, unit ok. RED: alarm on

MECHANICAL

A. Shaft Inertia.....25 Oz. In. Sec.^{2}
B. Acceleration.....5000 RPM/Sec. Max.
C. Speed.....5400 RPM Max.
D. Weight.....15-17 lbs. [4 kg.]

ENVIRONMENTAL

Solid cast aluminum stator and rotor
7.5% of magnesium, titanium and zirconium total by mass
Fully potted electronics, protected against oil and water spray
operating temp see rating on P/N chart
See “Description” section for information on hazardous location environments

XR685 Connector Spare Parts					
Style	Code	Encoder Side		Customer Side	
Large Industrial "Epic"	P, G	314879	Base	314880	Hood
		314878	Terminals	314877	Terminals
10 pin MS	A, B	Box Recepticle		Plug	
		315933	Standard	315932	Standard
		431079	Line Driver "R"	316445	Line Driver "R"
				411216	Bushing
				411217	Bushing
				411218	Bushing
				411219	Bushing
7 Pin MS	E, F, J, K, S, T, U, V	Box Recepticle		Plug	
		316297	Standard	315932	Standard
		431080	Line Driver "R"	316446	Line Driver "R"
				411218	Bushing
				411219	Bushing
Conduit Box	4,5,6,7			364987	Terminal Plug
10 pin mini MS Twist Lock	R	431081	Base	316447	Plug
		471748	Gasket		

			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

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	Phasing	Signal	0V Gnd	A+	B+	Z+	* Alm+	+Vin	$\overline{\text{A-}}$	$\overline{\text{B-}}$	$\overline{\text{Z-}}$	* Alm
10 Pin MS AvtronPinout	A,B	CW	Pin #	A	D	E	C	F	B	G	H	I	J
10 Pin, Industrial, Avtron Pinout	P	CW	Pin #	1	2	3	4	5	6	7	8	9	10
10 Pin, Industrial, Northstar Pinout	G	CW	Pin #	1	2	3	4	NC	6	7	8	9	NC
10 Pin MS Mini Twist Lock	R	CW	Pin #	F	A	B	C	NC	D	H	J	K	NC
Conduit Box W/10 Pin Terminal Block	4,5,6,7	CW	Pin #	1	2	3	4	5	6	7	8	9	10
10 Wire Cable	W	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	Phasing	Signal	0V Gnd	A+	B+	Z+	+Vin	$\overline{\text{A-}}$	$\overline{\text{B-}}$	$\overline{\text{Z-}}$
7 Pin MS, Avtron / BEI Pinout (A,A\,B,B\)	K	CW	Pin #	F	A	B	NC	D	C	E	NC
7 Pin MS, Avtron / BEI Pinout (A,A\)	F	CW	Pin #	F	A	NC	NC	D	C	NC	NC
7 Pin MS, Avtron / BEI Pinout (A,B,Z)	J	CW	Pin #	F	A	B	C	D	NC	NC	NC
7 Pin MS, Avtron / BEI Pinout (A,B)	E	CW	Pin #	F	A	B	NC	D	NC	NC	NC
7 Pin MS, Dynapar Pinout (A,A\,B,B\)	V	CCW	Pin #	F	A	B	NC	D	C	E	NC
7 Pin MS, Dynapar HS35 Pinout (A,A\)	T	CCW	Pin #	F	A	NC	NC	D	C	NC	NC
7 Pin MS, Dynapar HS35 Pinout (A,B,Z)	U	CCW	Pin #	F	A	B	C	D	NC	NC	NC
7 Pin MS, Dynapar HS35 Pinout (A,B)	S	CCW	Pin #	F	A	B	NC	D	NC	NC	NC

