



ENCODER INSTRUCTIONS

XR5 SMARTSafe™ MODULAR SENSOR & ROTOR

DESCRIPTION

The Avtron Model XR5 SMARTSafe™ is an incremental encoder for hazardous atmosphere applications (also known as tachometer or rotary pulse generator), allowing operation down to zero RPM. It provides a specific number of electrical Pulses Per Revolution (PPR) that are proportional to a shaft's revolution. The XR5 SMARTSafe encoder is a bearingless, couplingless, modular design, providing unequaled reliability and mechanical performance.

CAUTION

The XR5 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.

The XR5 Encoder consists of two parts: a rotor and a removable sensor module designed to be imbedded within or mounted on OEM machines.

The XR5 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 XR5 electronics are potted, providing full protection against liquids.

The outputs are protected against short circuits and wiring errors. An Avtron XR5 SMARTSafe encoder has a two-phase output (A,B) 90° out of phase, with complements (\bar{A} , \bar{B}), (A Quad B Output), and a marker pulse with complement (\bar{Z} , \bar{Z}).

The XR5 removable sensor assembly has a diagnostic package that includes Adaptive Electronics and a Fault-Check output. With this package, the SMARTSafe encoder can maintain itself, and let you know 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 XR5 by constantly monitoring and correcting duty cycle and edge separation over time.

INSTALLATION

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 XR5 is not considered as a safety device and is not suitable for connection into a safety system.

The XR5 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 XR5 may be subject. It is however the responsibility of the end user to ensure that the XR5 is selected correctly for the potentially explosive atmosphere in which the equipment is to be put into service. The XR5 installation is similar to AV5.

GENERAL

The sensor must be located accurately to properly center it on the rotor and provide the correct sensor-to-rotor air gap without permitting contact between the stationary sensor and spinning rotor. Axial shaft float or endplay must be less than ± 0.100 " inch.

CAUTION

Do not strike or pound the sensor or rotor.

Equipment needed for installation

Supplied:

XR5 Sensor

1. Washer, Spring Lock (4)
2. Soc. Hd. Cap Screw 10-24 x 0.75" (4)

Rotor

- Rotor installation hardware kit
- Anti-Seize Compound (copper)
- Thread Locker (blue)

Not Supplied:

- Dial Indicator
- Vernier Caliper
- 2mm Hex Wrench (T-Handle style for set screw style rotors)
- 5/32 Hex Wrench

- Model XRB3 Isolator for Division 1, Zone 0, 1, 20 and 21 applications (Sold Separately)

SENSOR LOCATION RELATIVE TO ROTOR.

The sensor must be properly located to sense the rotor, and the rotor-sensor orientation must be correct so that the incremental and marker tracks are correctly sensed.

The mounting diagrams (p9) show the sensor “pocket” used to orient and align the sensor to the rotor, as well as the tapped screw holes to secure the sensor to the mounting bracket. The instructions below assume a properly designed and located mounting bracket in place on the machine.

1. Slide the rotor onto the shaft to be sensed.
 - 1a. For cam screw style rotors, ensure the cam screw side of the rotor labeled “this side out” is oriented to the side of the sensor with the LED. (The black potted side of the sensor should orient to the side of the rotor without fasteners).
 - 1b. OR For set screw style rotors, ensure the set screw side of the rotor labeled “this side in” is oriented to the black potted side of the sensor (not the LED side).
2. Slide the rotor into position axially, using the machined face of the sensor as a reference. The rotor must be positioned correctly +/- 0.100” [2.54mm]. Secure the rotor using either the set screws with thread locker, or by tightening the cam screws.
3. Using a PLASTIC shim (only), check the sensor-to-rotor gap; should be nominally 0.045” [1.14mm]. For best performance and resistance to debris, the nominal gap should be +0.005” / -0.035” [+0.127mm / - 0.889mm] If the sensor gap is not correct, adjust the location of the mounting bracket as required.
4. Secure the sensor to the mounting bracket using 4 screws.

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 XR5 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 diagrams are shown for Zone 1 and Zone 2 applications. Refer to the wiring diagrams and pinout and phasing tables for specific information on each option. For bidirectional operation of the encoder, proper phasing of the two output channels is important. Phase A channel typically leads phase B channel for clockwise shaft rotation as viewed from the anti-drive or accessory end of the motor (encoder mounting end). See pinout and phasing tables for exceptions

NOTE

Wiring option “G” provides a pinout compatible with Northstar™ encoders, with a cable shield connection on pin 10. Note that this option does not ground the shield.

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 A in the phase A pair OR B with B in the phase B pair but NOT both.
3. Apply power and verify encoder feedback is correct. Interconnection cables specified in the wire selection chart are

based on typical applications. Cable must be selected and installed in accordance with regional standards. 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 16AWG (Industrial EPIC connector type options can use 14 AWG). Each twisted wire pairs overall shielded with braid or foil with drain wire, .05uF of maximum total mutual or direct capacitance, outer sheath insulator. See specifications for maximum cable length. Stranded 20 AWG wire should not be used for cable runs greater than 61 meters. If 20AWG is used with EPIC type connector options the wire ends should be tinned.

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.

See wiring diagram for examples of alarm output wiring.

MAINTENANCE

GENERAL

This section describes routine maintenance for the Avtron XR5 Encoder. For support, contact Avtron’s field service department at 216-642-1230. For emergency after hours service contact us at 216-641-8317. The XR5 SMARTSafe circuitry includes a diagnostic package that includes Adaptive Electronics and a Fault-Check output.

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. For units other than Zone 1 Units, Fault-Check annunciation is available as an “alarm” output through the connector (Zone 2 applications only) and as an integral LED.

TROUBLESHOOTING

If the drive indicates a loss of encoder/tach fault and the XR5 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. 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):

1. Check the rotor axial position relative to the sensor.
2. Check the air gap between the sensor and the rotor using a plastic shim (do not use metal). It should be 0.040” - 0.050” [1.02mm-1.27mm].
3. Ensure the sensor is mounted at 90 degrees to the rotor.

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), replace any magnetized material nearby with non-magnetic material (aluminum, stainless) (shafts, etc). If variations persist, consider replacing with super-shielded models, option -004.

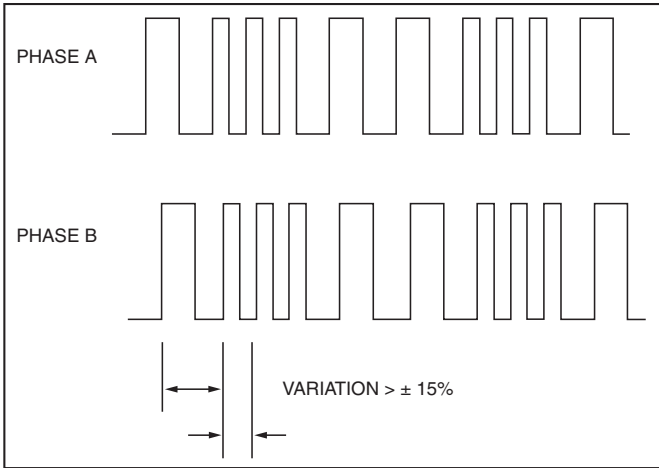
SENSOR REMOVAL

To remove the sensor remove the qty 4 screws holding the sensor to the mount. Take care that the sensor does not fall from the frame and crash into the rotor. Damage to the sensor or rotor could result.

