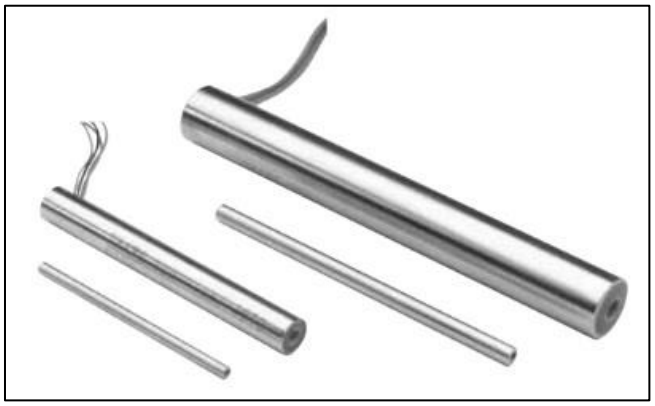
Series 100

Linear Velocity Transducers

The Series 100 Linear Velocity Transducers provide a simple yet accurate means of measuring linear velocity. They consist of high coercive force permanent magnet cores which induce sizable DC voltage while moving concentrically within shielded coils. The basic design permits operation **without external excitation** while the generated output voltage varies linearly with core (magnet) velocity. These transducers are ideal for seismology, hydraulic ram speed, drilling rate, and any other application where an instantaneous velocity measurement is required.



KEY FEATURES

Self-Generating DC Voltage Output	**Magnetically Shielded**
High Sensitivity	**High Frequency Response**

ELECTRICAL SPECIFICATIONS

	MAGNET DIMENSIONS Inches (mm)		**NOM. OUTPUT SENSITIVITY** mV/in/sec (mV/mm/sec)	**ELECTRICAL IMPEDANCE** Coils Connected in Series		**REPLACEMENT MAGNETS**	***FREQUENCY RESPONSE** Hz	
MODEL NUMBER	WORKING RANGE	USABLE RANGE	OPEN CIRCUIT	R (Ohms)	L (Henries)	MAGNET NUMBER	LOAD = 10R	LOAD = 100R
0100-0000	0.5 (12)	1.3 (33)	120 (5)	2000	0.085	M000-0000	350	1500
0100-0001	0.5 (12)	1.3 (33)	54 (2)	2000	0.085	M000-0008	350	1500
0101-0000	1.0 (25)	1.9 (48)	90 (4)	2500	0.065	M000-0001	600	1500
0101-0001	1.0 (25)	1.9 (48)	40 (2)	2500	0.065	M000-0009	600	1500
0111-0000	1.0 (25)	2.3 (58)	550 (22)	13000	1.6	M000-0002	120	600
0111-0001	1.0 (25)	2.3 (58)	250 (10)	13000	1.6	M000-0010	120	600
0112-0000	2.0 (50)	3.4 (86)	550 (22)	19000	2.9	M000-0003	100	500
0112-0001	2.0 (50)	3.4 (86)	250 (10)	19000	2.9	M000-0011	100	500
0113-0000	3.0 (75)	4.2 (107)	550 (22)	25000	3.2	M000-0004	120	500
0113-0001	3.0 (75)	4.2 (107)	250 (10)	25000	3.2	M000-0012	120	500
0114-00000	4.0 (100)	5.5 (140)	550 (22)	32000	4.0	M000-0005	120	400
0114-00001	4.0 (100)	5.5 (140)	250 (10)	32000	4.0	M000-0013	120	400
0122-00010	6.0 (150)	8.0 (203)	160 (6)	11500	1.9	M000-0014	95	450
0123-00010	9.0 (225)	11.0 (279)	160 (6)	17000	2.8	M000-0015	95	450
0124-00010	12.0 (300)	15.0 (381)	175 (7)	22000	3.7	M000-0023	95	450
0125-00010	16.5 (412)	18.5 (470)	175 (7)	29000	5.1	M000-0024	90	430
0126-00010	20.0 (500)	22.0 (559)	175 (7)	34000	6.2	M000-0025	90	430
0127-00010	24.0 (600)	26.0 (660)	175 (7)	42000	7.3	M000-0028	90	430
0128-00010	28.0 (711)	30.0 (762)	150 (6)			M000-0029		
0129-00010	36.0 (914)	38.0 (965)	170 (7)	60500	6.1	M000-0040	90	300
Operating Temperature Range: -50°F to +200°F (-46°C to +93°C)								
Max. Non-Linearity: <±2.5% of Reading, model 0129-0001 ±5% of Reading								

** Output voltage is attenuated < 1% of the constant velocity value.*
NOTE: Polarity of Output: Voltage at Red lead is positive with respect to that at Black when north pole of magnet is closest to, and traveling towards, lead end of LVT.

