Data Sheet - Series 160, 161 and 162 Miniature Position Transducers

Analog-Output Miniature Position Transducers

Key Features

1. Up to 42.5-Inch (1080-mm) Maximum Travel (Series 162)
2. Analog Signal Using Precision Conductive Plastic/Hybrid Potentiometers (Representative View)
3. AccuTrak™ Threaded Drum for Enhanced Repeatability
4. Bearing-Mounted Rotating Components
5. Optional Flexible Mounting Bases
6. DirectConnect™ Sensor-To-Drum Technology = Zero Backlash, No Torsion Springs or Clutches

Transducer Specifications

	1-turn	*3-turn*	*5-turn*
Potentiometer Type	1-turn, precision, conductive plastic	3-turn, precision, hybrid	5-turn, precision, hybrid
Standard Resistance:	5K ohms, ±20%	5K ohms, ± 3%	5K ohms, ± 3%
Travel: Electrical, Mechanical	340°, 360°	1080°, 1080° +10° -0°	1800°, 1800° +10° -0°
Output Signal	analog signal from about 4% to 96% of supply voltage (voltage divider circuit)		
Power De-rating	1.0 W at 158° F (70° C)	2.0 W at 158° F (70° C)	2.0 W at 158° F (70° C)
Linearity Error Best Straight Fit Line	±1.0% max	±0.25% max	±0.25% max
Insulation Resistance Min.	100 MOhms 1000 VDC	1000 MOhms at 500 VDC	1000 MOhms at 500 VDC
Dielectric Strength	1000 VDC min	1000 Vrms	1000 Vrms
Resolution	infinite signal	infinite signal	infinite signal
Operating Temperature	-40° to 212° F (-40° to 100° C)	-40° to 257° F (-40° to 125° C)	-40° to 257° F (-40° to 125° C)
Electrical Connection	3-terminal (1, 2, 3)	3-terminal (CW,CCW,S)	3-terminal (CW,CCW,S)
Shock	50 g for 11 ms	50 g 6 ms sawtooth (.01 ms discontinuity max)	50 g 6 ms sawtooth (.01 ms discontinuity max)
Vibration	10 to 2000 Hz at 15 g	10 to 2000 Hz, 15 g	0 to 2000 Hz, 15 g

Other Specifications

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Case/Drum Materials	precision-machined anodized aluminum
Displacement Cable	0.018-inch (0.46-mm) dia., 7-by-7 stranded stainless steel, 40-lb (177-N) min breaking strength
Displacement Cable End Effector Hardware Provided	1 each of 300196 loop sleeve, 300292 copper sleeve, 300688 ball-end plug, 300495 pull ring, 805-5 snap swivel, size 5; all items provided uncrimped
Electrical Connections	three solder terminals; electrical cable and connector options available
Nominal Mass	Series 160: 4 oz, 113 g; Series 161: 6.1 oz, 170 g; Series 162: 9 oz, 255 g
Environmental Protection	With optional sensor cover NEMA 4/ IP 55

Model Numbers and Ordering Codes

The sensor's displacement measurement range is dependent on the size of the AccuTrack™ threaded drum and the number of turns of the internal potentiometer. The sensor comes in three sizes, the 160-, the 161- and the 162-series. Outline dimensional details on the envelope of each can be found at the bottom of the data sheet.

Each measurement range has spring options available. In the ideal application, the measurement cable is never allowed to go slack nor is it so heavy as to infringes on the system being measured. If you need assistance determining the tension that best suits your application, please call 1-866-912-6232 and ask for Firstmark application support.