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

THIN-LINE II™

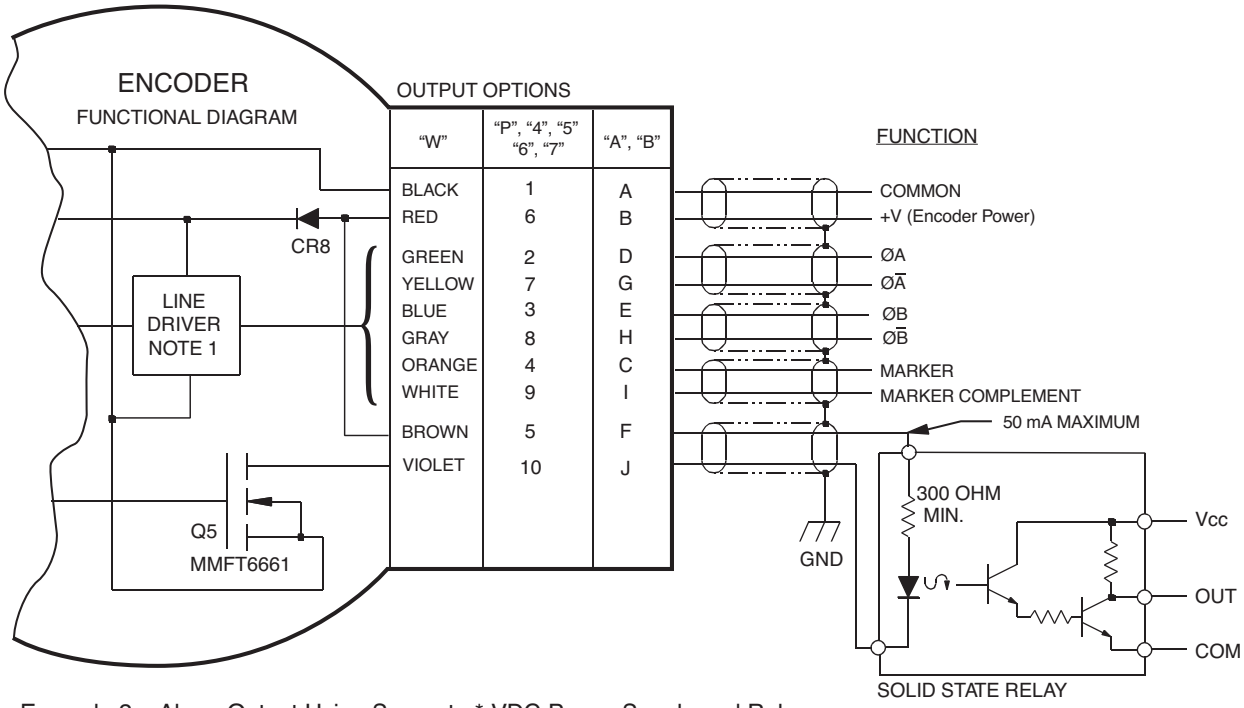
Application Examples

Applies to all XR685 Zone 2 & Division 2models with wiring optons “W”, “P”, “4”, “5”, “6”, “7”, “A” and “B”. Remote alarm not available for Zone 0, Zone 1 or Division 1.