MECHANICAL SPECIFICATIONS

	COIL HOUSING DIMENSIONS, Inches (mm)					MAGNET DIMENSIONS, Inches (mm)			
MODEL NUMBER	C_A	L_A	$(OD)_A$	$(ID)_A$	WEIGHT W_A Grams	L_C	$(OD)_C$	THREAD	WEIGHT W_C Grams
0100-0000	1.34 (34)	3.17 (81)	0.374 (9.5)	0.13 (3.3)	20	2.38 (60)	0.125 (3.2)	1-72 NF	3.5
0100-0001	1.34 (34)	3.17 (81)	0.374 (9.5)	0.13 (3.3)	20	1.63 (41)	0.125 (3.2)	1-72 NF	2.5
0101-0000	1.88 (48)	4.24 (108)	0.374 (9.5)	0.13 (3.3)	25	3.00 (76)	0.125 (3.2)	1-72 NF	4.5
0101-0001	1.88 (48)	4.24 (108)	0.374 (9.5)	0.13 (3.3)	25	2.25 (57)	0.125 (3.2)	1-72 NF	3.8
0111-0000	2.25 (57)	5.06 (129)	0.624 (15.9)	0.19 (4.8)	110	3.50 (89)	0.187 (4.8)	4-40 NC	11
0111-0001	2.25 (57)	5.06 (129)	0.624 (15.9)	0.19 (4.8)	110	2.75 (70)	0.187 (4.8)	4-40 NC	10
0112-0000	3.25 (83)	7.06 (179)	0.624 (15.9)	0.19 (4.8)	150	4.50 (114)	0.187 (4.8)	4-40 NC	15
0112-0001	3.25 (83)	7.06 (179)	0.624 (15.9)	0.19 (4.8)	150	3.75 (95)	0.187 (4.8)	4-40 NC	14
0113-0000	4.25 (108)	9.06 (230)	0.624 (15.9)	0.19 (4.8)	200	5.25 (133)	0.187 (4.8)	4-40 NC	17
0113-0001	4.25 (108)	9.06 (230)	0.624 (15.9)	0.19 (4.8)	200	4.50 (114)	0.187 (4.8)	4-40 NC	16
0114-00000	5.38 (137)	11.31 (287)	0.624 (15.9)	0.19 (4.8)	240	6.75 (171)	0.187 (4.8)	4-40 NC	22
0114-00001	5.38 (137)	11.31 (287)	0.624 (15.9)	0.19 (4.8)	240	6.00 (152)	0.187 (4.8)	4-40 NC	21
0122-00010	7.63 (194)	15.81 (402)	0.749 (19)	0.30 (7.6)	420	8.50 (216)	0.23 (5.8)	4-40 NC	51
0123-00010	11.1 (282)	22.81 (579)	0.749 (19)	0.30 (7.6)	610	11.00 (279)	0.23 (5.8)	4-40 NC	66
0124-00010	14.1 (358)	29.00 (737)	0.749 (19)	0.30 (7.6)	810	14.25 (362)	0.23 (5.8)	4-40 NC	88
0125-00010	18.6 (472)	38.00 (965)	0.749 (19)	0.30 (7.6)	1120	18.75 (476)	0.23 (5.8)	4-40 NC	121
0126-00010	22.1 (561)	45.00 (1143)	0.749 (19)	0.30 (7.6)	1360	22.25 (565)	0.23 (5.8)	4-40 NC	147
0127-00010	26.1 (663)	53.00 (1346)	0.749 (19)	0.30 (7.6)	1520	26.25 (667)	0.23 (5.8)	4-40 NC	156
0128-00010	30.12 (765)	61.00 (1549)	0.749 (19)	0.30 (7.6)		30.25 (768)	0.23 (5.8)	4-40 NC	177
0129-00010	37.9 (963)	77.00 (1956)	0.75 (19)	0.29 (7.4)	2200	38.25 (972)	0.23 (5.8)	4-40 NC	230