ROTOR REMOVAL

Remove the rotor by hand, taking care not to damage the outer magnetized ring.

If the rotor can not be removed by hand, use the lifter screw holes: thread in (2) 1/4-20 screws evenly until they contact a stationary surface. Turn each screw 1-3 more turns, and the rotor should break free. DO NOT APPLY HEAT TO THE ROTOR.



XR5 Sensor Part Numbers				
Model	Line Driver	PPR	Connector Options	Modifications
XR5	See line driver connector option chart	X- none S- 600 F- 60 V- 900 G- 100 J- 960 H- 120 Y- 1024 A- 128 Z- 1200 L- 240 3- 2000 N- 256 4- 2048 P- 300 5- 2500 E- 360 D- 4096 B- 480 8- 4800 Q- 500 9- 5000 R- 512 0- Special	See line driver connector option chart	000- none 004- Super Magnetic Shielding 018- Includes isolator 4xx- Special PPR (see table) 9xx- Special Cable Length (xx=ff/0.3m)

Special PPR Option Code	PPR
401	1270
402	150
403	50
404	512
405	N/A
406	6000

		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	XR3	None	XR3	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. 2O/ & Comp A, \bar{A} , B, \bar{B} (differential line driver)
 2. Marker 1/Rev, Z, \bar{Z}
- C. Signal Type Incremental, Square Wave, 50 \pm 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. 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. Rotor Inertia 0.17-0.36 Oz. In. Sec.2
- B. Acceleration 5000 RPM/Sec. Max.
- C. Speed 5400 RPM Max.
- D. Weight 2-3 lbs [0.9kg to 1.36kg].
- E. Sensor to Rotor
 Air Gap (nominal) 0.030" [0.76mm]
 Tolerance \pm 0.015" [0.38mm]
- F. Rotor Axial Tolerance \pm 0.050" [\pm 1.27mm]

ENVIRONMENTAL

Solid cast aluminum stator and rotor
 Less than 6% magnesium by mass
 Fully potted electronics, protected against oil and water spray
 V-Ring seals provided on through shaft covers
 Operating Temperature:
 -40 to 80°C, 0-100% condensing humidity
 See "Description" section for information on hazardous location environments

XR5 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
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		

Description	Code	Line Driver Specifications				Isolator Specifications		Units
		H	7	F	G	XR3		
	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		
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 Voltage 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							

END OF SHAFT ROTORS								
Motor Frame	Motor Specific Style			Universal Style				
	Code	Rotor	Shaft Grounding Kit	Code	Rotor	Shaft Adapter**	Shaft Ground Kit	Magnetic Shield
Universal rotor only* (no stub shaft)	-NA-	-NA-	-NA-	CB*	B31515	none	-NA-	-NA-
CD 180-32x	EF/HF	B30916-EF	-NA-	QF/UF/GF	B31515	B31516	-NA-	A35355
CD36x	EN/HN	B30916-EN	-NA-	QN/UN/GN	B31515	B31517	-NA-	A35355
CD4xx	EP/HP	B30916-EP	-NA-	QP/UP/GP	B31515	B31518	-NA-	A35355
CD444/CD505E	EQ/HQ	B30916-EQ	-NA-	QQ/UQ/GQ	B31515	B31631	-NA-	A35355
CD43xx, 44xx, 54xx, 64xx, 65xx		-NA-	-NA-	QV/UV/GV	B31515	B31676	-NA-	A35355
CD45xx, 75xx, 76xx		-NA-	-NA-	QW/UW/GW	B31515	B31676	-NA-	A35355
CD46xx, 47xx, 85xx, 86xx		-NA-	-NA-	QY/UY/GY	B31515	B31677	-NA-	A35355
CD68x		-NA-	-NA-	QZ/UZ/GZ	B31515	B31678	-NA-	A35355
CD5xx (excluding CD505)	E2/H2	B30916-E2	-NA-	Q2/U2/G2	B31515	B31519	-NA-	A35355
E9- CD60xx, 61xx, 62xx, 67xx, 68xx, 69xx	E9/H9	B31092	-NA-	Q9/U9/G9	B31515	B31520	-NA-	-NA-
All except CD505 and CD680	-NA-	-NA-	-NA-	UU	B31515	B31516, B31517, B31518, B31637, B31676, B31677	-NA-	-NA-

** Shaft adapter part numbers for rotor style "Q" (stacked encoders) is the same as above but with a "-1" suffix.

SPARE THROUGH SHAFT ROTORS AND COVERS					
Through Shaft Rotors					
Shaft Bore	Set Screw		Cam Screw		Magnetic Shield
Imperial (US) Sizes	Rotor Code	Rotor Part	Rotor Code	Rotor Part	
0.750"	TA	B30915-TA	CA	B31514-CA	A35355
0.625"	TB	B30915-TB	CB*	B31515	A35355
0.875"	TC	B30915-TC	CC	B31514-CC	A35355
3.625"	TD	B30915-TD	-NA-	-NA-	-NA-
1.000"	TE	B30915-TE	CE	B31514-CE	A35355
1.125"	TF	B30915-TF	CF	B31514-CF	A35355
3.750"	TG	B30915-TG	-NA-	-NA-	-NA-
1.375"	TH	B30915-TH	CH	B31514-CH	A35355
1.625"	TJ	B30915-TJ	CJ	B31514-CJ	A35355
1.750"	TK	B30915-TK	CK	B31514-CK	A35355
1.875"	TL	B30915-TL	CL	B31514-CL	A35355
2.000"	TM	B30915-TM	CM	B31514 CM	A35355
2.125"	TN	B30915-TN	CN	B31514-CN	A35355
2.375"	TP	B30915-TP	CP	B31514-CP	A35355
2.250"	TQ	B30915-TQ	CQ	B31514-CQ	A35355
2.500"	TR	B30915-TR	CR	B31514-CR	A35355
2.625"	TT	B30915-TT	CT	B31514-CT	A35355
3.250"	TW	B30915-TW	CW	B31514-CW	-NA-
3.375"	TY	B30915-TY	CY	B31514-CY	-NA-
3.421"	TZ	B30915-TZ	CZ	B31514-CZ	-NA-
4.000"	T1	B30915-T1	-NA-	-NA-	-NA-
2.875"	T2	B30915-T2	C2	B31514-C2	A35355
3.500"	T3	B30915-T3	C3	B31514-C3	-NA-
3.875"	T4	B30915-T4	-NA-	-NA-	-NA-
4.500"	T6	B30915-T6	-NA-	-NA-	-NA-
Metric Sizes	Set Screw		Cam Screw		
30mm	MF	B30915-MF	-NA-	-NA-	A35355
42mm	MJ	B30915-MJ	-NA-	-NA-	A35355
60mm	MP	B30915-MP	-NA-	-NA-	A35355
80mm	MY	B30915-MY	-NA-	-NA-	-NA-
80mm	MZ	B30915-MZ	-NA-	-NA-	-NA-
90mm	M3	B30915-T3	-NA-	-NA-	-NA-
95mm	M4	B30915-T4	-NA-	-NA-	-NA-

* Note Universal rotor (CB) is a 5/8" thru-shaft cam screw style rotor. Universal style kits (GF-G9, QF-Q9, UF-U9) add the required stub shaft to fit the rotor to GE CD frame motors.

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

PINOOTS 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	A-	B-	Z-	* Alm
10 Pin MS Avtron Pinout	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	A-	B-	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)

SMARTSafe™

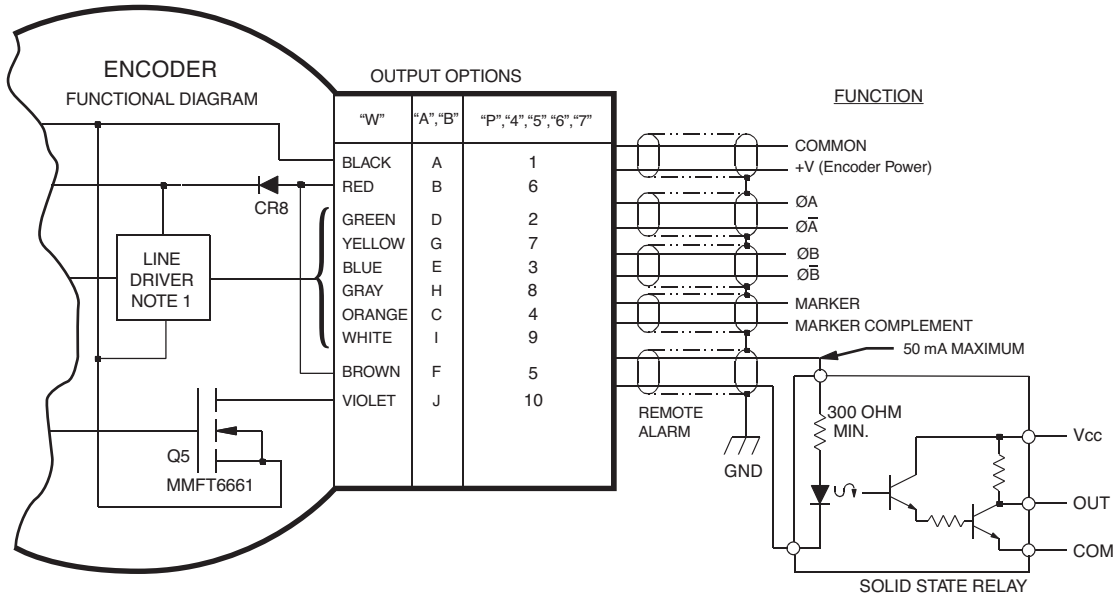
Application Examples

Applies to all Model XR5 Zone 2 and Division 2 models with wiring options A, B, P, W, 4, 5, 6 and 7 remote alarm not available for Zone 0, Zone 1 or Division 1.

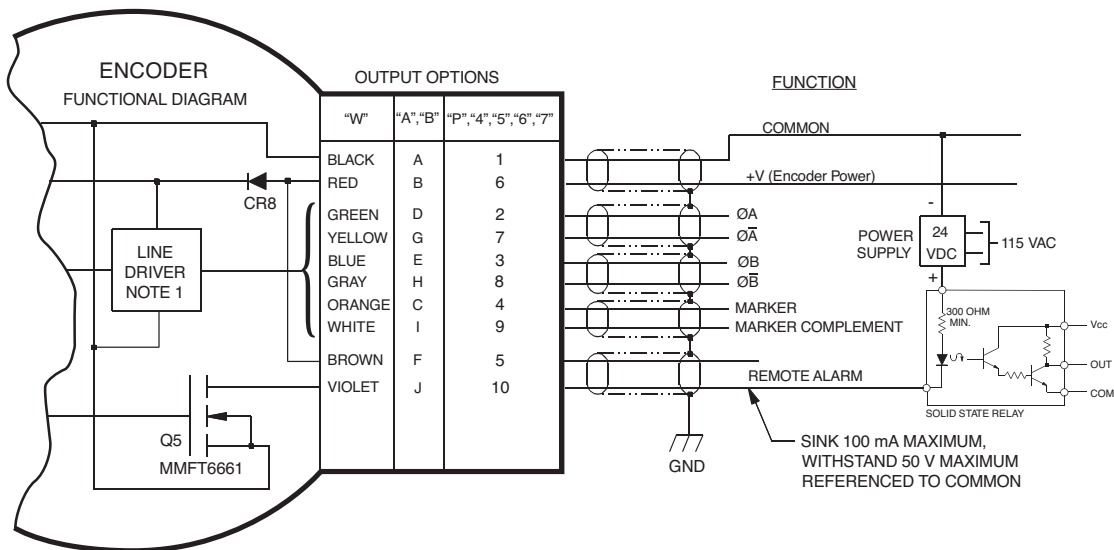
ALARM OUTPUT CONNECTION

Avtron SMARTSafe encoders provide an alarm signal if maintenance is required under specific circumstances. A green LED indicates power on and proper operation, 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.