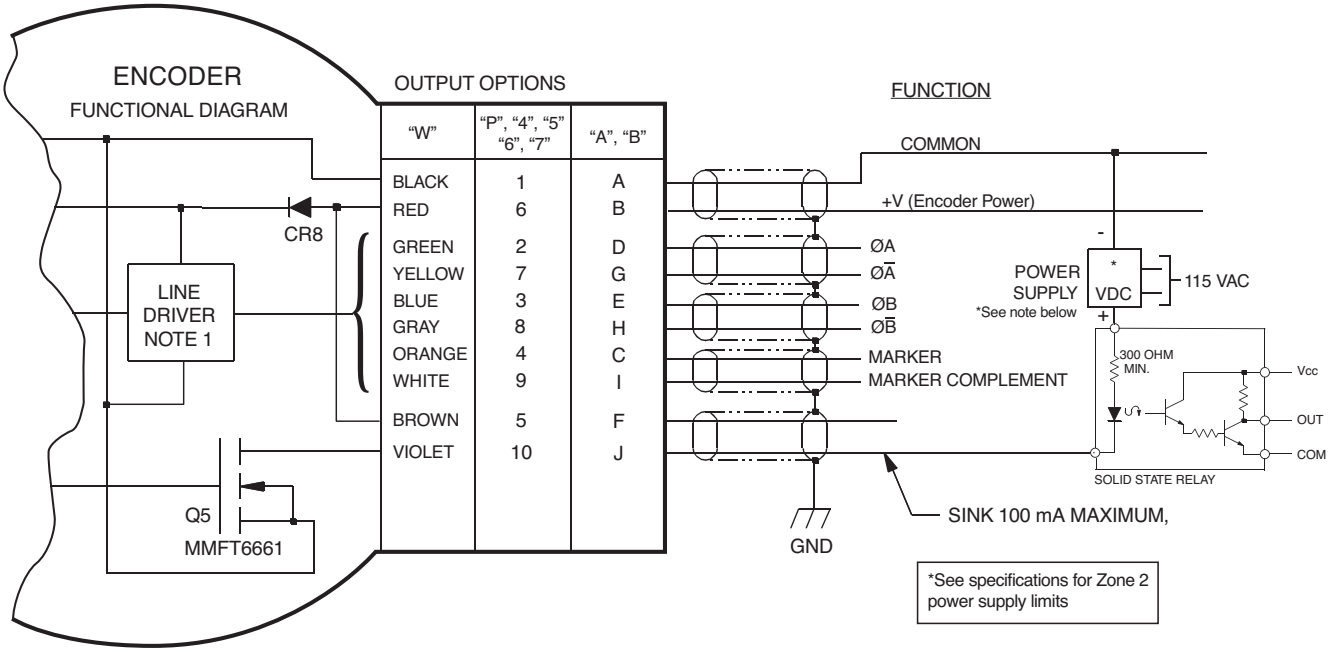
ALARM OUTPUT CONNECTION

Avtron encoders provide an alarm signal if maintenance is required under specific circumstances. An alarm LED indicator is also available. Green indicates power on, red indicates alarm on. Following are application examples provided to help install the alarm output.

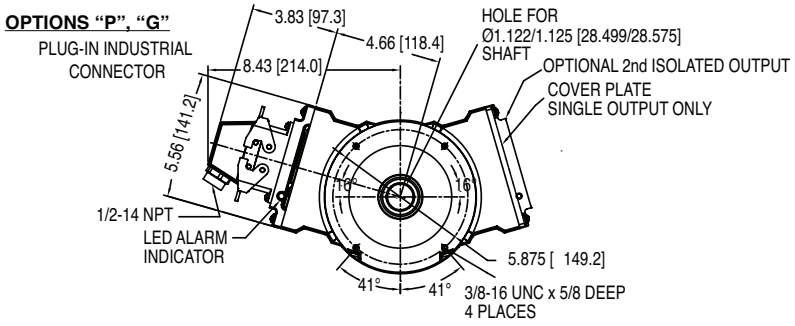
Example 1. Alarm output using +V(OUT). +V(OUT) is equal to +V, the encoder power supply.



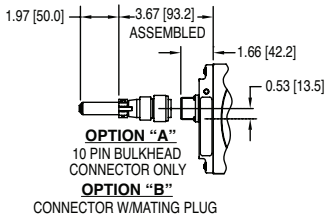
Example 2. Alarm Output Using Separate * VDC Power Supply and Relay.

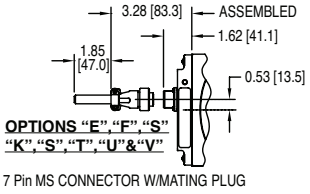


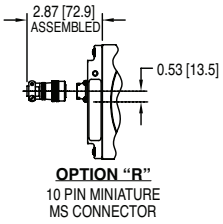
OUTLINE DRAWING

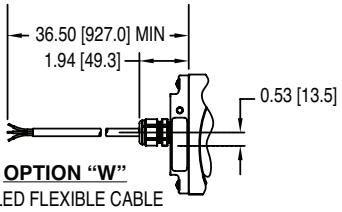


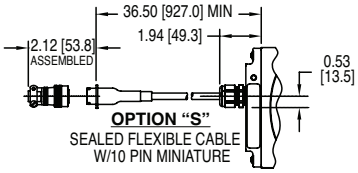
XR685 ENCODER





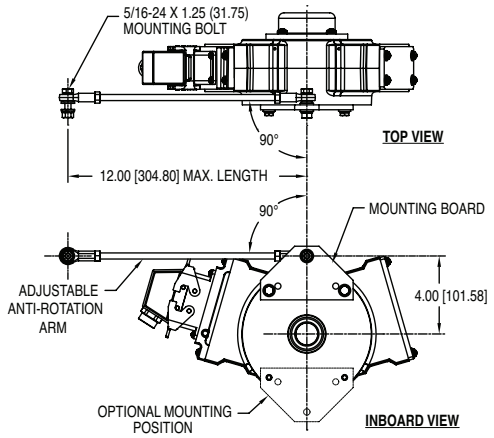


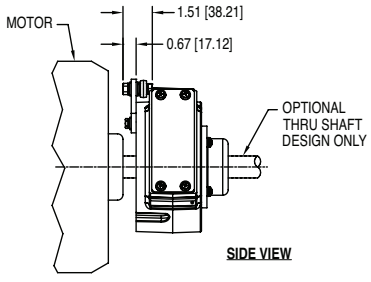




ANTI-ROTATION ARM/TETHER

INCLUDES ALL HARDWARE NECESSARY FOR MOUNTING ENCODER





CE

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

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

Company Name _____

Authorized Company Representative _____

Title _____ Date _____

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

LINE DRIVER OPTION CODE FOR: XR850, XR125, XR485, XR685 (5 = ib, H = ia)

XRYYY XXXX5XXX 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, (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.

