

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 257° F (-40° to 125° 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 , 160026 brass swivel , and 301003 nickel swivel ; all items provided uncrimped | | | | | |
| Electrical Connections | three solder terminals; electrical cable and connector options available | | | | | |
| Nominal Mass | Series 160 | | Series 161 | | Series 162 | |
| | 4 oz | 113 g | 6.1 oz | 170 g | 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: 160-0321-1-C5SS contains a 1-turn potentiometer while 161-2405-5-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 RoundAbout™ 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 RoundAbout™ 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 RoundAbout™ 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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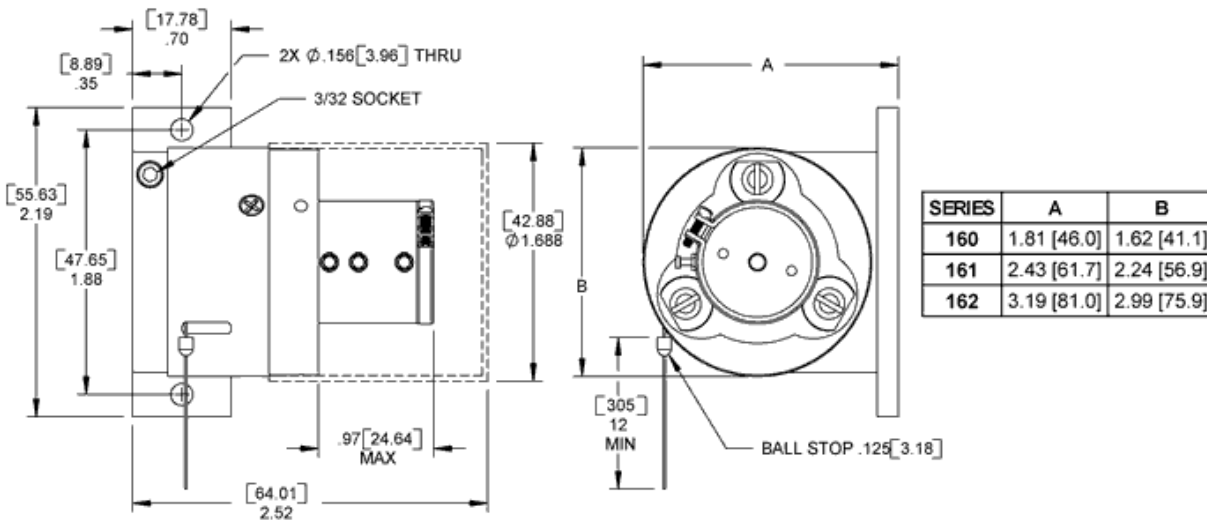
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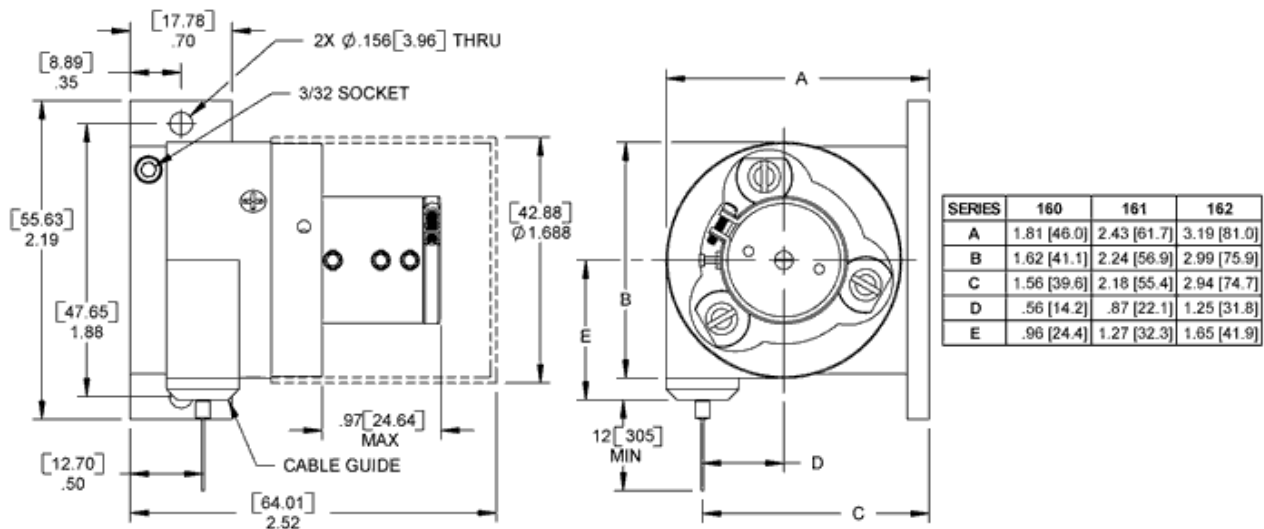
Data Sheet - Series 160, 161 and 162 Miniature Position Transducers