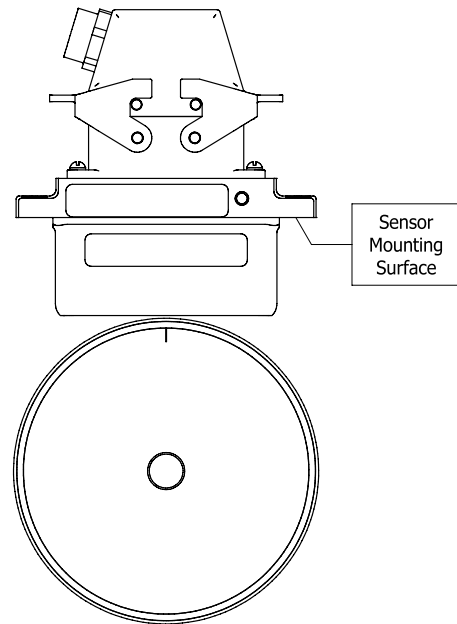
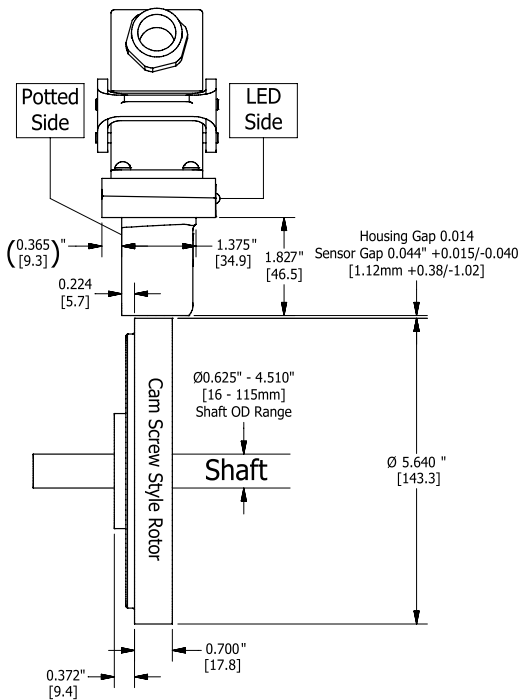
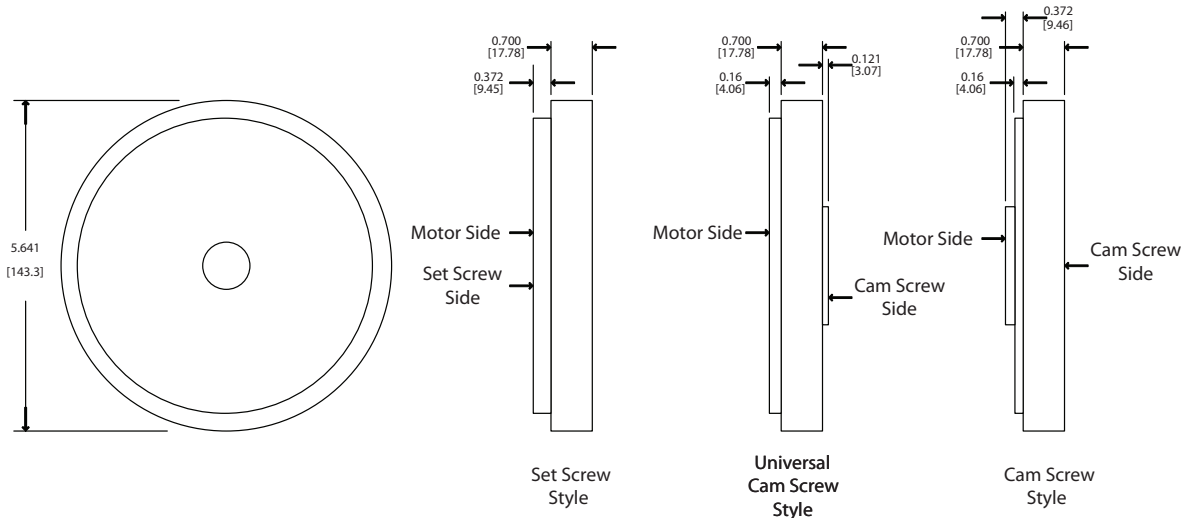
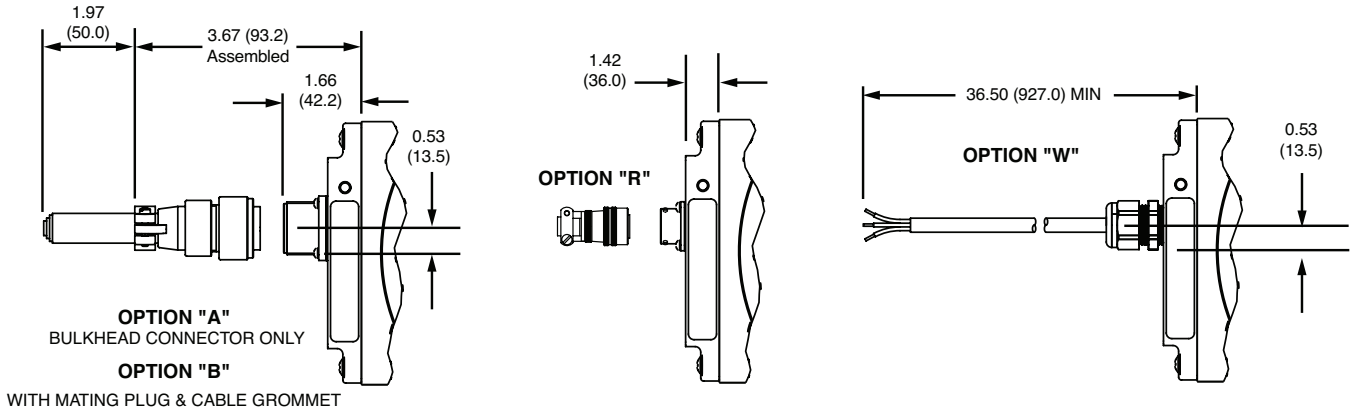


Example 2. Alarm Output Using Separate * VDC Power Supply and Relay.

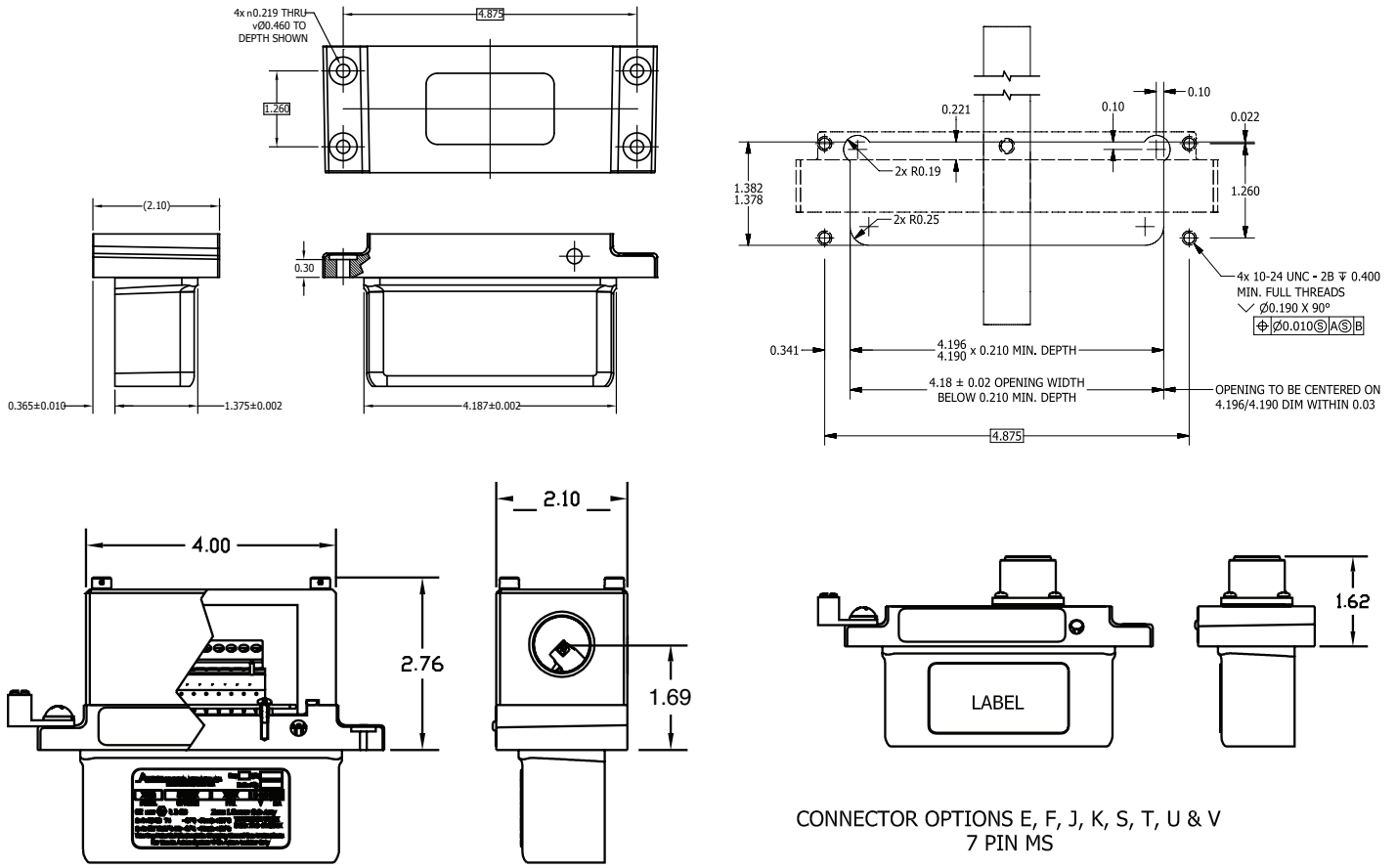


*See specifications for Zone 2 power supply limits

OUTLINE DIMENSIONS AND OPTION DETAILS

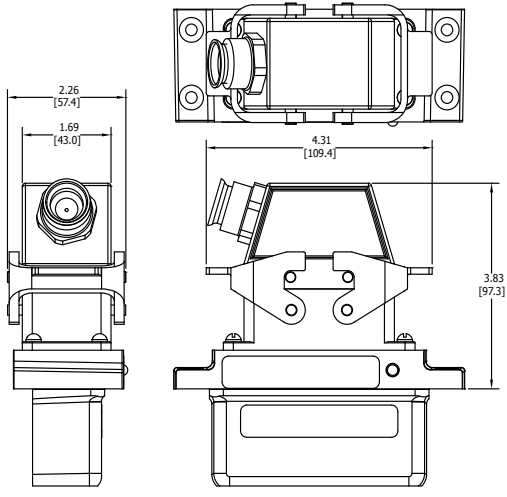


OUTLINE DIMENSIONS AND OPTION DETAILS



CONNECTOR OPTIONS E, F, J, K, S, T, U & V
7 PIN MS

CONDUIT BOX OPTIONS 4, 5, 6, & 7



Options P & G

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

Company Name _____
 Authorized Company Representative _____
 Title _____ Date _____

SMARTSafe is a trademark of Avtron Industrial Automation, Inc.
 Features and specifications subject to change without notice.
 Avtron standard warranty applies. All dimensions are in inches [mm].

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 ib 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 ib IIIC Db]

MAXIMUM SAFE AREA VOLTAGE = 30V, $-40^{\circ}\text{C} \leq \text{Tamb} \leq +80^{\circ}\text{C}$

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.

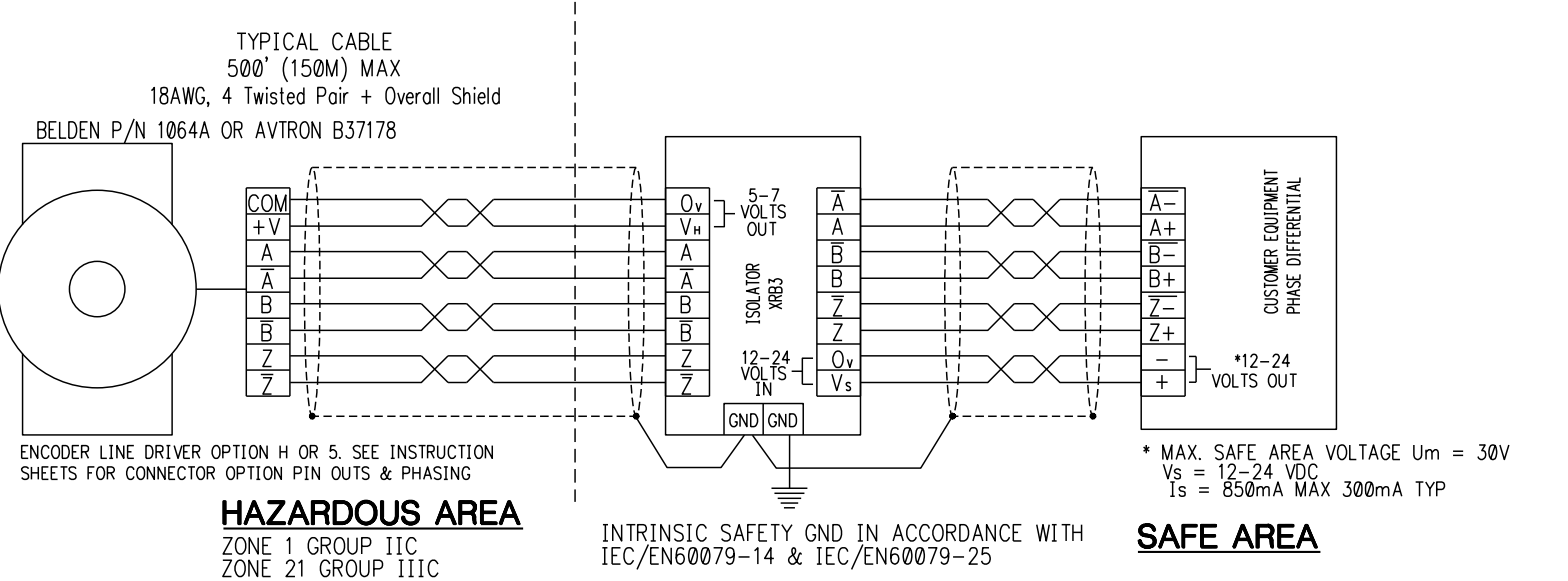
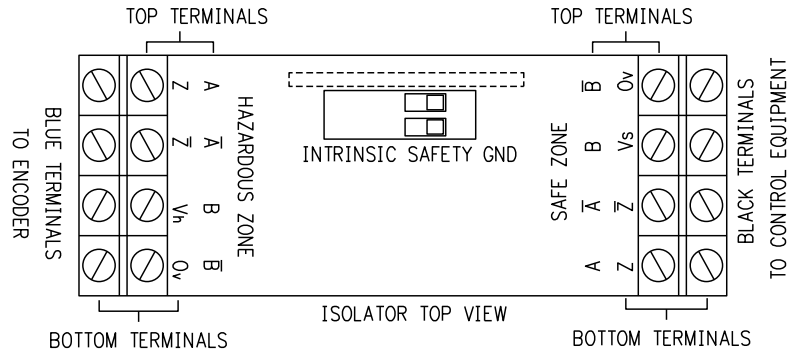
SYSTEM PARAMETERS ARE:

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.

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

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



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

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:**
- 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.
 - 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
 - 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.