Model	Range		Nominal Displacement Cable Tension Range (Full Retraction to Full Extraction)							
	inches	mm	Opt 5: -050 spring		Opt 6: -060 spring		Opt 7: -070 spring		Opt 8: -080 spring	
			oz.	N	oz.	N	oz.	N	oz.	N
160-0161	2.00	51	9 to 15	3 to 4	16 to 25	4 to 7	30 to 37	8 to 10	50 to 90	14 to 25
160-0241	3.00	76	**7 to 12**	**2 to 3**	10 to 18	3 to 5	17 to 30	5 to 8	40 to 55	11 to 15
160-0321	4.00	102	**4 to 8**	**1 to 2**	5 to 12	1 to 4	12 to 20	3 to 6	28 to 55	7 to 16
160-0403	5.00	125	**12 to 25**	**3 to 7**	14 to 30	4 to 8	20 to 50	6 to 14	30 to 65	8 to 16
160-0483	6.00	152	**10 to 21**	**3 to 6**	12 to 30	3 to 8	30 to 72	8 to 20	75 to 160	21 to 45
160-0643	8.00	203	7 to 17	2 to 5	**9 to 24**	**3 to 7**	22 to 38	6 to 11	40 to 120	11 to 33
160-0803	10.00	254	6 to 13	2 to 4	**8 to 19**	**2 to 5**	16 to 32	4 to 9	35 to 100	10 to 28
160-0963	12.00	305	5 to 11	1 to 3	**7 to 19**	**2 to 5**	14 to 27	4 to 8	24 to 82	7 to 23
160-1085	13.50	343	**7 to 20**	**2 to 6**	12 to 28	3 to 8	18 to 53	5 to 15	30 to 134	8 to 37
160-1285	16.00	406	6 to 17	2 to 5	**8 to 24**	**2 to 7**	19 to 40	5 to 11	17 to 102	5 to 28
160-1505	18.75	476	5 to 14	1 to 4	**8 to 22**	**2 to 6**	15 to 39	4 to 11	24 to 90	6 to 26

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160-1705	21.25	540	5 to 12	1 to 3	**7 to 19**	**2 to 5**	12 to 33	3 to 9	14 to 79	4 to 22
161-0461	5.75	146	-	-	**4 to 15**	**1 to 4**	13 to 32	4 to 9	35 to 50	10 to 14
161-1283	16.00	406	-	-	**6 to 12**	**2 to 3**	10 to 25	3 to 7	14 to 70	4 to 19
161-1915	23.88	606	-	-	**5 to 17**	**1 to 5**	13 to 30	4 to 8	16 to 80	4 to 22
161-2145	26.75	679	-	-	7 to 14	2 to 4	**10 to 25**	**3 to 7**	11 to 60	3 to 17
161-2405	30.00	762	-	-	5 to 12	1 to 3	**8 to 23**	**2 to 6**	9 to 60	3 to 17
162-2735	34.13	867	-	-	-	-	**8 to 21**	**2 to 6**	10 to 55	3 to 15
162-2945	36.75	933	-	-	-	-	**7 to 20**	**2 to 6**	15 to 44	4 to 12
162-3205	40.00	1016	-	-	-	-	**7 to 18**	**3 to 5**	10 to 43	3 to 12
162-3405	42.50	1080	-	-	-	-	**7 to 17**	**2 to 5**	8 to 41	2 to 11

Bolded entries are standard cable tension.

Shaded characteristics shown above (output signal, nonlinearity and cable tension) are verified during production and test. All others are for REFERENCE and information only.

Displacement Cable Maximum Acceleration by Model Number

Model	Max Cable Acceleration (g's)			
	Opt 5: -050 spring	Opt 6: -060 spring	Opt 7: -070 spring	Opt 8: -080 spring
160-0161	10	19	35	46
160-0241	14	22	123	82
160-0321	8	10	23	69
160-0483	38	54	173	357
160-0643	43	55	147	427
160-0803	38	64	121	242
160-0963	30	42	103	182
160-1085	55	65	109	165
160-1285	42	47	99	105
160-1505	16	49	98	127
160-1705	30	40	75	70
161-0461	5	8	16	23
161-1283	-	38	76	126

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161-1915	-	72	133	205
161-2145	-	70	130	201
161-2405	-	56	72	95
162-2735	-	-	60	84
162-2945	-	-	48	73
162-3205	-	-	37	63
162-3405	-	-	31	45

Having selected the envelope and measurement range, the potentiometer type, one, three or five turn, of a specific position sensor part number is designated by the 8th slot of the part number counting left to right. Example: 160-032**1**-C5SS contains a 1-turn potentiometer while 161-240**5**-D7NU contains a 5-turn potentiometer.