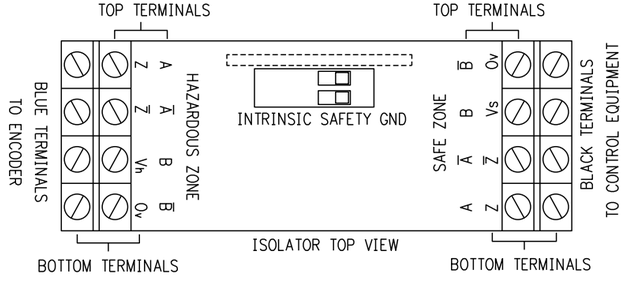
SYSTEM PARAMETERS ARE:

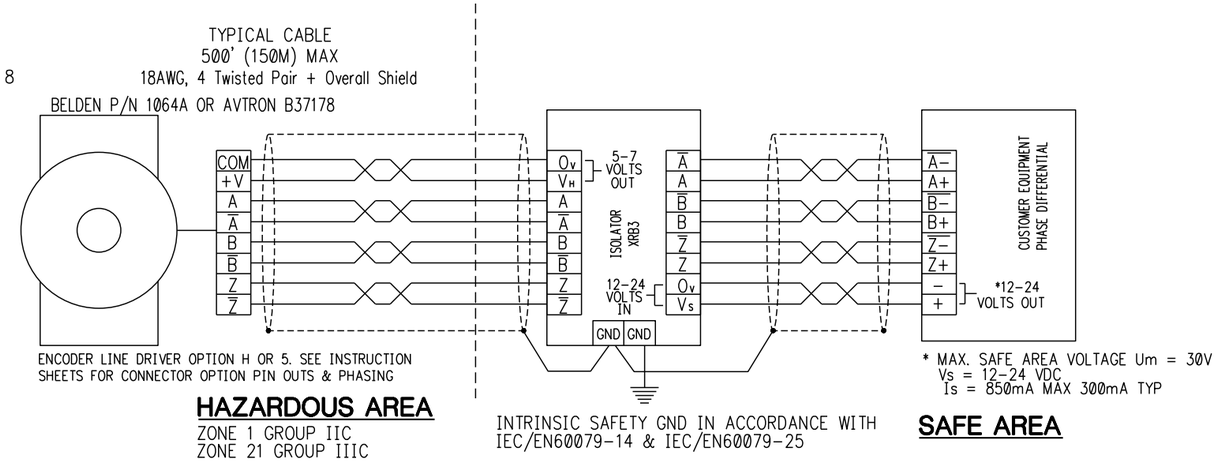
Um (MAXIMUM SAFE AREA VOLTAGE) = 30V
Uo (OPEN CIRCUIT VOLTAGE) = 7.14 VDC
Io (SHORT CIRCUIT CURRENT) = 420 mA
Co (SYSTEM CAPACITANCE) = 13.5 uF MAX.
Lo (SYSTEM INDUCTANCE) = .15 mH MAX.

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.