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OF NIDEC INDUSTRIAL SOLUTIONS AND MAY NOT BE DISCLOSED TO OTHERS OR USED FOR MANUFACTURING PURPOSES WITHOUT THE WRITTEN CONSENT OF NIDEC INDUSTRIAL SOLUTIONS.	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	DRAWN	ZIVKOVIC	DATE	7/21/20	<p>243 TUXEDO AVENUE BROOKLYN HEIGHTS, OH 44131</p>
	TOLERANCES: DECIMALS .xxx± .03 ANGLES ±1' .xxx± .015	CHECKED	SIRACKI	7/21/20	ATEX / IECEX, ZONE 1 & 21 INSTALLATION DRAWING	
	FINISH	ENG APVD	WOLFF	7/21/20		
	PAINT PER PS PLATE PER COAT PER PS ANODIZED PER OTHER	APVD PROD			SIZE D CAGE NO. 0FMV7 DWG. NO. D53008 SCALE 1/1 MODEL N/A	
NEXT ASSY	USED ON	APPLICATION				

UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY

LINE DRIVER OPTION CODE FOR XR850, XR125, XR485, XR685

XRYY XXXXX7XXX XXX

CONNECTOR OPTION CODE LOCATION FOR: XR56A, XR56S
 XR67A, XR85A, XR115, XR125, XR485, XR685
 XR67A, XR85A, XR115, 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

HAZARDOUS LOCATION CODE

CONNECTOR OPTION CODE LOCATION FOR: XR5, XR12, XR97

MODEL # CODES: 5, 12, 97

XRYY X XXX

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 TRACTA2ATEX0003X, IECX 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 EQUIVALENT POWER SUPPLY THAT LIMITS VOLTAGE AND CURRENT PER THE FOLLOWING CHART.

-40<Tamb<+80°C

TABLE 1: ZONE 2 POWER SUPPLY LIMITS

!	U	IIC	IIB	15V	25V	1.8uF
	IIC	IIB		12V	15V	
5A				12V		
1A				15V		
250mA				15V	25V	

HAZARDOUS LOCATION CODE = 7 FOR ZONE 2 & 22
 LINE DRIVER OPTION CODE = 7 FOR ZONE 2 & 22

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

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 ZINC OXIDE.
 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:
 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 INDEC 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.

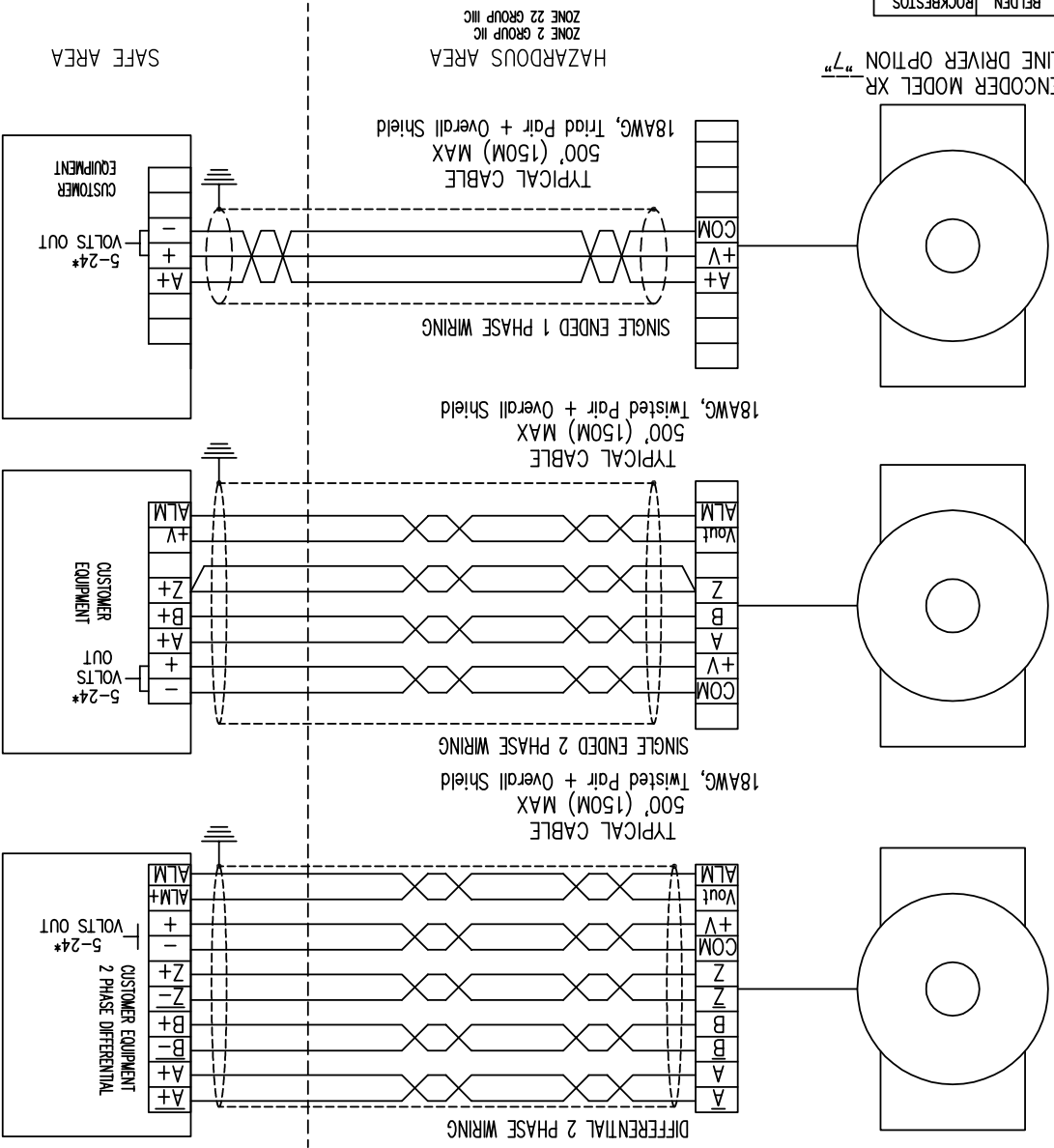
INTERCONNECTION CABLES SPECIFIED ARE BASED ON TYPICAL APPLICATIONS. CABLE MUST BE SELECTED AND INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND CANADIAN ELECTRICAL CODE. PHYSICAL PROPERTIES OF CABLE SUCH AS ABRASION, TEMPERATURE, TENSILE STRENGTH, SOLVENTS, ETC., ARE DICTATED BY THE SPECIFIC 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 FOL 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

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OF INDEC AVTRON AUTOMATION AND MAY NOT BE DISCLOSED TO OTHERS OR USED FOR MANUFACTURING PURPOSES WITHOUT THE WRITTEN CONSENT OF INDEC AVTRON AUTOMATION.

TYPE	PAIRS	WIRE GAUGE	MINIMUM CABLE LENGTH
2 PAIR	1063A	02P18/S-05	ROCKBESTOS
4 PAIR	1064A	04P18/S-05	ROCKBESTOS
5 PAIR	1064A	05P18/S-05	ROCKBESTOS
8 PAIR	1065A	08P18/S-05	ROCKBESTOS

TYPE	CONDUCTOR	WIRE GAUGE	MINIMUM CABLE LENGTH
3 CONDUCTOR	9365	01T18/S-05	ROCKBESTOS
			ROCKBESTOS



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.

DATE	1/13/14	DRAWN	NICKOLU
CHECKED		ENG APP'D	SHADDUCK
SIZE	D	SCALE	1/1
SIZE	01M7	MODEL	N/A
DWG. NO.	052353	REV	A

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

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

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	
EA1779	B	DEL NAME AND ADDRESS FROM LABEL	ZIVKOVIC	5/6/20	WOLFF
EA1658	C	UPDATED FOR XRB3	ZIVKOVIC	9/2/20	WOLFF

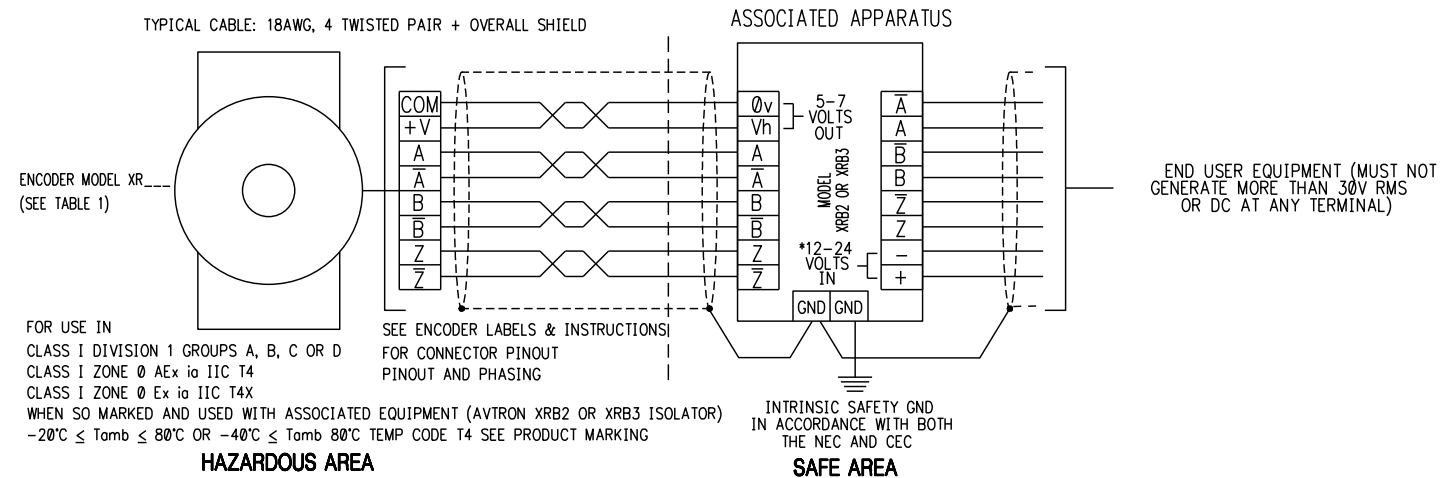
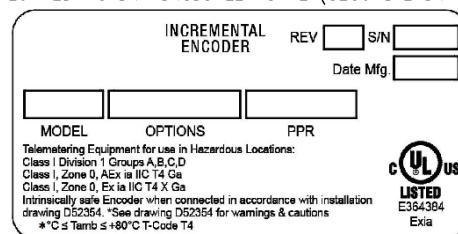


TABLE 1

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) C & D (IIB)	11.89 11.91	2 100

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 $P_o = (V_o * I_s) / 4 = (U_o * I_o) / 4$

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.

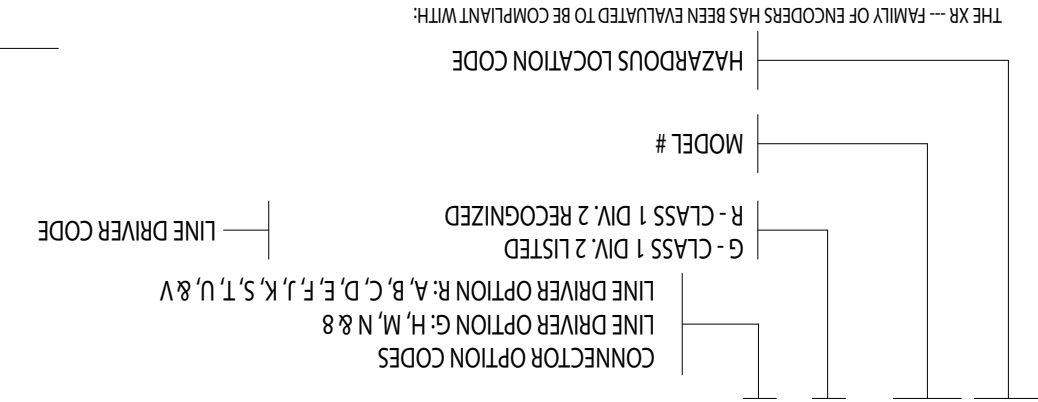
UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY

- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- WHEN AN ENCODER CONTAINS MULTIPLE ELECTRICALLY ISOLATED SENSOR MODULES, THE WIRING MUST BE IN SEPARATE CABLES TO SEPARATE ISOLATOR MODULES.
- INTERCONNECTION CABLES MUST BE SELECTED AND INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND CANADIAN ELECTRICAL CODE.
- 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.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		DRAWN	DATE	Nidec Industrial Solutions	243 TUXEDO AVENUE BROOKLYN HEIGHTS, OH 44131
TOLERANCES:	ANGLES±1°	NICKOLI	7/28/14		
DECIMALS .xx± .03 .xxx± .015		CHECKED	SHADDUCK	7/28/14	
FINISH		ENG APVD	SHADDUCK	7/28/14	
PAINT PER PS		APVD PROD			
PLATE PER					
COAT PER PS					
ANODIZED PER					
OTHER					

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

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



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

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

- CSA 222 NO. 14-13
- CSA C22.2 NO. 213-M1987
- ISA 12.1201 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 1 DIV 2 GROUPS A, B, C OR D, OR NON - HAZARDOUS LOCATIONS ONLY.

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

WHEN SO MARKED AS ABOVE
 $-40^{\circ}\text{C} < T_{amb} < +80^{\circ}\text{C}$ 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 déconnecter l'équipement à moins que l'alimentation est coupée
 ou que la zone est connue pour être non dangereuse.