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



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



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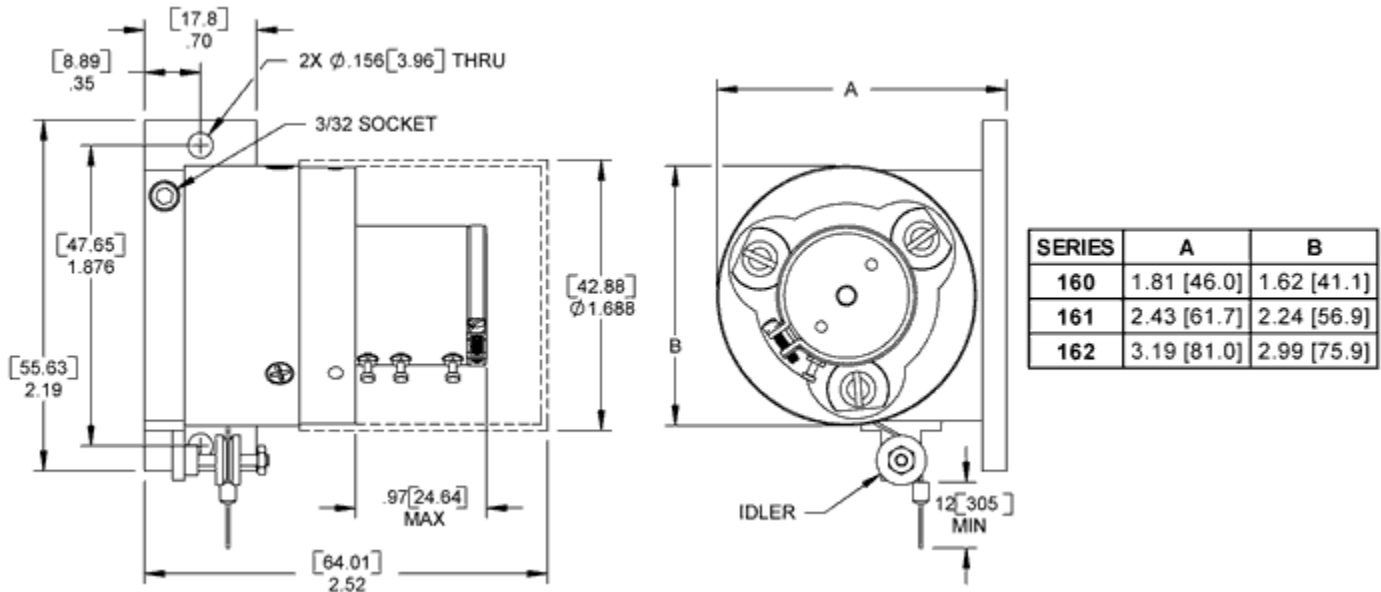
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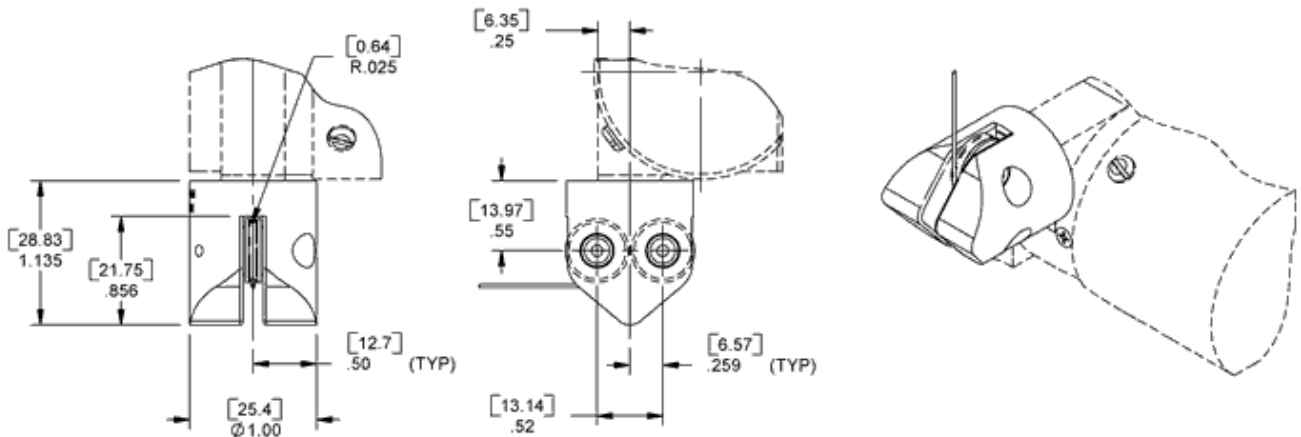
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Drawing: shown with *idler cable exit*, standard base, and optional sensor cover.

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.



Drawing: RoundAbout™ cable guide dimensional details



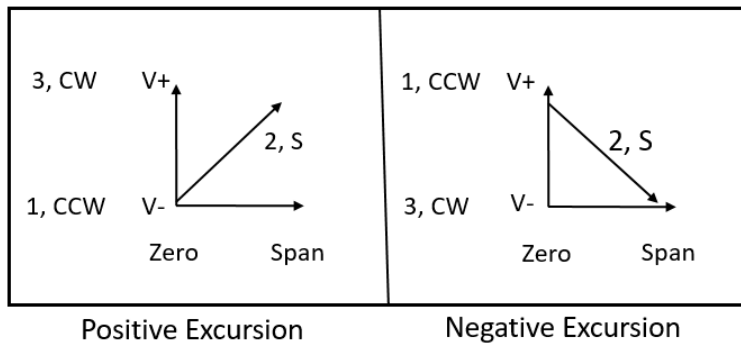
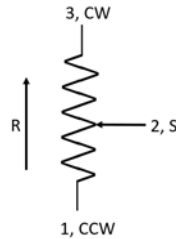
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Electrical Schematic



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.