

HX-EP SERIES

DIGITAL OUTPUT



Utilizing an incremental encoder as the sensor, the HX-EP series position transducer provides a two channel square wave current sinking output signal in quadrature. The standard output is a single-ended TTL compatible square. The resolution values shown in the specifications table indicate resolution for times 1 counting mode where a count is registered for one up transition in channel A. With interface electronics capable of times 2 or times 4 counting mode, a true resolutional increase of 2 or 4 may be obtained. For example, the HX-EP-50 has a resolution of approximately .004" per count in times 1 counting mode whereas the resolution is approximately .001" per count in times 4 counting mode. The actual resolution of a HX-EP transducer differs from unit to unit because of tolerances associated with the wire rope diameter and the capstan upon which the wire rope winds. The nylon jacketed wire rope option will have the effect of slightly reducing the resolution. Linearity and repeatability remain independent of resolution. In applications where the output count is interpreted as a percentage of total travel, resolutional differences from unit to unit are not critical. However, in applications where the digital output is to be interfaced to a digital display to give an output in engineering units, the calibration constant supplied with the transducer may be used to calculate a suitable scale multiplier to produce the correct engineering units. Alternative outputs shown in the Electrical Outputs table below are available to facilitate interfacing to a variety of different



SPECIFICATIONS

GENERAL

Connector..... MS3102E-14S-6P
Mating Connector..... MS3106E-14S-6S
Available Measurement Ranges..... See Supplemental Data^[1], Table 12

PERFORMANCE

Linearity..... ±0.03% Full Scale
Repeatability..... ±0.015% Full Scale
Resolution..... See Table 9

ENVIRONMENTAL

Operating temperature..... -20°C to +95°C
Storage temperature..... -40°C to +100°C
Shock..... 50 G's for 11 ms Duration
Vibration..... 15 G's 0.1 ms max.
Shock..... 50 G's 0.1 ms max.

INGRESS PROTECTION (Exclusive of Wire Rope Area)

Standard..... NEMA 4 (IP-65)
Optional..... NEMA 6 (IP-68)

ELECTRICAL

Input Voltage..... +5 VDC ±5% or 8-28 VDC
Input Current..... 125 mA Maximum
Output..... Two channel TTL square wave
Phase Quadrature..... 90°±20°

TABLE 9—RESOLUTION

MODEL	RANGE		RESOLUTION ^[2]		RESOLUTION TOLERANCE ^[2]
	inch	metric	counts/inch	counts/mm	
HX-EP-10	10	250 mm	500.0	19.69	±0.30%
HX-EP-25	25	640 mm	250.0	9.84	±0.20%
HX-EP-50	50	1250 mm	250.0	9.84	±0.20%
HX-EP-60	60	1.5 m	205.8	8.10	±0.20%
HX-EP-80	80	2.0 m	155.2	6.11	±0.20%
HX-EP-100	100	2.5 m	82.9	3.26	±0.20%
ALL RANGES GREATER THAN 100"	100	2.5 m	82.9	3.26	±0.20%

ELECTRICAL OUTPUT

For electrical output description, waveform and wiring, See Standard Series Supplemental Data, TABLE 8.

FOOTNOTES TO SPECIFICATIONS

- Supplemental Data section located at end of HX Series pages.
- The resolution shown is a calculated number based upon the capstan diameter, wire rope diameter and line count of the encoding device. The tolerance on the resolution accounts for resolutional differences from unit to unit due to manufacturing tolerances on the capstan and wire rope. In practice, the output count in a given unit of travel is an integer.

MODEL NUMBER CONFIGURATION

HX-EP- 0 1 2 3 N 5 7 8 9

BASIC CONFIGURATION (FOR ALL RANGES)

HX-EP-50-S10-N10-1BC

0 RANGE
Select Measurement Range From Supplemental Data, Table 12 on Page 38, Insert Corresponding Measurement Range Designator

1 WIRE ROPE
S..... Stainless Steel
(See Supplemental Data, Table 12)
N..... Ø.018 (0.45 mm)
Nylon Jacketed Stainless Steel
Ranges to 80" (2m) only. (formerly NJC)
J..... Ø.037 (0.94 mm)
Nylon Jacketed Stainless Steel
Ranges 100" (2.5m) to 500" (12.7m) only.