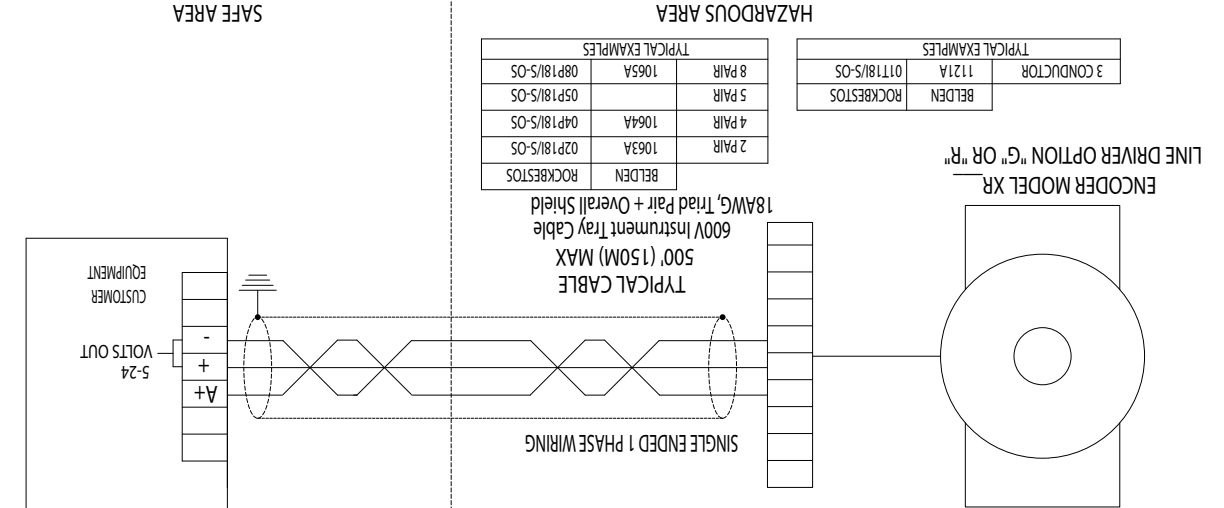
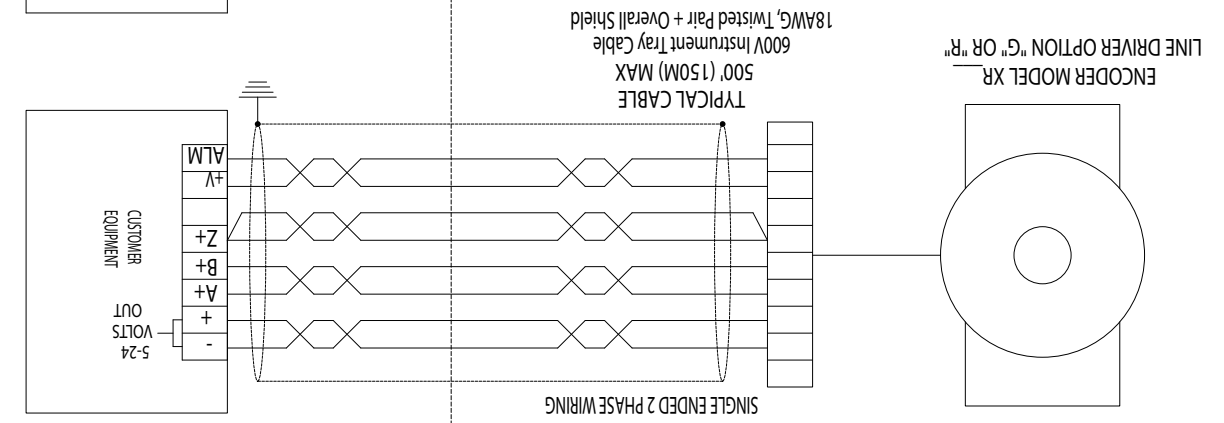
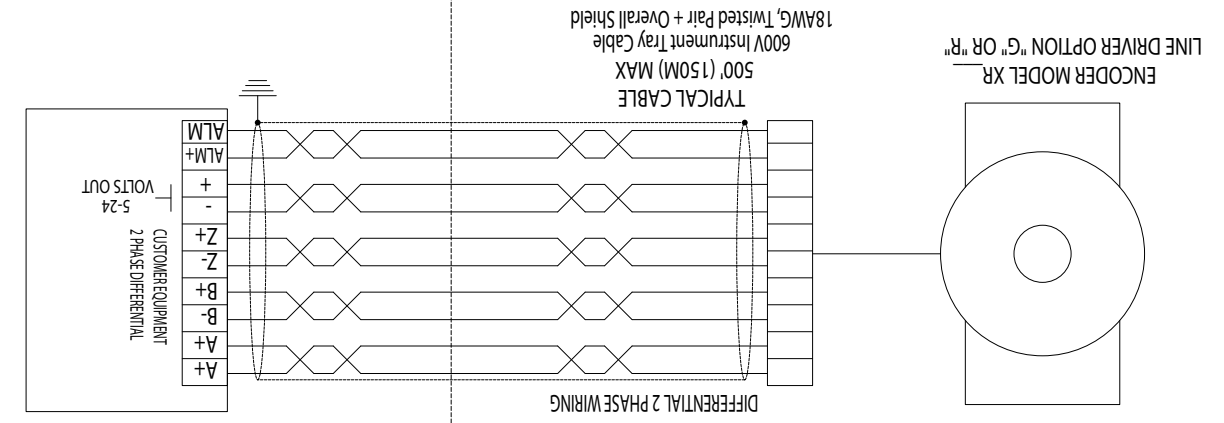
INPUT	OUTPUT
5-24VDC	5-24VDC
100mA Nom, 355mA Max.	100mA Max. ea Output

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 12.1201 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.

Get 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 classé.
 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.

REV	DESCRIPTION	DATE	APPROVED
EA0698 A	UPDATED ENCODER PARAMETERS	5/8/14	SHADDUCK



TYPICAL EXAMPLES	
3 CONDUCTOR	1121A
BELDEN	ROCKBESTOS

TYPICAL EXAMPLES	
2 PAIR	1063A
4 PAIR	1064A
5 PAIR	05P181/5-05
8 PAIR	1065A

HAZARDOUS AREA CLASS 1 DIVISION 2 GROUP A, B, C OR D
 INSTALLATION IN ACCORDANCE WITH THE NEC AND IN ACCORDANCE WITH THE CEC
 SEE INSTRUCTION SHEETS FOR CONNECTOR OPTION PIN OUTS AND PHASING
 SAFE AREA

DATE	DRAWN	CHECKED	ENG APP'D	APP'D PROJ
1/8/14	NICKOLI	SHADDUCK	SHADDUCK	SHADDUCK

UNLESS OTHERWISE SPECIFIED	OTHER
DIMENSIONS ARE IN INCHES	
ANGLES: 1°	
TOLERANCES: .03	
FINISH	
PAINT PER PS	
PLATE PER	
COAT PER PS	
MANUFACTURING PURPOSES	
WITHOUT THE WRITTEN	
CONSENT OF INDEC AVTRON	

SIZE	SCALE	MODEL	DWG. NO.	REV
D	1/1	0FMV7	N/A	A

APPLICATION	APP'D
NEXT ASSY	XXXXXX
USED ON	XXXXXX

REVISIONS	DATE	DESCRIPTION	APPROVED
EA0698 A	5/8/14	SHADDUCK	

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OF INDEC AVTRON AUTOMATION AND MAY NOT BE DISCLOSED TO OTHERS OR USED FOR MANUFACTURING PURPOSES WITHOUT THE WRITTEN CONSENT OF INDEC AVTRON AUTOMATION.