Remaining Product Configuration Codes
16_-_ _ _ _-**abcd** (example: 160-0321-C5SB (**a**: C (cable guide exit); **b**: 5 (cable tension: -050); **c**: S (sensor cover), and **d**: B (base: big foot)

Series 160	**a**	S	cable exit: slot (_60)
		C	cable exit: cable guide
		D	cable exit: idler (_60); pn 160022
		R	cable exit: RoundAbout™; pn 301224
	b	5	cable tension: -050
		6	cable tension: -060
		7	cable tension: -070
		8	cable tension: -080
	c	N	no sensor cover (_60)
		S	sensor cover (_60); pn 160060
	d	D	base: mounting disk (_6_); pn 160040-1 (cannot be ordered with a = R (cannot be used with RoundAboutTM cable exit))
		S	base: standard (_60); pn 160015-1
		U	base: universal (_60); pn 160030-1
		B	base: big foot (_60/_61); pn 160015-1_
		H	base: h (_60); pn 160015-G1
		P	base: universal (miniature) (_60); pn 300460

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Series 161	a	S	cable exit: slot (_61)
		C	cable exit: cable guide
		D	cable exit: idler (_61/_62); pn 161022
		R	cable exit: RoundAbout™; pn 301224
	b	5	cable tension: -050
		6	cable tension: -060
		7	cable tension: -070
		8	cable tension: -080
	c	N	no sensor cover (_61)
		S	sensor cover (_61); pn 160060
	d	D	base: mounting disk (_6_); pn 160040-1 (cannot be ordered with a = R (cannot be used with RoundAboutTM cable exit))
		S	base: standard (_61); pn 160015-3
		U	base: universal (_61); pn 160030-3
		B	base: big foot (_60/_61); pn 160015-1_

Series 162	a	S	cable exit: slot (_62)
		C	cable exit: cable guide
		D	cable exit: idler (_61/_62); pn 161022
		R	cable exit: RoundAbout™; pn 301224
	b	5	cable tension: -050
		6	cable tension: -060
		7	cable tension: -070
		8	cable tension: -080
	c	N	no sensor cover (_62)
		S	sensor cover (_62); pn 160060
	d	D	base: mounting disk (_6_); pn 160040-1 (cannot be ordered with a = R (cannot be used with RoundAboutTM cable exit))
		S	base: standard (_62); pn 160015-_
		U	base: universal (_62); pn 160030-_
		B	base: big foot (_62); pn 160015-1_

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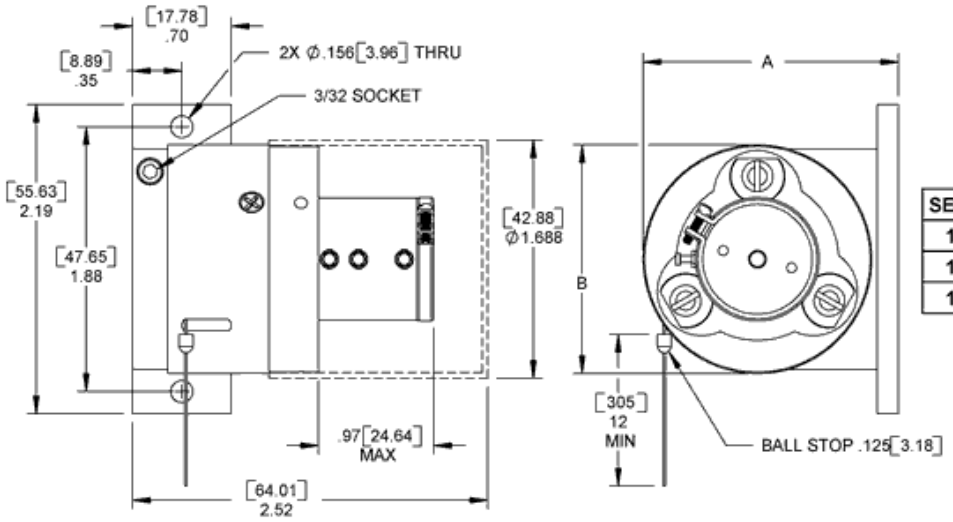
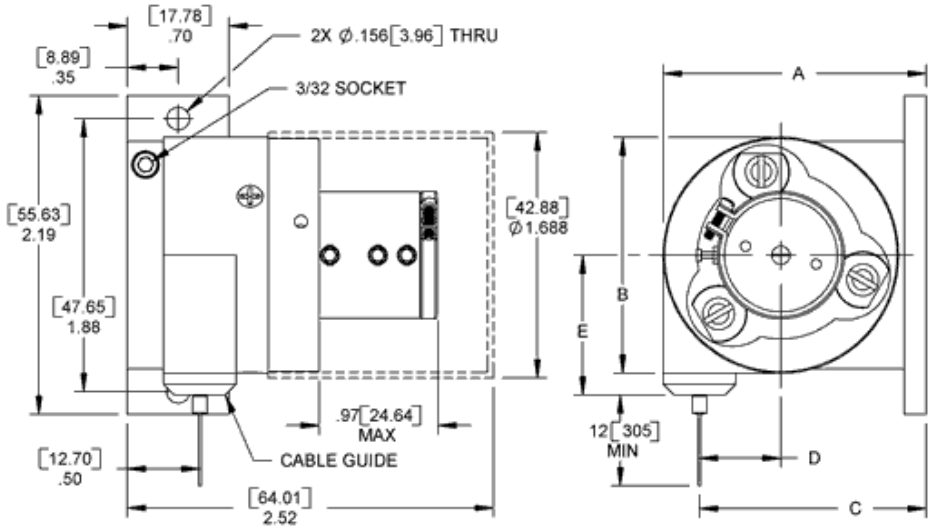
Drawing: shown with *slot cable exit*, standard base, and optional sensor cover.



SERIES	A	B
160	1.81 [46.0]	1.62 [41.1]
161	2.43 [61.7]	2.24 [56.9]
162	3.19 [81.0]	2.99 [75.9]

Drawing: shown with *cable guide cable exit*, standard base, and optional sensor cover.



SERIES	160	161	162
A	1.81 [46.0]	2.43 [61.7]	3.19 [81.0]
B	1.62 [41.1]	2.24 [56.9]	2.99 [75.9]
C	1.56 [39.6]	2.18 [55.4]	2.94 [74.7]
D	.56 [14.2]	.87 [22.1]	1.25 [31.8]
E	.96 [24.4]	1.27 [32.3]	1.65 [41.9]

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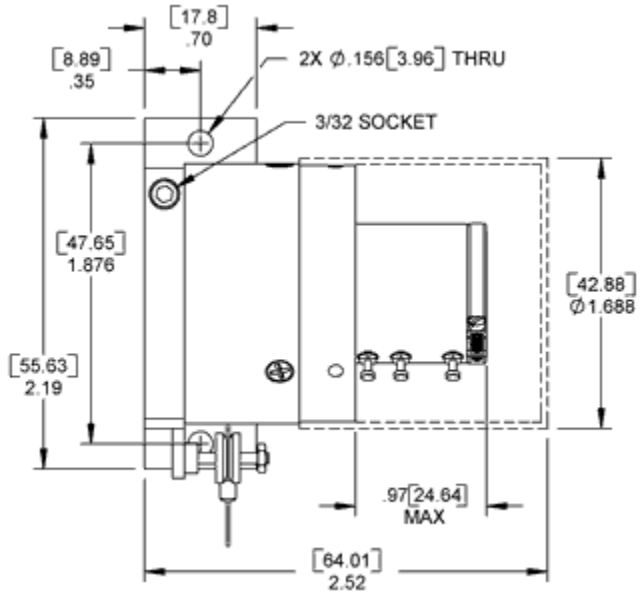
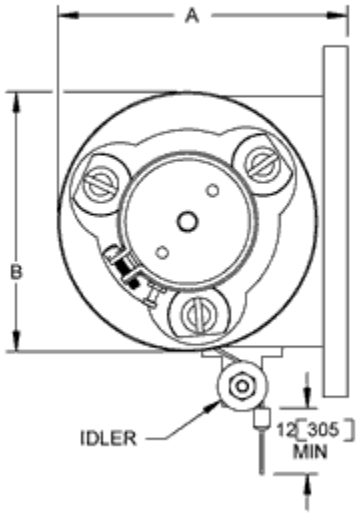
Drawing: shown with *idler cable exit*, standard base, and optional sensor cover.

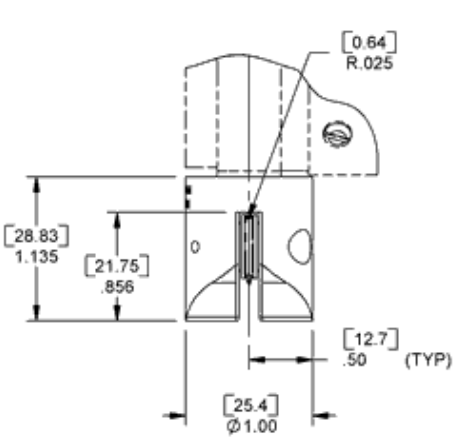
Idler cable exit will reduce displacement cable life and may reduce maximum range by up to 0.75 inch (19.1 mm). Idler not recommended for use with -080 spring.

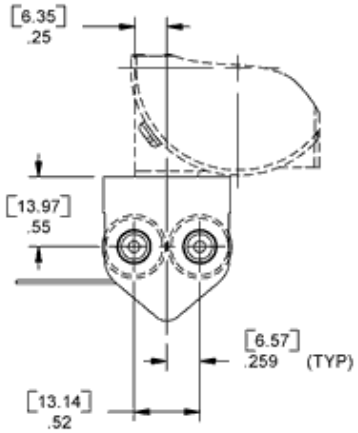


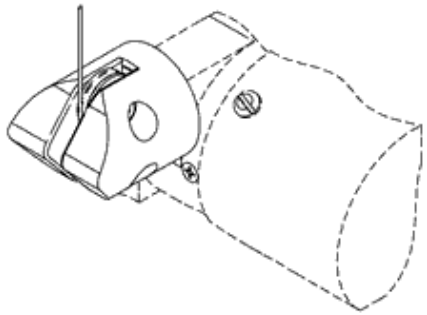


SERIES	A	B
160	1.81 [46.0]	1.62 [41.1]
161	2.43 [61.7]	2.24 [56.9]
162	3.19 [81.0]	2.99 [75.9]

Drawing: RoundAbout™ cable guide dimensional details







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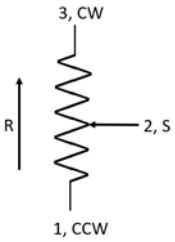
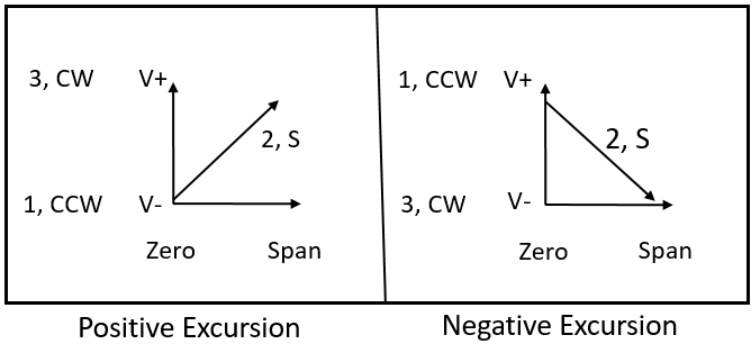
Electrical Schematic





Firstmark recommends that soldering to electrical terminals be in accordance with J-STD-001 guidelines for terminals.

For crimping of hardware to displacement cable, consider the 160001-01 installation kit.

Need something not shown? Complete a Custom Solution Request.

All dimensions are REFERENCE and are in inches [mm].

Semi-custom part numbers are designated by an extra variable, (-X) at the end of the part number. Example: 16_-_ _ _ _-abcd-X. The –X indicates a semi-custom unit. The product definition and build data are defined in the "Special Instruction" section of the Job Traveler.

General Note:

Firstmark Controls reserves the right to make changes in product specifications without notice or liability. All Information is subject to Firstmark Controls' own data and is considered to be accurate at time of printing.

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