2 WIRE ROPE TENSION
1.....Standard
2.....Reduced (Ranges to 80" only)

3 WIRE ROPE EXIT DIRECTION
Use Number Designators shown
(RANGES TO 80" (2030 mm))

(RANGES 100" TO 2000" (2.5 m TO 50 M))

5 ELECTRICAL OUTPUT
10.....5 VDC Standard 2 Channel, TTL
11.....5 VDC Standard 2 Channel, TTL with Index
30.....5 VDC Push-Pull Differential Line Drive
31.....5 VDC Push-Pull Differential Line Drive with Index*
50.....8 to 28 VDC Current Sinking 2 Channel
51.....8 to 28 VDC Current Sinking 2 Channel with Index
70.....8 to 28 VDC Push-Pull Differential Line Drive
71.....8 to 28 VDC Push-Pull Differential Line Drive with Index*
*Options **31** and **71**, only available with NEMA 4 (IP-65) configuration. No electrical cable available
For Description See Supplemental Data, TABLE 8

NOTES FOR OPTION BOXES 7, 8, and 9

IP-65 (NEMA 4): Transducer equipped with body mounted connector and with or without mating connector. Mating connector with electrical cable available separately as part number **10119-xM** where 'x' is length of electrical cable in meters.

IP-68 (NEMA 6): Transducer equipped with bulkhead fitting and length of electrical cable. Remote end of electrical cable may be outfitted with water proof connector. Mating connector with electrical cable available separately as part number **10424-xM** where 'x' is length of electrical cable in meters.

7 INGRESS PROTECTION
1..... IP-65 (NEMA 4)
2..... IP-68 (NEMA 6)
3..... IP-68 (NEMA 6) Corrosion Resistant Construction

8 IP-65—NEMA 4 CONNECTOR
B..... 6 Pin 3102E Body Mounted Connector
IP-68—NEMA 6 ELECTRICAL CABLE
P..... Bulkhead Fitting w/ 0.3m (12") Electrical Cable
3..... Bulkhead Fitting w/ 3m (10') Electrical Cable
4..... Bulkhead Fitting w/ 4m (13.5') Electrical Cable
5..... Bulkhead Fitting w/ 5m (16.5') Electrical Cable
6..... Bulkhead Fitting w/ 6m (20') Electrical Cable
7..... Bulkhead Fitting w/ 7m (23') Electrical Cable

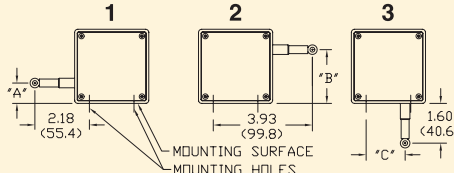
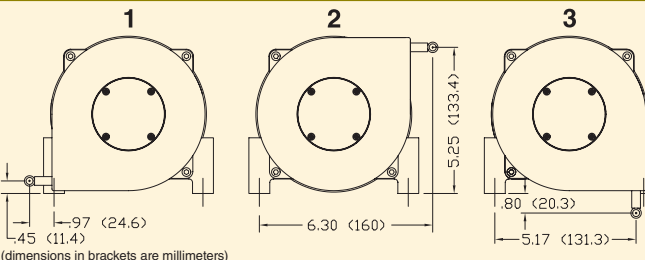
9 IP-65—NEMA 4 MATING CONNECTOR
C..... IP-65 Mating Connector Included
K..... IP-65 Mating Connector Omitted*
*Electrical cable with mating connector may be ordered separately as part number **10119-xM** where 'x' is the length required in meters.
IP-68—NEMA 6 CABLE MOUNTED CONNECTOR
N..... No connector on end of electrical cable
K..... IP-68 Cable to cable connector with no mating connector**
Electrical cable with mating connector may be ordered separately as part number **10424-xM where 'x' is the length required in meters. Mating connector alone unavailable.

HX SERIES

SUPPLEMENTAL DATA



OPTION DESCRIPTIONS

OPTION	OPTION DESIGNATOR	DESCRIPTION																												
WIRE ROPE	N	Replaces standard stainless steel wire rope with Ø.018 nylon jacketed wire rope. This option increases wire rope life dramatically but may increase non-linearity by as much as ±.05% of full scale.																												
NYLON JACKETED WIRE ROPE RANGES TO 80" ONLY																														
NYLON JACKETED WIRE ROPE RANGES 100" TO 500" ONLY	J	Replaces standard stainless steel wire rope with Ø.037 nylon jacketed wire rope.																												
WIRE ROPE EXIT DIRECTION	1, 2, 3	 <table><thead><tr><th>RANGE</th><th>"A"</th><th>"B"</th><th>"C"</th></tr></thead><tbody><tr><td>2", 10"</td><td>1.12 (28.4)</td><td>1.79 (45.5)</td><td>1.21 (30.7)</td></tr><tr><td>3", 15", 30"</td><td>.96(24.4)</td><td>1.95 (49.5)</td><td>1.37 (34.8)</td></tr><tr><td>4", 20", 40"</td><td>.80 (20.3)</td><td>2.11 (53.6)</td><td>1.53 (38.9)</td></tr><tr><td>5", 25", 50"</td><td>.64 (16.3)</td><td>2.27 (57.7)</td><td>1.69 (42.9)</td></tr><tr><td>6", 60"</td><td>.49 (12.4)</td><td>2.42 (61.5)</td><td>1.84 (46.7)</td></tr><tr><td>80"</td><td>.25 (6.4)</td><td>2.66 (67.6)</td><td>2.08 (52.8)</td></tr></tbody></table> (dimensions in brackets are millimeters)	RANGE	"A"	"B"	"C"	2", 10"	1.12 (28.4)	1.79 (45.5)	1.21 (30.7)	3", 15", 30"	.96(24.4)	1.95 (49.5)	1.37 (34.8)	4", 20", 40"	.80 (20.3)	2.11 (53.6)	1.53 (38.9)	5", 25", 50"	.64 (16.3)	2.27 (57.7)	1.69 (42.9)	6", 60"	.49 (12.4)	2.42 (61.5)	1.84 (46.7)	80"	.25 (6.4)	2.66 (67.6)	2.08 (52.8)
RANGE		"A"	"B"	"C"																										
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80"	.25 (6.4)	2.66 (67.6)	2.08 (52.8)																											
ALTERNATE WIRE ROPE EXIT RANGES TO 80" (2.0 m)																														
ALTERNATE WIRE ROPE EXIT RANGES 100" (2.5 m) and GREATER	1, 2, 3	 (dimensions in brackets are millimeters)																												
POTENTIOMETER VALUE	2, 3, 4	Non-standard potentiometer linearity is as follows: <table><thead><tr><th>RANGE</th><th>LINEARITY</th></tr></thead><tbody><tr><td>5" and Below</td><td>±1.00% of full scale</td></tr><tr><td>10" to 25"</td><td>±0.50% of full scale</td></tr><tr><td>30" and above</td><td>±0.25% of full scale</td></tr></tbody></table> Note: This option is subject to potentiometer availability.	RANGE	LINEARITY	5" and Below	±1.00% of full scale	10" to 25"	±0.50% of full scale	30" and above	±0.25% of full scale																				
RANGE		LINEARITY																												
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30" and above	±0.25% of full scale																													
NON-STANDARD POTENTIOMETER APPLIES TO HX-PA & HX-VPA ONLY																														
ELECTRICAL OUTPUT POLARITY	R	Output is at a maximum when wire rope is fully retracted. Output decreases as wire rope is extended. Does not apply to velocity signal.																												
REVERSED OUTPUT																														
INGRESS PROTECTION	2	 Connector is replaced with a bulkhead fitting and a designated length of urethane jacketed, shielded, twisted pair cable. Retraction mechanism and electrical components are sealed to NEMA 6, IP-68 capability.																												
NEMA 6, IP-68 CAPABILITY																														
CORROSION RESISTANT CONSTRUCTION	3	All external anodized aluminum parts of transducer are replaced with stainless steel and corrosion resistant plastic. Transducer is sealed to NEMA 6, IP-68 capability. Urethane jacketed, shielded, twisted pair cable exits unit. No connector on unit. 																												

HX SERIES

SUPPLEMENTAL DATA



ADDITIONAL OPTIONS

TABLE 8

EP, HX-EP SERIES OPTIONAL ELECTRICAL OUTPUTS

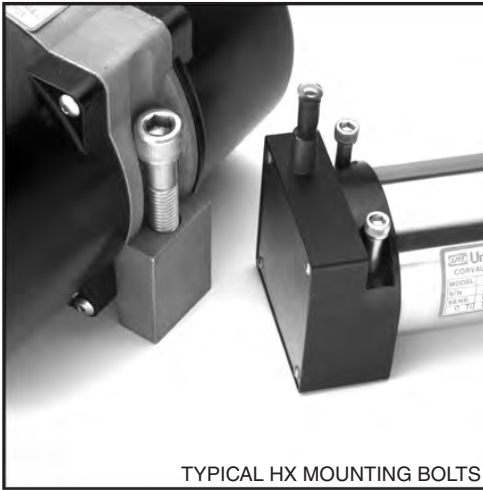
OPTION	OUTPUT DESCRIPTION	OUTPUT STAGE	WAVEFORM	CONNECTOR WIRING																
10	5 VDC Current Sinking 5 VDC TTL compatible open collector current sinking output.			<table><tr><td>A</td><td>+Vin</td></tr><tr><td>B</td><td>COMMON</td></tr><tr><td>C</td><td>CHANNEL A</td></tr><tr><td>D</td><td>CHANNEL B</td></tr><tr><td>E</td><td>CHANNEL Z</td></tr><tr><td>F</td><td></td></tr></table>	A	+Vin	B	COMMON	C	CHANNEL A	D	CHANNEL B	E	CHANNEL Z	F					
A	+Vin																			
B	COMMON																			
C	CHANNEL A																			
D	CHANNEL B																			
E	CHANNEL Z																			
F																				
11	Two channels with optional index channel available. 11 is same as Option 10 but adds the index (Z) channel.																			
50	8 to 28 VDC Current Sinking Current sinking output with 10KΩ internal pullup resistors 8 to 28 VDC input voltage. 51 is same as Option 50 but adds the index (Z) channel.		Z information applies to Options 11 and 51 only.	Z information applies to 11 and 51 options only.																
51																				
30	5 VDC Push-Pull Differential Line Drive Push-Pull, current sourcing and current sinking output. 5 VDC input voltage. Output is compliant with requirements of TIA/EIA-422-B. 31 is same as Option 30 but adds the index (Z) channel			<table><tr><td>A</td><td>+Vin</td></tr><tr><td>B</td><td>COMMON</td></tr><tr><td>C</td><td>CHANNEL A</td></tr><tr><td>D</td><td>CHANNEL A-bar</td></tr><tr><td>E</td><td>CHANNEL B</td></tr><tr><td>F</td><td>CHANNEL B-bar</td></tr><tr><td>G</td><td>CHANNEL Z</td></tr><tr><td>H</td><td>CHANNEL Z-bar</td></tr></table>	A	+Vin	B	COMMON	C	CHANNEL A	D	CHANNEL A-bar	E	CHANNEL B	F	CHANNEL B-bar	G	CHANNEL Z	H	CHANNEL Z-bar
A	+Vin																			
B	COMMON																			
C	CHANNEL A																			
D	CHANNEL A-bar																			
E	CHANNEL B																			
F	CHANNEL B-bar																			
G	CHANNEL Z																			
H	CHANNEL Z-bar																			
31																				
70	8 to 28 VDC Push-Pull Differential Line Drive Push-Pull, current sourcing and current sinking output. 8 to 28 VDC input voltage. 71 is same as Option 70 but adds the index (Z) channel.			Z & Z information applies to 31 and 71 options only.																
71																				

HX SERIES

SUPPLEMENTAL DATA



MECHANICAL SPECIFICATIONS



TYPICAL HX MOUNTING BOLTS

AVAILABLE MEASUREMENT RANGES See Table 12

CONSTRUCTION

Ranges 80" (2 m) and under	Anodized Aluminum Mounting Base
	Stainless Steel & Anodized Aluminum Housing
Ranges 100" (2.5 m) and greater	Stainless Steel Mounting Base
	High Impact, Corrosion Resistant
	Thermoplastic Housings
Wire Rope Tension.....	See Table 12
Wire Rope Diameter	See Table 12
Weight	See Table 12
Connector	MS3102A-14S-6P
Mating Connector	MS3106E-14S-6S
Optional NEMA 6 Capability	Bulkhead fitting with shielded twisted pair cable

Life⁽¹⁾

Ranges 2" to 6"	5,000,000 full stroke cycles
Ranges 10" to 25"	500,000 full stroke cycles
Ranges 30" to 400"	250,000 full stroke cycles
Ranges 500" to 2000"	200x10 ⁶ lineal inches

NOTES:

1. With 1K ohm potentiometer, wire rope misalignment 2° maximum at full stroke, relatively dust free environment, nylon jacketed wire rope on units with ranges 80" and less.

TABLE 12

MEASUREMENT RANGE DESIGNATOR	STANDARD MEASUREMENT RANGES		APPLICABLE SERIES			WIRE ROPE TENSION (NOMINAL)		WIRE ROPE DIAMETER		TRANSDUCER WEIGHT		Product Photo
	(in)	(mm)	HX-PA HX-PB HX-P420 HX-P510	HX-EP	HX-V HX-VP	(oz)	(N)	(in)	(mm)	(lb)	(Kg)	
2	2	50	✓	-	✓	34	9.4	.016	0.4	2	0.9	
3	3	75	✓	-	✓	24	6.7	.016	0.4	2	0.9	
4	4	100	✓	-	✓	24	6.7	.016	0.4	2	0.9	
5	5	125	✓	-	✓	19	5.3	.016	0.4	2	0.9	
6	6	150	✓	-	✓	24	6.7	.016	0.4	2	0.9	
10	10	250	✓	✓	✓	34	9.4	.016	0.4	2	0.9	
15	15	390	✓	-	✓	24	6.7	.016	0.4	2	0.9	
20	20	500	✓	-	✓	24	6.7	.016	0.4	2	0.9	
25	25	640	✓	✓	✓	19	5.3	.016	0.4	2	0.9	
30	30	750	✓	-	✓	24	6.7	.016	0.4	2	0.9	
40	40	1000	✓	-	✓	24	6.7	.016	0.4	2	0.9	
50	50	1250	✓	✓	✓	19	5.3	.016	0.4	2	0.9	
60	60	1500	✓	✓	✓	24	6.7	.016	0.4	2	0.9	
80	80	2.0m	✓	✓	✓	21	5.8	.016	0.4	2	0.9	
100	100	2.5m	✓	✓	✓	36	10.0	.024	0.6	6.8	3.1	
120	120	3.0m	✓	✓	✓	36	10.0	.024	0.6	6.8	3.1	
150	150	3.8m	✓	✓	✓	36	10.0	.024	0.6	6.8	3.1	
200	200	5.0m	✓	✓	✓	36	10.0	.024	0.6	6.8	3.1	
250	250	6.3m	✓	✓	✓	36	10.0	.024	0.6	6.8	3.1	
300	300	7.5m	✓	✓	✓	36	10.0	.024	0.6	6.8	3.1	
350	350	8.8m	✓	✓	✓	36	10.0	.024	0.6	6.8	3.1	
400	400	10.0m	✓	✓	✓	36	10.0	.024	0.6	6.8	3.1	
500	500	12.5m	✓	✓	✓	36	10.0	.024	0.6	8.6	3.9	
600	600	15.2m	✓	✓	✓	36	10.0	.024	0.6	8.6	3.9	
800	800	20.3m	✓	✓	✓	36	10.0	.024	0.6	8.6	3.9	
1000	1000	25.4m	✓	✓	-	36	10.0	.024	0.6	12.0	5.4	
1200	1200	30.4m	✓	✓	-	36	10.0	.024	0.6	12.3	5.6	
1600	1600	40.6m	✓	✓	-	36	10.0	.024	0.6	14.1	6.4	
1800	1800	45.7m	✓	✓	-	36	10.0	.021	0.6	15.9	7.2	
2000	2000	50.8m	✓	✓	-	36	10.0	.021	0.5	16.3	7.4	

Specifications subject to change without notice

HX SERIES

SUPPLEMENTAL DATA



DIMENSIONAL INFORMATION

HX SERIES | RANGES 80" (2 m) OR LESS

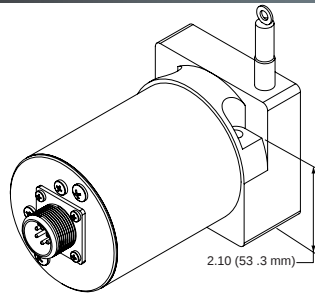


FIG. 1

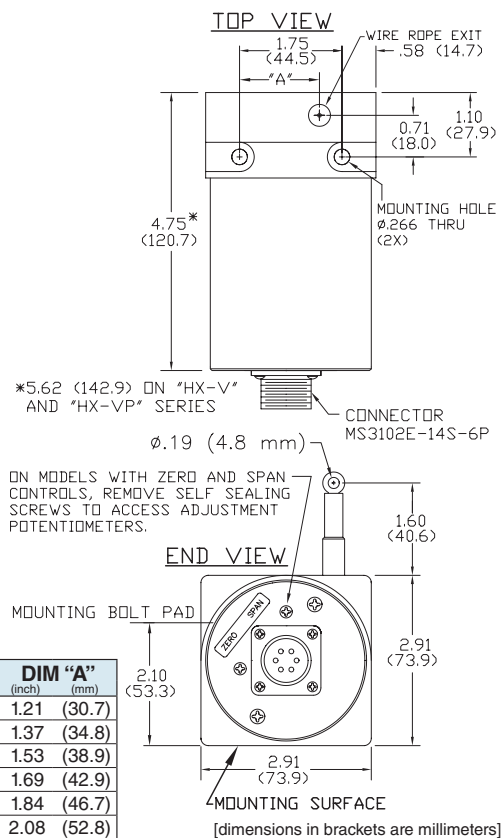


TABLE 13

RANGE	DIM "A"
(inch)	(mm)
2", 10"	1.21 (30.7)
3", 15", 30"	1.37 (34.8)
4", 20", 40"	1.53 (38.9)
5", 25", 50"	1.69 (42.9)
60"	1.84 (46.7)
80"	2.08 (52.8)

NOTES:

1. Transducer mounts with Ø.25 or M6 socket head cap bolts.

TABLE 14

RANGE	DIM "A"	DIM "B"
	(inch) (mm)	(inch) (mm)
Ranges to 800"	7.70 (196)	3.80 (97)
1000" to 2000"	11.0 (280)	5.60 (142)

NOTES:

- Transducer mounts with Ø.50 or M12 socket head cap bolts.
- Dimension "C" is the cable offset that occurs as the cable is extended from the transducer. For "C" in inches, $C = .0016 \times E$ where E = extension in inches. For "C" in millimeters, $C = .0016 \times E$ where E = extension in mm.

HX SERIES | RANGES GREATER THAN 80" (2 m)

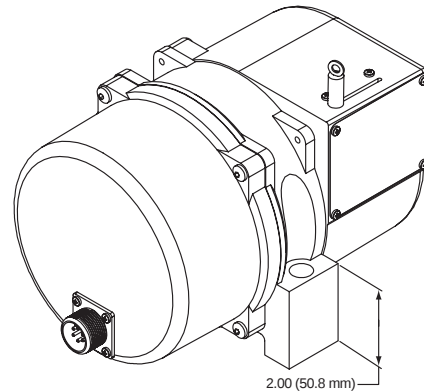
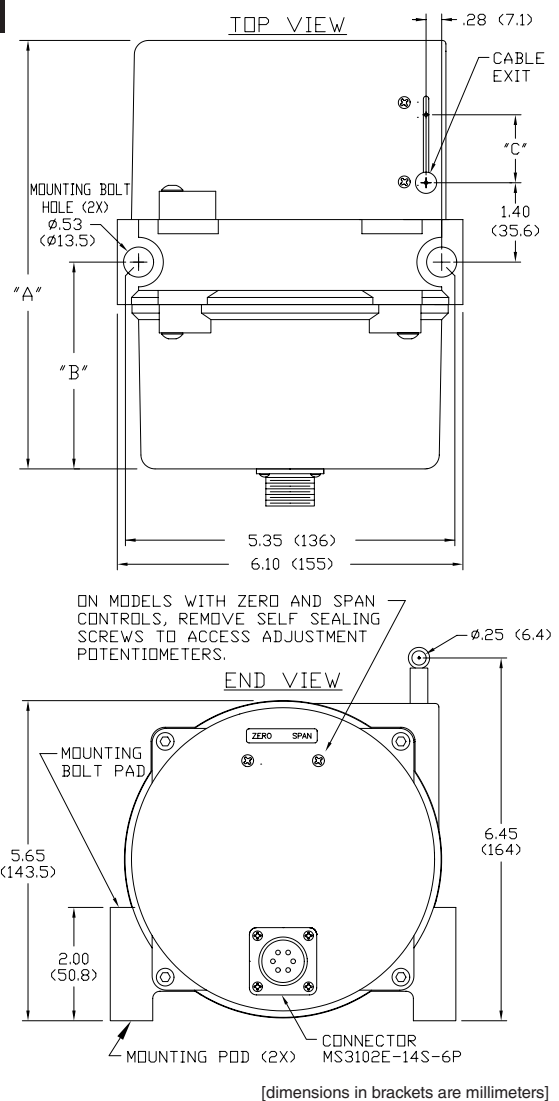


FIG. 2



We are here for you. Addresses and Contacts.

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