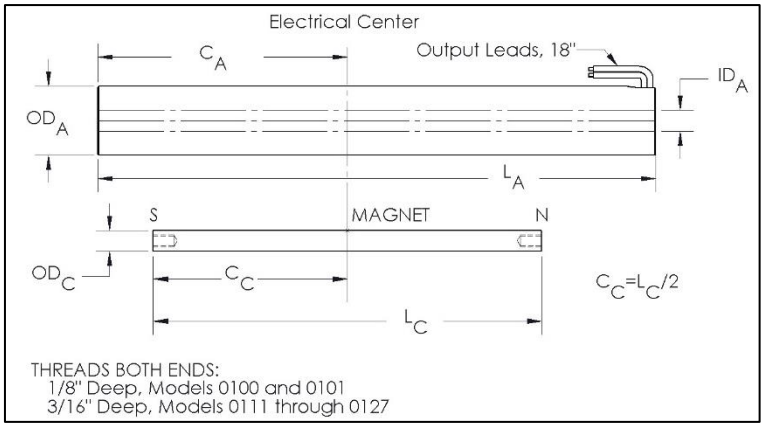
PERFORMANCE SPECIFICATIONS

Unlike LVDTs, these transducers do not produce a voltage output unless the magnet is moving. This makes it impossible to electrically identify the correct location of the magnet for linear operation. Users must mechanically position the magnet in the LVT at a known reference point.

As shown in the Dimensional Drawing, the location of the electrical center of the coils is known, and can be used as a reference point. The midpoint of the linear stroke is found by aligning the center of the magnet, C_C, with the electrical center, C_A, of the coils. Once in position, the magnet can be moved ½ the linear range in either direction.

The transducer housing can be secured with a split block or clamping arrangement. The use of set screws should be avoided, as this may cause internal damage if overtightened.

DIMENSIONAL DIAGRAM

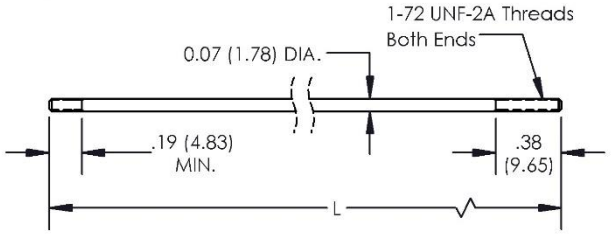


CORE EXTENSION RODS (Sold Separately)

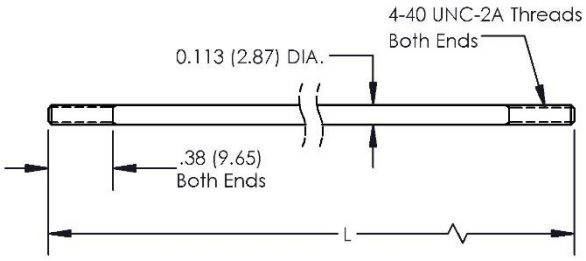
The recommended core extension rods are made of nonmagnetic stainless steel and are sized to allow the transducers to operate over their full range. Extension rods from models with longer strokes may be used to facilitate installation. Using extension rods shorter than recommended may reduce the LVDTs usable measurement range.

CORE EXTENSION ROD	LENGTH, L Inches (mm)	RECOMMENDED FOR USE WITH TRANSDUCER MODEL
0.070 inch (1.78 mm) Diameter Rod with 1-72 UNF-2A Thread Both Ends		
C006-0057	3.255 (82.68)	0100-0000/ -0001 0101-0000/ -0001
0.113 inch (2.87 mm) Diameter Rod with 4-40 UNC-2A Thread Both Ends		
C006-0233	3.50 (88.9)	0111-0000/ -0001
C006-0234	4.50 (114.3)	0112-0000/ -0001
C006-0235	5.50 (139.7)	0113-0000/ -0001
C006-0236	6.50 (165.1)	0114-00000/ -00001
0.187 inch (4.75 mm) Diameter Rod with 4-40 UNC-2A Thread One End, 10-32 UNF-2A Thread Other End		
C006-0072	8.50 (215.9)	0122-00010
C006-0073	13.00 (330.2)	0123-00010
C006-0074	16.00 (406.4)	0124-00010
C006-0075	20.50 (520.7)	0125-00010
C006-0076	24.00 (609.6)	0126-00010
C006-0121	28.00 (711.2)	0127-00010
C006-0187	40.00 (1016)	0129-00010

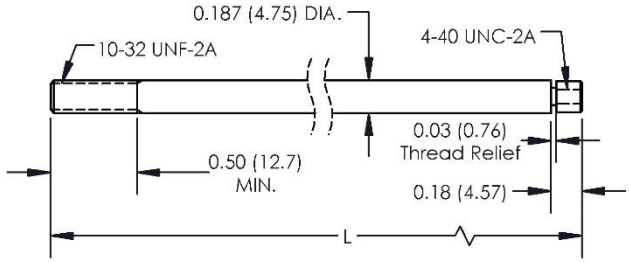
Models 0100 and 0101



Models 0111 through 0114



Models 0122 through 0129



All Dimensions in Inches (mm)

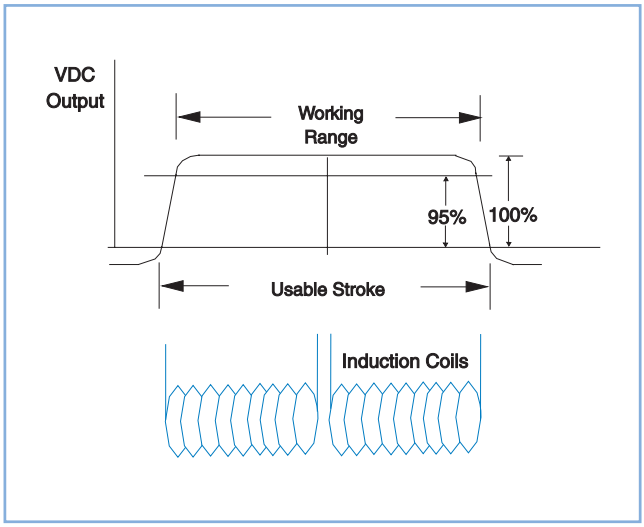
Linear Velocity Transducers (LVTs)

Inductive Technology

Trans-Tek manufactures and designs Linear Velocity Transducers using inductive technology. Moving a magnet through a coil of wire will induce a voltage in the coil according to Faraday's and Lenz's Laws. This voltage is proportional to the magnet's velocity and field strength. Trans-Tek LVTs use this principle of magnetic induction, with a permanent magnet and a fixed geometry coil, so the output voltage of the coil is directly proportional to the magnet's relative velocity over its working range.

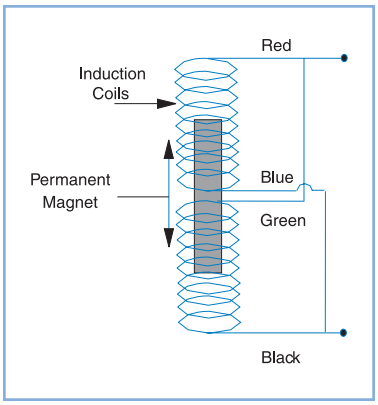
During operation in the working range of the transducer, both ends of the magnet are inside the coil. With a single coil this would give zero output because the voltage generated by one pole of the magnet would cancel the voltage generated by the other pole. To avoid this, the coil is divided into two sections, so the N (North) pole of the magnet will induce a voltage in one coil and the S (South) pole will induce a voltage in the other coil. These two coils are then connected in series-aiding, to obtain a DC voltage output proportional to the magnet's velocity.

OUTPUT CURVE



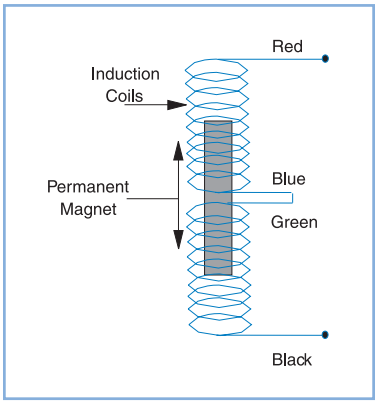
COILS IN PARALLEL

Parallel operation is achieved by tying the black and blue leads together, and the green and red leads together. The two connections create the terminals for the output. This configuration cuts the sensitivity in half, and reduces the source impedance by a factor of 4. The benefits of this arrangement are: lower output (for use in high speed applications); lower output impedance (for compatibility with electronics with a low input impedance); and higher frequency response (for a given load impedance).