REVISIONS				
ECN NO.	REV	DESCRIPTION	DATE	APPROVED

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

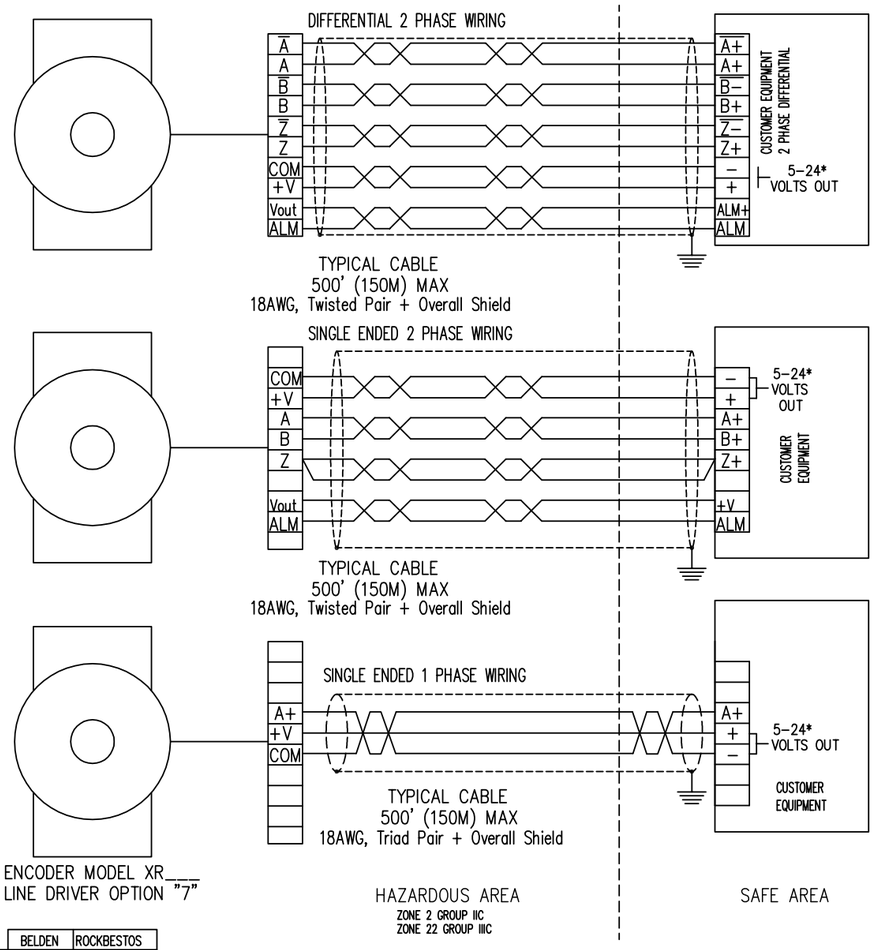
THE XR --- FAMILY OF ENCODERS HAS BEEN EVALUATED TO BE COMPLIANT WITH:
IEC60079-0:2011, EN60079-0:2012/A11:2013
IEC60079-11:2011, EN60079-11:2012
BSEN61000-6-4:2007 AND BSEN61000-6-2:2005
CERTIFICATES OF CONFORMITY TRAC12ATEX0003X, IECEx TRC12.0009X

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

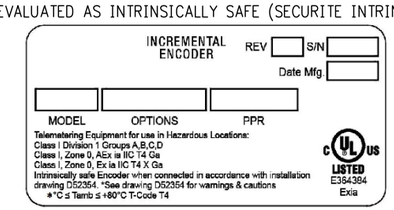
XRYY F X X XXX

- 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

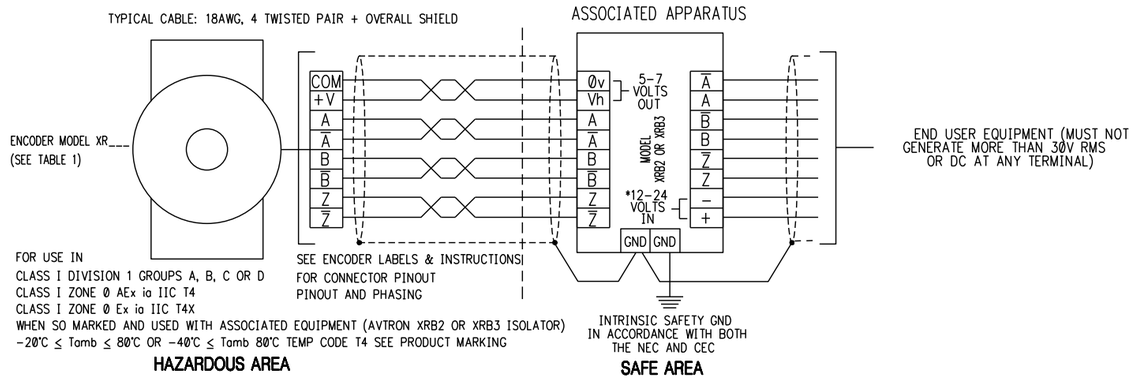
2. CAPACITANCE AND INDUCTANCE CONNECTED TO THE OUTPUT TERMINALS MUST BE ADDED TO Ci AND Li OF THE INPUT TERMINALS OF THE ENCODER WHEN DETERMINING THE MAXIMUM CAPACITANCE AND INDUCTANCE APPARENT AT THE INPUT TERMINALS. WHERE THE CABLE CAPACITANCE AND INDUCTANCE PER FOOT ARE NOT KNOWN, THE FOLLOWING VALUES 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 0 ENCODER INSTALLATION DRAWING