COILS IN SERIES

For series operation, the blue and green leads are tied together and the output is taken from the black and red leads. With the coils wired in series, the output is summed, producing the maximum sensitivity. Besides a high sensitivity, the transducer exhibits excellent noise immunity, attributed to the coils being wound in series opposition. Noise generated on one coil will be equal in magnitude but opposite in polarity to the other coil.



MAGNETS

The LVT's performance is directly associated with the condition of the magnet, or magnet assembly. In order to maintain optimum performance it is necessary to preserve the integrity of the magnet used with the transducer.

Trans-Tek uses two different magnetic materials in the LVT's:

ALNICO and CUNIFE

ALNICO is made from sintered metal, and is characterized by its high sensitivity, brittleness, plated surface, and threaded brass endcaps.

CUNIFE is machined from bar stock, and is characterized by its lower sensitivity compared to ALNICO, ruggedness, visible draw marks, and internal threads on each end of the magnet.

Subjecting the material to a very strong electromagnetic field of predetermined polarity aligns the molecule's charges. The strength of the magnetic field is a function of the strength of each molecule's charge, the number of molecules aligned and the path that the field takes. Proper care of the magnet is primarily a matter of guarding against changes in molecular alignment and magnetic field.

HELPFUL HINTS

Changing the internal field path of the magnet

Inducing internal stresses by bending or gripping the magnet with pliers, or altering the magnetic path by scratching the magnet, will change the internal field path.

Operating in very strong electromagnetic fields

If a strong electromagnetic field is introduced that interrupts the magnet's field, it may disrupt the alignment of the molecules - resulting in a loss of magnetization. The duration and strength of exposure to the secondary electromagnetic field will determine how much magnetic field strength is lost.

Approaching or exceeding the Curie Temperature

The Curie Temperature of a magnet is the point at which the molecules return to their natural random polarization. For ALNICO magnets it is 540°C; for CUNIFE magnets it is 840°C. The recommended operating ranges for these magnets are 300°C and 540°C, respectively. If operating between the recommended operating range and the Curie Temperature, there will be some permanent loss of magnetic field strength which will equate to loss of sensitivity. Operation at or above the Curie Temperature will result in permanent loss of all magnetic field strength.

Contacting another strong magnet

This has the same effect as subjecting the magnet to a very strong opposing magnetic field.

Subjecting the magnet to a physical shock

A shock force of substantial magnitude will disrupt the alignment of the molecules. The amount and permanency of the loss depend on factors such as the magnitude and direction of shock force as well as duration.

Crack(s) in the magnet

Cracks in a magnet disrupt the continuity of the field and result in the loss of strength. ALNICO magnets are particularly susceptible to cracking if dropped.

COMMONLY ASKED QUESTIONS

How do I read the output?
Since the output of these transducers is DC voltage, the output can be read with a digital volt meter, A/D board, strip chart recorder or any other instrument capable of reading DC voltages. Since the output is generated only when there is motion, Trans-Tek recommends the use of a data recording device for applications requiring the analysis of velocity data.

How do I scale the output signal?
The output can be scaled by using a voltage divider across the leads. The resistance of the voltage divider as seen by the LVT should be kept above 10x the impedance of the transducer's coils.

Do I need an excitation voltage?
NO! These units generate a DC voltage output.

Is there a minimum velocity threshold?
No. Since this is an analog device, the resolution is dependent only on the instrumentation used to read the signal. However, speeds less than 0.01 in/sec can be difficult to read with standard commercial equipment.

Is there a maximum velocity threshold?
Yes. Maximum velocity of the transducer is limited only by the maximum permissible generated voltage of 500 VDC.

Which magnet material should I select?
ALNICO is usually selected for its high sensitivity - most beneficial in applications where velocity is going to be very slow. CUNIFE is selected for its ruggedness, and typically has one half the sensitivity of the ALNICO magnets.

Are extension rods available for these transducers?
Yes. There is a detailed list of extension rods published in the Accessories portion of the catalog. These rods can be purchased separately.