IMF ☒ PSF ☐

SIZE	CAGE NO.	DWG. NO.	REV
D	0FMV7	D52354	C

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

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

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

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

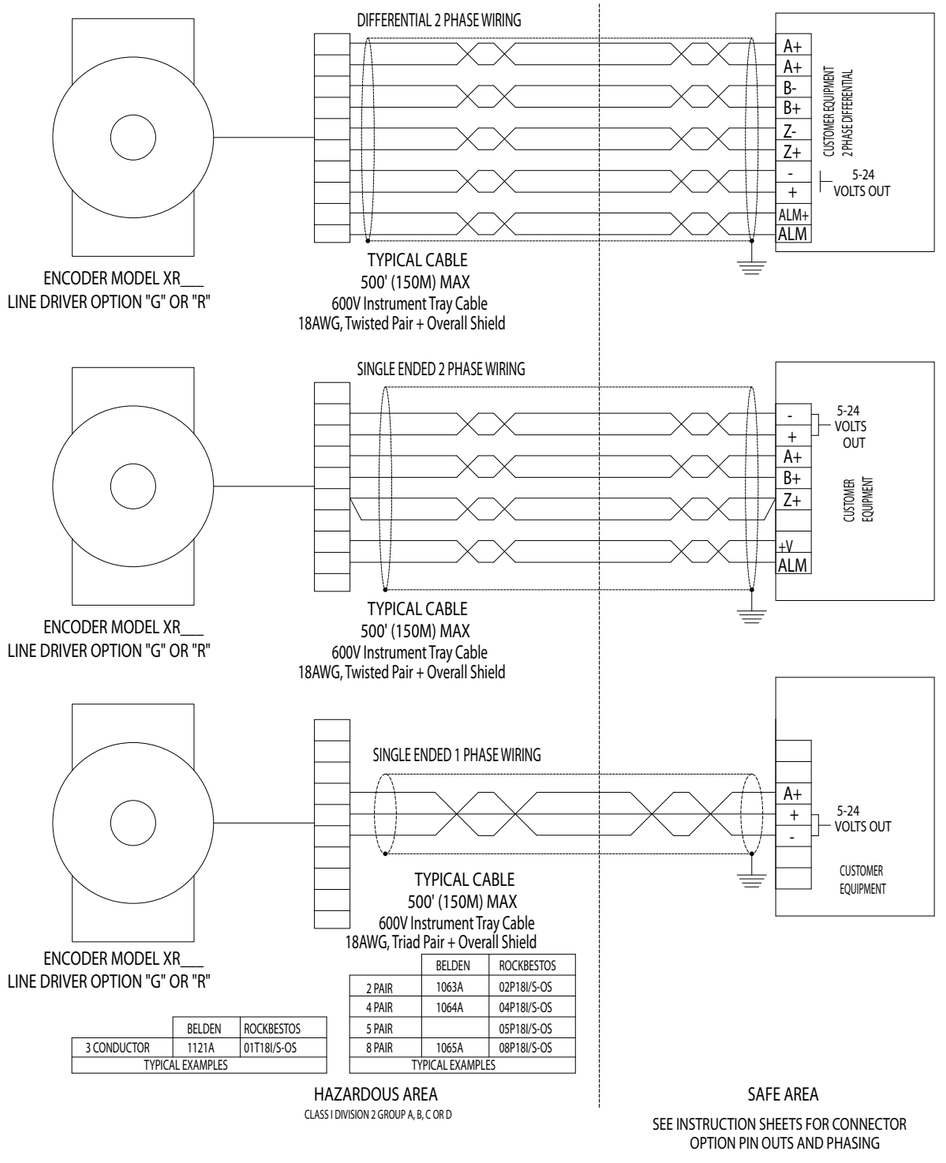
FOR LISTED ENCODERS AND CABLE MUST BE SELECTED AND INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF ARTICLE 504 OF THE NATIONAL ELECTRICAL CODE AS WELL AS THE CANADIAN ELECTRICAL CODE. CABLE CHARACTERISTICS MUST COMPLY WITH THE NATIONAL ELECTRICAL CODE (600V INSTRUMENT TRAY CABLE). INTERCONNECTION 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.



	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		

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

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

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

UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY