

# TE SENSOR SOLUTIONS

POSITION SENSORS PRODUCT GUIDE

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TE Connectivity (TE) is one of the largest connectivity and sensor companies in the world, with the acquisition of Measurement Specialties. Our broad portfolio of sensor technologies is designed for a wide range of applications and serves a number of industries. We collaborate with engineers to help transform their concepts into creations—redefining what’s possible using intelligent, efficient and high-performing TE products and solutions proven in harsh environments.



### INNOVATIVE SENSOR SOLUTIONS



### INTRODUCTION

TE is a leading manufacturer of linear and angular position, tilt and fluid level sensors. Both off-the-shelf and custom position sensing solutions are available featuring our inductive, magneto-resistive, Hall effect, MEMS, electrolytic and capacitive core technologies. Sophisticated designs and state-of-the-art manufacturing techniques provide reliable and cost effective solutions for a broad range of applications.

Applications range from automotive, construction equipment/vehicles, power generation, oil and gas including subsea, hydraulics, medical, HVACR, metrology, process controls and factory automation to the most severe environments in military, aerospace and nuclear operations.

TE position sensors are available in both analog and digital outputs. Our comprehensive range of signal conditioning instrumentation allows us to meet the specific needs of both OEMs and end users.

# POSITION SENSORS PRODUCT GUIDE

## INDUCTIVE LINEAR POSITION TRANSDUCERS

TE technologies for inductive linear absolute position transducers include the LVDT (Linear Variable Differential Transformer) and the LVIT (Linear Variable Inductive Transducer). These sensors feature friction-free, non-contact inductive magnetic coupling for extremely long cycle life and virtually infinite resolution. Various off the shelf and custom packaging options are available for the most demanding application requirements. Our AC operated LVDTs are compatible with our full line of signal conditioners, panel displays and mini-controllers.



	<b>HR</b>	<b>MHR</b>	<b>M12</b>	<b>E Series</b>	<b>XS-B/-BG</b>	<b>XS-D</b>
<b>Applications</b>	General	General	General	General	General	General
<b>Type</b>	AC Operated LVDT	AC Operated LVDT	AC Operated LVDT	AC Operated LVDT	AC Operated LVDT	AC Operated LVDT
<b>Description</b>	High Reliability	Miniature High Reliability	Metric High Reliability	Economy Series	Sub-Miniature	Long Stroke Series
<b>Ranges</b>	±0.05 to ±10 in	±0.005 to ±2 in	±5 to ±100 mm	±0.1 to ±2 in	±0.1 & ±0.25 in	±1 to ±10 in
<b>Input Voltage (nominal)</b>	3Vrms	3Vrms	3Vrms	3Vrms	1Vrms	3Vrms
<b>Input Frequency</b>	400Hz to 5kHz	2 to 20kHz	2 to 20kHz	50Hz to 10kHz	2.5 to 20kHz	400Hz to 3kHz
<b>Test Frequency</b>	2.5kHz	2.5kHz	2.5kHz	2.5kHz	2.5kHz	2.5kHz
<b>Output(s)</b>	AC	AC	AC	AC	AC	AC
<b>Non-Linearity</b>	±0.25% of FR	±0.25% of FR	±0.25% of FR	±0.5% of FR	±0.2% of FR	±2% of FR
<b>Operating Temperature</b>	-55°C to +150°C	-55°C to +150°C	-55°C to +150°C	-55°C to +95°C	-55°C to +150°C	-55°C to +150°C
<b>Core Threads, in</b>	6-40 UNF-2B	1-72 UNF-2B	1-72 UNF-2B	4-40 UNC-2B	N/A	6-40 UNF-2B
<b>Core Threads, metric</b>	M4x0.7-6H	M2x0.4-6H	M2x0.4-6H	M3x0.5-6H	N/A	M4x0.7-6H
<b>Diameter, in (mm)</b>	0.812 (20.62)	0.375 (9.53)	0.47 (12)	0.75 (19.05)	0.188 (4.78)	0.812 (20.62)
<b>Housing Material</b>	400 series stainless steel	400 series stainless steel	304 series stainless steel	400 series stainless steel	Kovar	410 series stainless steel
<b>Housing Length, in</b>	1.1 to 31	0.38 to 8	2.7 to 11.2	1.75 to 10.5	0.9 and 1.9	2.5 to 25
<b>Housing Length, mm</b>	28 to 788	10 to 203	69 to 285	45 to 267	23 to 49	64 to 635
<b>Features</b>	<ul style="list-style-type: none"> <li>• Large 1/16 Inch radial core-to-bore clearance</li> </ul>	<ul style="list-style-type: none"> <li>• Small size</li> <li>• Light weight</li> </ul>	<ul style="list-style-type: none"> <li>• Excellent stroke-to-length ratio</li> <li>• Constant sum of secondary VAC</li> <li>• Very low TC</li> </ul>	<ul style="list-style-type: none"> <li>• Low cost</li> </ul>	<ul style="list-style-type: none"> <li>• Low mass core</li> </ul>	<ul style="list-style-type: none"> <li>• Longest stroke to body length offered by TE</li> <li>• Long strokes</li> </ul>
<b>Certifications/ IP Rating</b>	IP61	IP61	IP61	IP61	IP61	IP61
<b>Options</b>	<ul style="list-style-type: none"> <li>• 220°C rating</li> <li>• 5KHz calibration</li> <li>• Guided core</li> <li>• Metric threaded core</li> <li>• Small dia. core</li> <li>• Mild radiation resistance</li> </ul>	<ul style="list-style-type: none"> <li>• 220°C high temp. rating</li> <li>• 5KHz calibration</li> <li>• 10KHz calibration</li> <li>• Metric threaded core</li> </ul>	<ul style="list-style-type: none"> <li>• 5KHz calibration</li> <li>• Metric threaded core</li> </ul>	<ul style="list-style-type: none"> <li>• Metric threaded core</li> </ul>	<ul style="list-style-type: none"> <li>• Threaded mount (metric)</li> </ul>	<ul style="list-style-type: none"> <li>• Metric threaded core</li> </ul>
<b>Typical applications</b>	<ul style="list-style-type: none"> <li>• General industrial</li> </ul>	<ul style="list-style-type: none"> <li>• XYZ stage feedback</li> <li>• Wire-die bonding machines</li> <li>• Cylinder position feedback</li> <li>• Voice coil testing</li> <li>• Materials testing machines</li> </ul>	<ul style="list-style-type: none"> <li>• Materials testing machines</li> <li>• Cylinder position feedback</li> <li>• Hydraulic valve spool position</li> <li>• Auto suspension testing</li> <li>• Aircraft flight control feedback</li> </ul>	<ul style="list-style-type: none"> <li>• General Industrial</li> <li>• Moderate temperature applications</li> </ul>	<ul style="list-style-type: none"> <li>• Miniature servo-mechanisms</li> <li>• Multi-point measurements on small components</li> <li>• Applications where small size is required</li> </ul>	<ul style="list-style-type: none"> <li>• Applications where sensor installation length is restricted</li> <li>• Well suited replacement for potentiometers</li> </ul>

# POSITION SENSORS PRODUCT GUIDE

## INDUCTIVE LINEAR POSITION TRANSDUCERS



	<b>XS-C</b>	<b>MP</b>	<b>HCA</b>	<b>HCA-RA</b>	<b>XS-ZTR</b>
<b>Applications</b>	High Pressure	Harsh Industrial	Hostile Environment	Hostile Environment	Extreme Environments
<b>Type</b>	AC Operated LVDT	AC Operated LVDT	AC Operated LVDT	AC Operated LVDT	AC Operated LVDT
<b>Description</b>	High Pressure Sealed	Ruggedized High Reliability	All Welded Hermetically Sealed	Hermetically Sealed, Right Angle Connector	High Temp, Cryogenic & Nuclear Radiation
<b>Ranges</b>	±0.25, ±0.5, ±1in	±0.5 to ±10 in	±0.05 to ±10 in	±0.05 to ±10 in	±0.1 to ±1 in
<b>Input Voltage (nominal)</b>	3Vrms	3Vrms	3Vrms	3Vrms	1Vrms
<b>Input Frequency</b>	400Hz to 20kHz	400Hz to 5kHz	400Hz to 5kHz	400Hz to 5kHz	400Hz to 5kHz
<b>Test Frequency</b>	2.5kHz	2.5kHz	2.5kHz	2.5kHz	2.5kHz
<b>Output(s)</b>	AC	AC	AC	AC	AC
<b>Non-Linearity</b>	±0.25% of FR	±0.25% of FR	±0.25% of FR	±0.25% of FR	±0.5% of FR
<b>Operating Temperature</b>	-55°C to +150°C	-55°C to +150°C	-55°C to +150°C	-55°C to +150°C	-195°C to +550°C
<b>Core Threads, in</b>	4-40 UNC-2B	6-40 UNF-2B	4-40 UNC-2B	4-40 UNC-2B	4-40 UNC-2B
<b>Core Threads, metric</b>	M3x0.5-6H	M4x0.7-6H	M3x0.5-6H	M3x0.5-6H	M3x0.5-6H
<b>Diameter, in (mm)</b>	0.75 (19.05)	1.25 (31.75) sq.	0.75 (19.05)	0.75 (19.05)	1 (25.4)
<b>Housing Material</b>	304 series stainless steel	Anodized Aluminum	400 series stainless steel	400 series stainless steel	304 series stainless steel
<b>Housing Length, in</b>	2.9 to 7.9	6.5 to 32	1.7 to 34 + connector	1.7 to 34	2.5 to 6.8
<b>Housing Length, mm</b>	74 to 201	166 to 913	44 to 864 + connector	44 to 864	64 to 173
<b>Features</b>	<ul style="list-style-type: none"> <li>• 3000 PSI (210 bars) operating pressure</li> <li>• Bulkhead mount</li> </ul>	<ul style="list-style-type: none"> <li>• Industrial flange mounting</li> <li>• Screw terminal wiring</li> </ul>	<ul style="list-style-type: none"> <li>• Welded PT06A hermetic connector</li> <li>• Double magnetic shielding</li> </ul>	<ul style="list-style-type: none"> <li>• Welded PT06A hermetic connector</li> <li>• Through bore body</li> <li>• Double magnetic shielding</li> </ul>	<ul style="list-style-type: none"> <li>• Withstand neutron flux levels of 3x10<sup>20</sup> NVT</li> <li>• Withstands total integrated radiation 10<sup>9</sup> gray</li> </ul>
<b>Certifications/ IP Rating</b>	IP61	IP61	IP68 to1KSI (70Bars)	IP68 to1KSI (70Bars)	—
<b>Options</b>	<ul style="list-style-type: none"> <li>• Metric threaded core</li> </ul>	<ul style="list-style-type: none"> <li>• 5kHz calibration</li> <li>• Metric threaded core</li> <li>• Small diameter, low mass core</li> </ul>	<ul style="list-style-type: none"> <li>• 5 or 10kHz calibration</li> <li>• 220°C high temp. rating</li> <li>• Metric threaded core</li> <li>• Guided core</li> <li>• Small diameter, low mass core</li> <li>• Mild radiation resistance</li> </ul>	<ul style="list-style-type: none"> <li>• 5 or 10kHz calibration</li> <li>• 220°C high temp. rating</li> <li>• Metric threaded core</li> <li>• Guided core</li> <li>• Small diameter, low mass core</li> <li>• Mild radiation resistance</li> </ul>	<ul style="list-style-type: none"> <li>• Metric threaded core</li> <li>• Custom length stainless steel cable</li> <li>• Sealed header or connector at cable end</li> </ul>
<b>Typical Applications</b>	<ul style="list-style-type: none"> <li>• Hydraulic actuators</li> <li>• Other pressurized vessels</li> </ul>	<ul style="list-style-type: none"> <li>• Rolling mills</li> <li>• Power turbines</li> <li>• Paper mill head boxes</li> </ul>	<ul style="list-style-type: none"> <li>• Applications where resistance to dirt, water, steam, and corrosive liquids and vapors is needed (verify metals compatibility)</li> <li>• Submersible with appropriate connector</li> </ul>	<ul style="list-style-type: none"> <li>• Turbine valve position</li> <li>• Vertically mounted applications</li> <li>• Submersed applications (with appropriate mating connector)</li> </ul>	<ul style="list-style-type: none"> <li>• Nuclear reactors</li> <li>• Nuclear lab testing</li> <li>• Space and rockets</li> <li>• Silicon wafer fab equipment</li> <li>• Particle accelerators</li> <li>• Cryogenic medicine</li> </ul>

## INDUCTIVE LINEAR POSITION TRANSDUCERS

					
	<b>DC-EC</b>	<b>DC-SE</b>	<b>LCIT</b>	<b>CTS 420</b>	<b>HCD</b>
<b>Applications</b>	General	General	General	General	High pressure
<b>Type</b>	DC Operated LVDT	DC Operated LVDT	DC Operated LVIT	Position Transmitter System	DC Operated LVDT
<b>Description</b>	Symmetrical Output	Single-Ended Supply Low current draw	Low Cost OEM Position Transducer	LVDT or RVDT with External Signal Conditioner	All Welded Hermetically Sealed
<b>Ranges</b>	±0.05 to ±10 in	0-0.1 to 0-6 in	0-0.25 to 0-4-in	0-0.25 to 0-10 in; 0-90°	±.05 to ±10 in
<b>Input Voltage (nominal)</b>	±15VDC	8.5 to 28VDC	7-36VDC	Loop 10 to 36VDC	±15VDC
<b>Output(s)</b>	±10VDC	0 to 5 and 1 to 6VDC	0.5 to 4.5VDC	4 to 20mA	±10VDC
<b>Non-Linearity</b>	±0.25% of FR	±0.25% of FR	±0.25% of FR	±1.5% of FR	±0.25% of FR
<b>Operating Temperature</b>	0°C to +70°C	-25°C to +85°C	0°C to +85°C	-40°C to +95°C	0°C to +70°C
<b>Core Threads, in</b>	4-40 UNC-2B	4-40 UNC-2B	Not applicable	Not applicable	4-40 UNC-2B
<b>Core Threads, metric</b>	M3x0.5-6H	M3x0.5-6H	Not applicable	Not applicable	M3x0.5-6H
<b>Diameter, in (mm)</b>	0.75 (19.05)	0.75 (19.05)	0.75 (19.05)	0.75 (LVDT); 1.5 (RVDT)	0.75 (19.05)
<b>Housing Material</b>	400 series stainless steel	400 series stainless steel	400 series stainless steel	Stainless steel	400 series stainless steel
<b>Housing Length, in</b>	2.1 to 35.4	3.5 to 17.3	2.6 to 10.4	2.5 to 19.7 (LVDT)	2.4 to 34.6
<b>Housing Length, mm</b>	54 to 900	89 to 440	66 to 265	64 to 501 (LVDT)	61 to 879
<b>Features</b>	<ul style="list-style-type: none"> <li>• Double magnetic shielding</li> <li>• 200/500 Hz response @ -3dB</li> <li>• Shielded cable</li> </ul>	<ul style="list-style-type: none"> <li>• 4-Wire 0 to 5VDC output</li> <li>• Low 6mA typical current draw</li> <li>• Shielded cable</li> </ul>	<ul style="list-style-type: none"> <li>• Reverse polarity protection to 40 V</li> <li>• Aluminum core</li> <li>• High frequency response (1kHz @ -3dB)</li> </ul>	<ul style="list-style-type: none"> <li>• 2-Wire operation</li> <li>• Zero and Span Adjustments</li> <li>• With Model HCI LVDT</li> <li>• or R36AS RVDT</li> </ul>	<ul style="list-style-type: none"> <li>• Welded PT06A hermetic connector</li> <li>• Double magnetic shielding</li> <li>• 200/500 Hz frequency response @ -3dB</li> </ul>
<b>Certifications/ IP Rating</b>	CE Mark; IP61	CE Mark; IP61	IP61	IP68 to 1KSI (70Bars), LVDT only	CE Mark; IP68 to 1KSI (70Bars)
<b>Options</b>	<ul style="list-style-type: none"> <li>• Metric threaded core</li> <li>• Guided core</li> <li>• Captive core</li> <li>• Small diameter, low mass core</li> </ul>	<ul style="list-style-type: none"> <li>• Metric threaded core</li> <li>• Guided core</li> <li>• Captive core</li> <li>• Small diameter, low mass core</li> </ul>	—	<ul style="list-style-type: none"> <li>• Splash-proof electronic enclosure</li> <li>• Metric threaded core (LVDT)</li> <li>• Interconnecting cable</li> </ul>	<ul style="list-style-type: none"> <li>• Metric threaded core</li> <li>• Guided core</li> <li>• Captive core</li> <li>• Small diameter, low mass core</li> </ul>
<b>Typical Applications</b>	<ul style="list-style-type: none"> <li>• General industrial</li> <li>• Test &amp; measurement</li> </ul>	<ul style="list-style-type: none"> <li>• Battery operated systems</li> <li>• Field testing/test labs</li> <li>• Ram guide position feedback</li> <li>• Platen position feedback</li> </ul>	<ul style="list-style-type: none"> <li>• General industrial</li> <li>• Tool position</li> <li>• Valve position</li> </ul>	<ul style="list-style-type: none"> <li>• Process controls</li> <li>• Stem-type valve position</li> </ul>	<ul style="list-style-type: none"> <li>• Applications where resistance to dirt, water, steam, and corrosive liquids and vapors is needed (verify metals compatibility)</li> <li>• Submersible with appropriate connector</li> </ul>

# POSITION SENSORS PRODUCT GUIDE

## INDUCTIVE LINEAR POSITION TRANSDUCERS



**HCT**



**HC485**





**PTS 420**

<b>Applications</b>	2-Wire Current Loop	RS-485 Output	Process Controls
<b>Type</b>	DC operated LVDT	DC Operated LVDT	DC Operated LVDT
<b>Description</b>	Hermetically Sealed 4-20mA	Hermetically Sealed RS-485 Digital Series	LVDT Position Transmitter
<b>Ranges</b>	0-0.25 to 0-10 in	±0.05 to ±3 in	0-0.25 to 0-10 in
<b>Input Voltage (nominal)</b>	Loop 12.75 to 28VDC	8.5 to 30VDC	Loop 10.5 to 28VDC
<b>Output(s)</b>	4 to 20mA	Metric & Inches (Digital)	4 to 20mA
<b>Non-Linearity</b>	±0.5% of FR (±1% for 10 in model)	±0.25% of FR	±0.75% of FR (±1.25% for 10 in model)
<b>Operating Temperature</b>	-25°C to +85°C	-25°C to +85°C	-25°C to +85°C
<b>Core Threads, in</b>	4-40 UNC-2B	4-40 UNC-2B	4-40 UNC-2B
<b>Core Threads, metric</b>	M3x0.5-6H	M3x0.5-6H	Not applicable
<b>Diameter, in (mm)</b>	0.75 (19.05)	0.75 (19.05)	1 (25.4)
<b>Housing material</b>	400 series stainless steel	400 series stainless steel	400 series stainless steel
<b>Housing Length, in</b>	4.4 to 21.6	3.4 to 17.6	3.5 to 20.8
<b>Housing Length, mm</b>	112 to 549	87 to 447	89 to 529
<b>Features</b>	<ul style="list-style-type: none"> <li>• 4-20mA, 2-wire operation</li> <li>• Welded PT06A hermetic connector</li> <li>• Hermetically sealed</li> </ul>	<ul style="list-style-type: none"> <li>• Up to 32 sensors/network</li> <li>• Programmable filtering</li> <li>• Built-in Tare/Untare</li> <li>• Built-in Min/Max function</li> <li>• Velocity output</li> <li>• MOD-Bus ASCII &amp; RTU</li> </ul>	<ul style="list-style-type: none"> <li>• 4-20mA, 2-Wire operation</li> <li>• Zero and Span adjustments</li> <li>• Rugged splashproof housing</li> <li>• Well suited for noisy environments</li> <li>• Compatible with process controllers</li> </ul>
<b>Certifications/ IP Rating</b>	IP68 to 1,000PSI (70Bars)	CE Mark IP68 to 1,000PSI (70Bars)	IP65
<b>Options</b>	<ul style="list-style-type: none"> <li>• Metric threaded core</li> <li>• Captive core option</li> </ul>	<ul style="list-style-type: none"> <li>• ±0.05% FR linearity</li> <li>• Metric threaded Core</li> <li>• Captive core</li> <li>• Guide core</li> <li>• Special OEM protocols</li> </ul>	<ul style="list-style-type: none"> <li>• Metric threaded core</li> </ul>
<b>Typical Applications</b>	<ul style="list-style-type: none"> <li>• Valve position indication</li> <li>• Outdoor use with long cable</li> <li>• Controller roller gap in rolling mills</li> <li>• Process industries</li> <li>• Ideal for noisy areas</li> </ul>	<ul style="list-style-type: none"> <li>• Process control</li> <li>• Valve position feedback</li> <li>• Roller gap</li> <li>• Automated test systems</li> </ul>	<ul style="list-style-type: none"> <li>• Stem-type valves</li> <li>• Power generation</li> <li>• Air-handling systems</li> <li>• Filtration/water treatment</li> <li>• Rolling mills</li> <li>• Sluice gates in sewage and waste water treatment plants</li> </ul>

# POSITION SENSORS PRODUCT GUIDE

## INDUCTIVE DIMENSIONAL GAGING PRODUCTS

TE Gage Heads, also called Gaging Probes, are spring loaded or air actuated LVDTs with contact tips. Our precision gage heads are classified into several categories based on size, repeatability, and input/output. Our AC operated Gage Heads are compatible with our full line of signal conditioners, panel displays and mini-controllers.

					
	<b>LBB</b>	<b>GCA</b>	<b>PCA375</b>	<b>PCA375PR-020</b>	<b>PCA116</b>
<b>Applications</b>	Precision Gaging	Gaging	Gaging	Gaging	Gaging
<b>Type</b>	AC Operated Gage Head	AC Operated Gage Head	AC Operated Gage Head	AC Operated Gage Head	AC Operated Gage Head
<b>Description</b>	Linear Ball Bearing Spring or Air Extend	Hermetically Sealed Spring or Air Extend	Longer Stroke Spring Extend	Ultra Compact Spring Extend	Economy Series
<b>Ranges, inch</b>	±0.02 to ±0.2 in	±0.05 to ±2 in	±0.1 to ±1 in	±0.02 in	±0.1, ±0.2 & ±0.3 in
<b>Input Voltage (nominal)</b>	3.5Vrms	3Vrms	3Vrms	3.5Vrms Max.	3Vrms
<b>Input Frequency</b>	2.5 to 10KHz	400 to 10KHz	2.5 to 10KHz	2.5 to 10 KHz	50Hz to 10kHz
<b>Test Frequency</b>	5 KHz	2.5KHz	10 KHz	5 KHz	2.5KHz
<b>Output(s)</b>	AC	AC	AC	AC	AC
<b>Non-Linearity</b>	±0.2% of FR	±0.25% of FR	±0.5% of FR	±0.5% of FR	±0.5% of FR
<b>Operating Temperature</b>	-40°C to +70°C	-55°C to +150°C	-20°C to +70°C	-18 to +121°C	-55°C to +95°C
<b>Diameter, in (mm)</b>	0.315 (8) or 0.375 (9.5)	0.75 (19.05)	0.375 (9.53)	0.375 (9.53)	0.75 (19.05)
<b>Housing Material</b>	Hardened stainless steel	400 series stainless steel	400 series stainless steel	304 series stainless steel	400 series stainless steel
<b>Housing Length, in</b>	2.3 to 5.8	1.9 to 20.9	2 to 9	0.9	1.75 to 2.8
<b>Housing Length, mm</b>	59 to 148	49 to 531	51 to 229	23	45 to 72
<b>Features</b>	<ul style="list-style-type: none"> <li>• 4µin (0.10µm) repeatability</li> <li>• Removable tungsten carbide contact tip</li> <li>• Double shielded LVDT</li> <li>• Repairable</li> </ul>	<ul style="list-style-type: none"> <li>• All-welded construction</li> <li>• Hermetic connector</li> <li>• 25µin (.6um) repeatability</li> <li>• Special tips available</li> </ul>	<ul style="list-style-type: none"> <li>• Longer strokes</li> <li>• Accepts industry standard contact tips</li> <li>• Heavy duty return spring</li> <li>• Based on MHR Series LVDT</li> </ul>	<ul style="list-style-type: none"> <li>• 40µin (1µm) repeatability</li> <li>• Very compact design</li> <li>• 90° cable exit</li> <li>• 4-48 ADG standard dial gage tip</li> </ul>	<ul style="list-style-type: none"> <li>• Cost Effective Performance</li> <li>• 100µin (2.5µm) repeatability</li> <li>• Nylon sleeve bearings</li> <li>• Uses E-Series LVDT</li> </ul>
<b>Certifications/ IP Rating</b>	IP60	IP68	IP60 (IP65 cable exit)	IP61	IP61
<b>Options</b>	<ul style="list-style-type: none"> <li>• Air extend</li> <li>• Threaded housing</li> <li>• Installed connectors</li> <li>• Special contact tips</li> </ul>	<ul style="list-style-type: none"> <li>• Mating connector</li> <li>• Special contact tips</li> <li>• Air extend, spring retract</li> </ul>	<ul style="list-style-type: none"> <li>• Installed connectors</li> <li>• Special contact tips</li> </ul>	<ul style="list-style-type: none"> <li>• Installed connectors</li> <li>• Special contact tips</li> </ul>	<ul style="list-style-type: none"> <li>• Special contact tips</li> </ul>
<b>Typical Applications</b>	<ul style="list-style-type: none"> <li>• Automotive factory automation</li> <li>• Mfg on-line inspection</li> <li>• Robotics</li> <li>• Replaces dial indicators</li> <li>• Process standards</li> <li>• Factory SPC</li> </ul>	<ul style="list-style-type: none"> <li>• In-process measurements</li> <li>• Harsh environments</li> <li>• High temperature applications</li> <li>• Elevator landing systems</li> </ul>	<ul style="list-style-type: none"> <li>• High density gaging fixtures</li> <li>• Resistance weld verification</li> <li>• Pressing applications</li> <li>• X-Y stage position feedback</li> <li>• Rough casting inspection</li> </ul>	<ul style="list-style-type: none"> <li>• Bore gages</li> <li>• Fixture gages</li> <li>• Limited space applications</li> <li>• Small inside diameter measurements</li> </ul>	<ul style="list-style-type: none"> <li>• Less demanding applications</li> </ul>

## INDUCTIVE DIMENSIONAL GAGING PRODUCTS



	<b>GCD</b>	<b>GCD-SE</b>	<b>GCT</b>	<b>GC 485</b>	<b>DLBB Digital LBB</b>
<b>Applications</b>	Gaging	Gaging	Gaging	Digital I/O Gaging	Digital I/O Gaging
<b>Type</b>	DC Operated Gage Head	DC Operated Gage Head	DC Operated Gage Head	DC Operated Gage Head	Gage Head Stackable System
<b>Description</b>	Hermetically Sealed Spring or Air Extend	Hermetically Sealed Single Ended Supply	2-Wire Current Loop Spring or Air Extend	Hermetically Sealed RS-485 Ultra Precision	Ultimate-Precision Gaging system
<b>Ranges, inch</b>	±0.05 to ±2 in	0.1 to 2 in	0.25 to 2 in	±0.05 to ±1 in	1, 2, 5 and 10 mm
<b>Input Voltage (nominal)</b>	± 15VDC	8.5 to 28VDC	Loop 12.75 to 28VDC	8.5 to 30VDC	5 VDC (USB bus or external power supply)
<b>Output(s)</b>	± 10VDC	1 to 6VDC; 0 to 5VDC(4 wires)	4 to 20mA	Metric & Inches (Digital)	RS485; USB
<b>Non-Linearity</b>	±0.25% of FR	±0.25% of FR	±0.5% of FR	±0.1% of FR	±0.1% to ±0.2% of reading accuracy
<b>Operating Temperature</b>	0°C to +70°C	-25°C to +85°C	-25°C to +85°C	-25°C to +85°C	0 to +60°C
<b>Diameter, in (mm)</b>	0.75 (19.05)	0.75 (19.05)	0.75 (19.05)	0.75 (19.05)	0.315 (8) & 0.375 (9.5)
<b>Housing Material</b>	400 series stainless steel	400 series stainless steel	400 series stainless steel	400 series stainless steel	Hardened stainless steel
<b>Housing Length, in</b>	2.7 to 11.5	4.1 to 9.7	4.7 to 9.5	4.1 to 9.5	2.3 to 5.8
<b>Housing Length, mm</b>	69 to 293	105 to 247	120 to 242	105 to 242	59 to 148
<b>Features</b>	<ul style="list-style-type: none"> <li>All-welded construction</li> <li>Hermetic connector</li> <li>25 µin (0.6µm) repeatability</li> </ul>	<ul style="list-style-type: none"> <li>Welded hermetic connector</li> <li>Single-ended voltage supply</li> <li>Low 6mA typical current draw</li> <li>25 µin (0.6µm) repeatability</li> </ul>	<ul style="list-style-type: none"> <li>All-welded construction</li> <li>Welded hermetic connector</li> <li>25 µin (0.6µm) repeatability</li> </ul>	<ul style="list-style-type: none"> <li>Up to 32 sensors per network</li> <li>Programmable filtering</li> <li>Built-in Tare/Untare</li> <li>Min/Max/TIR function</li> <li>Velocity output</li> <li>MOD-Bus ASCII &amp; RTU</li> </ul>	<ul style="list-style-type: none"> <li>14 bit resolution (0.006%)</li> <li>COM libraries provided</li> <li>USB adapter &amp; power supply available</li> </ul>
<b>Certifications/ IP Rating</b>	CE mark; IP68	CE mark; IP68	IP68	CE mark; IP68	CE mark
<b>Options</b>	<ul style="list-style-type: none"> <li>Mating connector</li> <li>Special contact tips</li> <li>Air extend, spring retract</li> </ul>	<ul style="list-style-type: none"> <li>Mating connector</li> <li>Special contact tips</li> <li>Air extend, spring retract</li> </ul>	<ul style="list-style-type: none"> <li>Mating connector</li> <li>Special contact tips</li> <li>Air extend, spring retract</li> </ul>	<ul style="list-style-type: none"> <li>Special contact tips</li> <li>Special OEM protocols</li> <li>Air extend, spring retract</li> </ul>	<ul style="list-style-type: none"> <li>Air extend</li> <li>Threaded housing</li> <li>Special contact tips</li> </ul>
<b>Typical Applications</b>	<ul style="list-style-type: none"> <li>In-process measurements</li> <li>Harsh environments</li> <li>Environments requiring hermetic seal</li> <li>Elevator landing systems</li> </ul>	<ul style="list-style-type: none"> <li>Battery operated systems</li> <li>Roller gap control</li> <li>In-process wet grinding</li> <li>Handheld gages</li> <li>X-Y position feedback</li> </ul>	<ul style="list-style-type: none"> <li>Bridge expansion monitoring</li> <li>Pipeline vibration monitoring</li> <li>Valve position</li> <li>Compressor feedback</li> <li>Well suited for noisy environments</li> </ul>	<ul style="list-style-type: none"> <li>Roller gap control</li> <li>In-process wet grinding</li> <li>Handheld gages</li> <li>Metrology</li> <li>X-Y position feedback</li> </ul>	<ul style="list-style-type: none"> <li>Multi-channel electronic dimensional gaging</li> <li>Precision dimensional measurement</li> <li>Optics inspection systems</li> <li>SPC Data Collection</li> <li>Hand tools</li> </ul>



## INDUCTIVE ANGULAR POSITION TRANSDUCERS

TE technologies for inductive angular absolute position transducers include the RVDT (Rotary Variable Differential Transformer) and the RVIT (Angular Variable Inductive Transducer). All of these sensors feature precision ball bearings and non-contact inductive magnetic coupling for extremely long cycle life and virtually infinite resolution. Various off the shelf and custom packaging options are available for the most demanding application requirements. Our AC operated RVDTs are compatible with our full line of signal conditioners, panel displays and mini-controllers.



**R30A**



**R36AS**



**RSYN**



**R30D**

<b>Applications</b>	General	Harsh Environment	Hostile Environment	General
<b>Type</b>	AC Operated RVDT	AC Operated RVDT	AC Operated RVDT	DC Operated RVDT
<b>Description</b>	Size 11 Servo Mount Lead-Wires	Size 15 Servo Mount Connector	Ruggedized RVDT High Output Voltage	Size 11 Servo Mount Amplified
<b>Range, degree</b>	±60°	±60°	±30°	±60°
<b>Input Voltage (nominal)</b>	3Vrms	3Vrms	7.5Vrms	±15VDC
<b>Input Frequency</b>	2.5 to 10KHz	2.5 to 10KHz	3KHz	Not applicable
<b>Test Frequency</b>	10KHz	2.5KHz	3KHz	Not applicable
<b>Output(s)</b>	AC	AC	AC	±3.75VDC
<b>Non-Linearity</b>	±0.25(±30°), ±0.5(±40°), ±2(±60°) % of FR	±0.25(±30°), ±0.5(±40°), ±2(±60°) % of FR	±0.5% of FR	±0.25(±30°), ±0.5(±40°), ±2(±60°) % of FR
<b>Operating Temperature</b>	-55°C to +150°C	-55°C to +150°C	-55°C to +105°C	-18°C to +75°C
<b>Diameter, in (mm)</b>	1.06 (26.9)	1.5 (38.1)	0.75 (19.1) and 1.06 (26.9)	1.06 (26.9)
<b>Housing Material</b>	Aluminum	Stainless steel	Stainless steel	Aluminum
<b>Housing Length, in (mm)</b>	0.9 (23)	1.8 (46)	1.3 (33)	2 (51)
<b>Features</b>	<ul style="list-style-type: none"> <li>• Small size &amp; light weight</li> <li>• Shielded ABEC 3 precision ball bearings</li> <li>• 3/16 inch shaft diameter</li> </ul>	<ul style="list-style-type: none"> <li>• MS type connector</li> <li>• Rugged housing</li> <li>• Shielded ABEC 3 precision ball bearings</li> <li>• 3/16 inch shaft diameter</li> </ul>	<ul style="list-style-type: none"> <li>• High tolerance to shock and vibration</li> <li>• Humidity &amp; salt mist resistant</li> <li>• Low temperature coefficient of sensitivity</li> <li>• High output voltage</li> </ul>	<ul style="list-style-type: none"> <li>• Shielded ABEC 3 precision ball bearings</li> <li>• 3/16 inch shaft diameter</li> </ul>
<b>Certifications/ IP Rating</b>	IP60	IP65	IP60	CE Mark; IP60
<b>Options</b>	<ul style="list-style-type: none"> <li>• R-Flex coupler</li> </ul>	<ul style="list-style-type: none"> <li>• R-Flex coupler</li> <li>• Mating Connector</li> </ul>	<ul style="list-style-type: none"> <li>• R-Flex coupler</li> </ul>	<ul style="list-style-type: none"> <li>• R-Flex coupler</li> </ul>
<b>Typical Applications</b>	<ul style="list-style-type: none"> <li>• Machine tool equipment</li> <li>• Rotary actuator feedback</li> <li>• Valve positioning</li> <li>• Power generation valve position</li> </ul>	<ul style="list-style-type: none"> <li>• Machine tool equipment</li> <li>• Rotary actuator feedback</li> <li>• Valve positioning</li> <li>• Power generation valve position</li> </ul>	<ul style="list-style-type: none"> <li>• Rotary valve position for process industries</li> <li>• Headbox position feedback</li> <li>• Spinnerets for paper and plastic</li> <li>• Heavy duty transmission control</li> <li>• Boat rudder position</li> <li>• Aircraft cockpit controls</li> </ul>	<ul style="list-style-type: none"> <li>• Dancer arm position</li> <li>• Rotary actuator position</li> <li>• Throttle lever position</li> <li>• Ball valve position</li> <li>• Textile manufacturing equipment</li> <li>• Printing presses</li> </ul>

## INDUCTIVE ANGULAR POSITION TRANSDUCERS



	<b>R60D</b>	<b>R120LC</b>	<b>RVIT-15-60</b>	<b>RVIT15-120i</b>	<b>RVIT-Z</b>
<b>Applications</b>	General	General	General	Process Controls	OEM
<b>Type</b>	DC Operated RVIT	DC Operated RVIT	DC Operated RVIT	DC Operated RVIT	DC Operated RVIT
<b>Description</b>	Low Inertia Size 11 Servo Mount	Potentiometer Replacement	Low Inertia Size 15 Servo Mount	Transmitter Size 15 Servo Mount	OEM PC Board Assembly
<b>Range, degree</b>	±60°	±60°	±60°	0° to 120°	±60° or 0° to 120°
<b>Input Voltage (nominal)</b>	±15VDC	4.75 to 5.25V	4 to 5.5 VDC	10 to 28 VDC	+5, +10 to +28, or ±15 VDC
<b>Output(s)</b>	±7.5VDC	0.5 to 4.5 VDC	±3VDC	4-20mA & 1 to 5VDC	Analog or Digital
<b>Non-Linearity</b>	±0.5% of FR	±0.5% of FR	±0.25% of FR	±0.25% of FR	±0.5% of FR
<b>Operating Temperature</b>	-25°C to +85°C	-40°C to +85°C	-25°C to +85°C	-25°C to +85°C	-25°C to +85°C
<b>Diameter, in (mm)</b>	1.06 (26.9)	1 (25.5)	1.5 (38.1)	1.5 (38.1)	Custom
<b>Housing Material</b>	Aluminum	Aluminum	Aluminum	Aluminum	Custom
<b>Housing Length, in (mm)</b>	1.3 (33)	1.2 (31)	1.6 (41)	1.6 (41)	Custom
<b>Features</b>	<ul style="list-style-type: none"> <li>• Low moment of inertia</li> <li>• Printed circuit coils</li> <li>• Shielded ABEC 3 precision ball bearings</li> <li>• 3/16in shaft diameter</li> </ul>	<ul style="list-style-type: none"> <li>• Low 5mA supply current</li> <li>• Low cost</li> <li>• Printed circuit coils</li> <li>• 1/4in shaft diameter</li> </ul>	<ul style="list-style-type: none"> <li>• Matched &amp; preloaded ABEC 3 bearings</li> <li>• Printed circuit coils</li> <li>• 3/16in shaft diameter</li> </ul>	<ul style="list-style-type: none"> <li>• Matched &amp; preloaded ABEC 3 bearings</li> <li>• Printed circuit coils</li> <li>• 3/16in shaft diameter</li> </ul>	<ul style="list-style-type: none"> <li>• Low cost</li> <li>• Extremely light Weight</li> </ul>
<b>Certifications/ IP Rating</b>	CE Mark; IP60	CE Mark; IP60	CE Mark; IP60	CE Mark; IP60	—
<b>Options</b>	<ul style="list-style-type: none"> <li>• R-Flex coupler</li> </ul>	<ul style="list-style-type: none"> <li>• R-Flex coupler</li> </ul>	<ul style="list-style-type: none"> <li>• R-Flex coupler</li> <li>• Flange mount</li> <li>• Custom electronics for high volume OEMs</li> </ul>	<ul style="list-style-type: none"> <li>• R-Flex coupler</li> <li>• Flange mount</li> <li>• Custom electronics for high volume OEMs</li> </ul>	<ul style="list-style-type: none"> <li>• Custom designs for high volume OEMs</li> </ul>
<b>Typical Applications</b>	<ul style="list-style-type: none"> <li>• Dancer arm position</li> <li>• Rotary actuator position</li> <li>• Throttle lever position</li> <li>• Ball valve position</li> <li>• Textile manufacturing equipment</li> <li>• Textile manufacturing equipment</li> <li>• Printing presses</li> </ul>	<ul style="list-style-type: none"> <li>• No wear potentiometer replacement</li> <li>• Battery operated systems</li> <li>• Systems requiring much longer life cycles than potentiometers</li> </ul>	<ul style="list-style-type: none"> <li>• Dancer arm position</li> <li>• Rotary actuator position</li> <li>• Throttle lever position</li> <li>• Ball valve position</li> <li>• Textile manufacturing equipment</li> <li>• Textile manufacturing equipment</li> <li>• Printing presses</li> </ul>	<ul style="list-style-type: none"> <li>• Process controls</li> <li>• Dancer arm position</li> <li>• Rotary actuator position</li> <li>• Ball valve position</li> <li>• Textile manufacturing equipment</li> <li>• Textile manufacturing equipment</li> <li>• Printing presses</li> </ul>	<ul style="list-style-type: none"> <li>• Viscometers</li> <li>• Valve position</li> <li>• Robotics</li> <li>• HVAC vane position</li> <li>• ATMs</li> <li>• Joysticks</li> <li>• UAV flight controls</li> </ul>

# POSITION SENSORS PRODUCT GUIDE

## LVDT/RVDT INSTRUMENTATION

TE OEM and end-user oriented signal conditioners, panel displays and read-out devices are specifically designed to be compatible with our AC LVDT and RVDT position transducers. These instruments provide everything needed to interface them to controls or data acquisition systems. The PSD 4-15 power supply is designed to power multiple DC LVDTs and RVDTs.



**LVM-110**



**LiM 4-20**



**PSD 40-15**



**LDM-1000**

<b>Applications</b>	General OEM	General OEM	General	Controls & Automation
<b>Type</b>	Open Circuit Board	Open Circuit Board	DIN Rail Mount	DIN Rail Mount
<b>Description</b>	OEM Signal Conditioner Voltage Out	OEM Signal Conditioner Current Out	Dual-Rail DC Power Supply	Industrial Conditioner Voltage/Current Out
<b>Supply Voltage</b>	+/-15VDC, +/-12VDC	18 to 30VDC	115/230 VAC, 47-63Hz	10 to 30VDC
<b>Output</b>	±10,±5, 0 to 5 and 0 to 10VDC	4 to 20mA	±15 VDC, 1A	±5, 0 to 5VDC, 0 to 10VDC, and 4 to 20mA
<b>Non-Linearity</b>	±0.05% of FR	0.05% of FR	Not applicable	±0.02% of FR
<b>VDT Excitation Voltage</b>	3Vrms ± 10%	3.5Vrms ± 10%	Not applicable	1 and 3Vrms
<b>VDT Excitation Frequency</b>	2.5, 5, 8 and 10KHz	2.5KHz	Not applicable	2.5, 5 and 10KHz
<b>Digital Display</b>	No	No	Not applicable	No
<b>Operating Temperature</b>	0 to +55°C	-25°C to +85°C	-25°C to +70°C	-25°C to +85°C
<b>Dimensions, in</b>	2.45 x 2.2 x 0.8	2.45 x 2.2 x 0.8	4.5 x 3.9 x 1.8	4.5 x 3.9 x 0.9
<b>Dimensions, mm</b>	63 x 56 x 21	63 x 56 x 21	114 x 99 x 46	115 x 99 x 23
<b>Features</b>	<ul style="list-style-type: none"> <li>• Master/slave for multi-up applications</li> <li>• Dip switch selectable LVDT/ RVDT excitation frequencies</li> <li>• Plug-in PCB or wires to terminal strip</li> <li>• Low cost</li> <li>• ±6VDC Zero suppression adjustment</li> </ul>	<ul style="list-style-type: none"> <li>• Master/slave for multi-up applications</li> <li>• Dip switch selectable LVDT/ RVDT excitation frequencies</li> <li>• Plug-in PCB or wires to terminal strip</li> <li>• Low cost</li> <li>• ±2.5mA Offset adjustment</li> </ul>	<ul style="list-style-type: none"> <li>• ±15 VDC ±1%</li> <li>• Low noise outputs</li> <li>• Overload &amp; short circuit protection</li> </ul>	<ul style="list-style-type: none"> <li>• Operates with 4, 5 &amp; 6 wire LVDT and RVDT</li> <li>• Status LEDs</li> <li>• Front mounted Zero, Phase and Span adjustment potentiometers</li> <li>• 100% Zero suppression</li> <li>• Multiple LVDT/RVDT Master/Slave Feature</li> </ul>
<b>Certifications/ IP Rating</b>	—	—	CE and UL; IP60	CE mark; IP60
<b>Typical Applications</b>	<ul style="list-style-type: none"> <li>• General OEM applications</li> </ul>	<ul style="list-style-type: none"> <li>• Valve position feedback</li> <li>• Roller gap sensing</li> <li>• Paper head box position</li> <li>• Coater knife gap</li> <li>• Materials testing machines</li> </ul>	<ul style="list-style-type: none"> <li>• For operation with our DC transducers</li> <li>• Powers multiple sensors</li> <li>• Din rail applications</li> <li>• Chassis applications</li> <li>• Industrial environments</li> </ul>	<ul style="list-style-type: none"> <li>• Automotive test track instrumentation</li> <li>• Gas &amp; steam turbine controls</li> <li>• Factory automation</li> </ul>

## LVDT/RVDT INSTRUMENTATION



	<b>ATA-2001</b>	<b>PML 1000</b>	<b>MP 2000</b>	<b>IEM 422, LDM 8000</b>
<b>Applications</b>	Industrial & Metrology	Industrial & Process	Industrial & Process	Process Controls
<b>Type</b>	1/8 DIN Panel Mount	1/8 DIN Panel Mount	1/4 DIN Panel Mount	Industrial Steel Box
<b>Description</b>	Rugged Industrial Signal Conditioner with Digital Calibration	LVDT/RVDT Signal Conditioner and Panel Meter	Dual Channel LVDT/RVDT Indicator & Set-Point Controller	LVDT/RVDT Current Transmitter
<b>Supply Voltage</b>	115VAC/220VAC 50-400Hz	90 to 265VAC, 24VAC* and 24VDC*	100 to 240VAC 47-63 Hz	115 and 240VAC
<b>Output</b>	±10VDC, 0 to 10VDC, and 4-20mA	0 to 10VDC, 0 to 20mA, 4-20mA, and RS485	+/-5 VDC, 0 to 10VDC, and RS232	4 to 20mA
<b>LVDT Excitation Voltage</b>	0.5 and 3.5Vrms	1 and 3Vrms	1 and 3Vrms	3Vrms
<b>LVDT Excitation Frequency</b>	2.5, 5 and 10KHz	2.5 and 10KHz	2.5, 3.3, 5 and 10KHz	2.5, 5 and 10KHz
<b>Digital Display</b>	No	5-digit LED display	5-digit LCD display	No
<b>Operating Temperature</b>	-40°C to +85°C	+10°C to +50°C	0°C to +55°C	-25°C to +70°C
<b>Dimensions, in</b>	10.5 x 3.9 x 1.9	6.8 x 3.8 x 1.9	7.0 x 3.6 x 3.6	9.5 x 6.0 x 6.0
<b>Dimensions, mm</b>	267 x 99 x 49	173 x 97 x 49	178 x 92 x 92	242 x 153 x 153
<b>Features</b>	<ul style="list-style-type: none"> <li>• Push button programmable</li> <li>• Splash proof front panel</li> <li>• Extruded aluminum housing</li> <li>• LED status lights</li> <li>• Phase Shift compensation</li> <li>• ±110% Zero suppression</li> <li>• Auto fall-back synchronization for multiple LVDT/RVDT</li> </ul>	<ul style="list-style-type: none"> <li>• Splash proof front panel</li> <li>• Auto-calibration</li> <li>• 2 programmable logic inputs</li> <li>• 2 programmable function keys</li> <li>• Min, Max, AVG, Zero, and Hold functions</li> <li>• User-select decimal point</li> <li>• Mounting hardware included</li> </ul>	<ul style="list-style-type: none"> <li>• 17-Bit A to D converter</li> <li>• Programmable set points</li> <li>• Auto-calibration</li> <li>• Dual channel with math</li> <li>• Digital I/O</li> <li>• 9-Pin RS232 Connector</li> <li>• Splash proof front panel</li> <li>• Aluminum Case</li> </ul>	<ul style="list-style-type: none"> <li>• DIN rail mount power supply</li> <li>• ±30% Zero adjust</li> <li>• Power &amp; loop LEDs</li> <li>• Adjustable Zero, Phase and Span</li> <li>• NEMA 13 enclosure</li> <li>• LDM 8000 has 8 channels</li> </ul>
<b>Certifications/ IP Rating</b>	CE mark; IP61 (front panel only)	CE mark; IP61 (front panel only)	IP61 (front panel only)	IP65 (Nema 13)
<b>Options</b>	—	<ul style="list-style-type: none"> <li>• RS422/485 interface model</li> <li>• *Low voltage operation (24V) model</li> </ul>	<ul style="list-style-type: none"> <li>• Relay board</li> <li>• Lab stand/bench mount</li> <li>• 4-Up rack adapter</li> </ul>	—
<b>Typical Applications</b>	<ul style="list-style-type: none"> <li>• Precision metrology labs</li> <li>• Control valve position</li> <li>• Head box slice lip position</li> <li>• Roller gap position feedback</li> </ul>	<ul style="list-style-type: none"> <li>• Remote monitoring stations</li> <li>• Measurement test stands</li> <li>• Process monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Weighting systems</li> <li>• Pass/Fail part sorting</li> <li>• Roller gap control</li> <li>• Concentricity gaging</li> <li>• Press cycle control</li> <li>• Part classification</li> <li>• Quality inspection</li> </ul>	<ul style="list-style-type: none"> <li>• Steam turbine throttle valve position</li> <li>• Pulp paper industry</li> <li>• Petrochemical process control</li> <li>• Roller gap process control</li> </ul>

# POSITION SENSORS PRODUCT GUIDE

## ANGULAR AND LINEAR ENCODERS

TE offers absolute and incremental, linear and angular encoders based on our AMR (Anisotropic Magneto Resistive) and Hall-effect technologies. These technologies are not affected by dirt, oil, dust or other contaminants, or by changes in ambient lighting conditions. Outputs are either analog or digital. Various off the shelf and custom packaging options provide rugged, low cost, non contacting position feedback for demanding applications.



	<b>ED18</b>	<b>ED19</b>	<b>ED20</b>	<b>ED21</b>
<b>Applications</b>	Medium Duty	Medium Duty	Heavy Duty	Heavy Duty
<b>Type</b>	Hall-Effect Angular Encoder	AMR Angular Encoder	AMR Angular Encoder	Hall-Effect Angular Encoder
<b>Description</b>	Absolute, Analog Output	Absolute, Quadrature	Absolute, Quadrature	Absolute, Analog Output
<b>Range</b>	0 to 360°	0 to 360°	0 to 360°	0 to 360°
<b>Supply voltage</b>	5±0.25VDC	5±0.25VDC	5±0.25 or 12 to 32VDC	5±0.25VDC
<b>Output</b>	0.5 to 4.5VDC or 4-20mA	Quadrature (TTL level, open collector, 10KΩ internal pull-up)	Quadrature (Open collector NPN, LDV and HDV)	0.5 to 4.5VDC or 4-20mA
<b>Resolution (CPR=counts/revolution)</b>	8 bits (1.4°)	64/256/400 CPR (others on request)	200/400 CPR (others on request)	8 bits (1.4°)
<b>Maximum speed</b>	300 RPM (sleeve) 3000 RPM (ball)	300 RPM (sleeve) 3000 RPM (ball)	3000 RPM	3000 RPM
<b>Operating Temperature</b>	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
<b>Size, in (mm)</b>	1 (25.4) square	1 (25.4) square	1.25 (31.7) diameter	1.25 (31.7) diameter
<b>Bearing System</b>	Aluminum sleeve or stainless steel ball bearing	Aluminum sleeve or stainless steel ball bearing	Stainless steel ball bearing	Stainless steel ball bearing
<b>Shaft Diameter, inch (mm)</b>	1/4 (6.3)	1/4 (6.3)	1/4 (6.3)	1/4 (6.3)
<b>Features</b>	<ul style="list-style-type: none"> <li>• Excellent stability</li> <li>• Sleeve, 3 million cycles; Bearing, 30 million cycles</li> <li>• Sealed electronics</li> <li>• For harsh environments</li> </ul>	<ul style="list-style-type: none"> <li>• Electrically compatible with other encoders</li> <li>• Sleeve, 3 million cycles; bearing, 30 million cycles</li> <li>• Sealed electronics</li> <li>• For harsh environments</li> </ul>	<ul style="list-style-type: none"> <li>• 30 million cycle life</li> <li>• Excellent stability</li> <li>• Sealed electronics</li> <li>• For harsh environments</li> <li>• Metal shaft &amp; barrel</li> </ul>	<ul style="list-style-type: none"> <li>• 30 million cycle life</li> <li>• Excellent stability</li> <li>• Sealed electronics</li> <li>• For harsh environments</li> <li>• Metal shaft &amp; barrel</li> </ul>
<b>IP Rating</b>	IP52	IP52	IP52	IP52
<b>Options</b>	<ul style="list-style-type: none"> <li>• Extended temp. range</li> <li>• Custom/special outputs, shaft sizes, connectors, and housings</li> </ul>	<ul style="list-style-type: none"> <li>• Custom/special shaft sizes, connectors and housings</li> </ul>	<ul style="list-style-type: none"> <li>• Custom/special shaft sizes, connectors and housings</li> </ul>	<ul style="list-style-type: none"> <li>• Extended temp range</li> <li>• Custom/special outputs, shaft sizes, connectors and housings</li> </ul>
<b>Typical Applications</b>	<ul style="list-style-type: none"> <li>• Potentiometer replacement</li> <li>• Avionics &amp; radio controls</li> <li>• Marine steering &amp; throttle</li> <li>• Motor/pump speed, direction &amp; position</li> <li>• Camera control</li> <li>• XY stage positioning</li> <li>• Video/sound editing equipment</li> <li>• Valve position</li> <li>• Medical diagnostic equipment</li> <li>• Syringe pump</li> </ul>	<ul style="list-style-type: none"> <li>• Potentiometer replacement</li> <li>• Avionics &amp; radio controls</li> <li>• Marine steering &amp; throttle</li> <li>• Motor/pump speed, direction &amp; position</li> <li>• Camera control</li> <li>• XY stage positioning</li> <li>• Video/sound editing equipment</li> <li>• Valve position</li> <li>• Medical diagnostic equipment</li> <li>• Syringe pump</li> </ul>	<ul style="list-style-type: none"> <li>• Potentiometer replacement</li> <li>• Avionics &amp; radio controls</li> <li>• Marine steering &amp; throttle</li> <li>• Motor/pump speed, direction &amp; position</li> <li>• Camera control</li> <li>• XY stage positioning</li> <li>• Video/sound editing equipment</li> <li>• Valve position</li> <li>• Medical diagnostic equipment</li> <li>• Syringe pump</li> </ul>	<ul style="list-style-type: none"> <li>• Potentiometer replacement</li> <li>• Avionics &amp; radio controls</li> <li>• Marine steering &amp; throttle</li> <li>• Motor/pump speed, direction &amp; position</li> <li>• Camera control</li> <li>• XY stage positioning</li> <li>• Video/sound editing equipment</li> <li>• Valve position</li> <li>• Medical diagnostic equipment</li> <li>• Syringe pump</li> </ul>







## ANGULAR AND LINEAR ENCODERS



	<b>ED22</b>	<b>R36</b>	<b>ED32i</b>	<b>ED34</b>	<b>MRLF30-USB</b>
<b>Applications</b>	Potentiometer Replacement	Heavy Duty Shaftless	Linear Displacement Sensing	Linear Displacement Sensing	Linear Displacement Sensing
<b>Type</b>	Hall-Effect Angular Encoder	Hall-Effect Angular Encoder	Magneto-Resistive Scale based Linear Encoder	Magneto-Resistive Scale based Linear Encoder	Magneto-Resistive Scale based Linear Encoder
<b>Description</b>	Absolute, Analog Output	Absolute, Analog Output	Incremental or Absolute	Incremental AB signal	Absolute, USB Interface
<b>Range</b>	0 to 300° (mech. stops)	0 to 180°	0 to 100m (incr) 100mm (abs)	0 to 100m	30mm
<b>Supply Voltage</b>	5±0.25VDC	5±0.25VDC	5±0.25VDC	5±0.25VDC	5±0.5VDC
<b>Output</b>	0 to 5VDC for 0 to 270°	0.5 to 4.5VDC	ABZ Quadrature (TTL level) or RS485	Quadrature (TTL level)	USB Type A (Full Duplex)
<b>Resolution</b>	8 bits (1.4°)	1.4°	10 µm	0.5 µm	—
<b>Maximum speed</b>	300 RPM	—	4 m/s	12 m/s	10ms update time
<b>Operating Temperature</b>	-40°C to +85°C	-40°C to +85°C	-25°C to +85°C	-25°C to +85°C	-25°C to +85°C
<b>Size, in (mm)</b>	0.75 (19) diameter	(38.1 x 25.4 x 7.62)	(60 x 20 x 10)	(20 x 10 x 8)	—
<b>Bearing System</b>	Aluminum sleeve	Not applicable	Not applicable	Not applicable	Not applicable
<b>Shaft Diameter, in (mm)</b>	1/4 (6.3)	Not applicable	Not applicable	Not applicable	Not applicable
<b>Features</b>	<ul style="list-style-type: none"> <li>• Excellent stability</li> <li>• 3 million cycle life</li> <li>• Sealed electronics</li> <li>• High vibration and shock resistant</li> <li>• For harsh environments</li> <li>• Metal shaft &amp; barrel</li> </ul>	<ul style="list-style-type: none"> <li>• Shaftless</li> <li>• Very rugged</li> <li>• Sealed electronics</li> <li>• High vibration and shock resistant</li> <li>• For harsh environments</li> <li>• Target: Magnet</li> </ul>	<ul style="list-style-type: none"> <li>• Non-contact measurement</li> <li>• Very high accuracy</li> <li>• Programmable resolution</li> <li>• Error detection</li> <li>• Adapter plate for easy mounting</li> <li>• Target: Magnet</li> </ul>	<ul style="list-style-type: none"> <li>• Non-contact measurement</li> <li>• Excellent accuracy at very high speeds</li> <li>• Programmable resolution</li> <li>• Error detection</li> <li>• Very small housing</li> </ul>	<ul style="list-style-type: none"> <li>• USB powered</li> <li>• Full duplex serial interface</li> <li>• High accuracy</li> <li>• Very low hysteresis</li> <li>• Magnet out-of-range detection</li> <li>• C- or T-Slot compatible</li> </ul>
<b>IP Rating</b>	IP52	IP52	IP67	IP67	RoHS
<b>Options</b>	<ul style="list-style-type: none"> <li>• Electrical cable or pins</li> <li>• Special connectors</li> <li>• Extended temp range</li> </ul>	—	<ul style="list-style-type: none"> <li>• USB version</li> <li>• Cable or connector</li> <li>• Special connectors</li> <li>• Extended accuracy</li> </ul>	<ul style="list-style-type: none"> <li>• Cable or connector</li> <li>• Special connectors</li> </ul>	<ul style="list-style-type: none"> <li>• Cable length</li> <li>• Connector</li> </ul>
<b>Typical Applications</b>	<ul style="list-style-type: none"> <li>• Machine tool control</li> <li>• Paint spraying system control</li> <li>• Medical equipment</li> <li>• Test &amp; measuring equipment</li> <li>• Off highway cabin controls</li> <li>• Marine equipment</li> <li>• Exercise equipment</li> <li>• Valve positioning</li> <li>• Industrial joysticks</li> </ul>	<ul style="list-style-type: none"> <li>• Machine tool control</li> <li>• Medical equipment</li> <li>• Test &amp; measuring equipment</li> <li>• Rotational position feedback</li> <li>• Human-machine interface</li> </ul>	<ul style="list-style-type: none"> <li>• Linear displacement measurement in industrial and medical applications</li> <li>• Cutting tools (including laser) for stone, wood, water, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Linear displacement measurement in industrial and medical applications</li> <li>• Cutting tools (including laser) for stone, wood, water, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Handling machines</li> <li>• Machine tools</li> <li>• Pneumatic cylinder position</li> <li>• Gripper positioning</li> </ul>

## ANISOTROPIC MAGNETO-RESISTIVE (AMR) SENSOR COMPONENTS

TE AMR sensor components are precise and contactless devices that measure the changes in the angle of a magnetic field as seen by the sensor. The unique feature of the AMR effect enables designs of devices that can either detect disturbance in extremely weak fields, for example in traffic detection sensors, as well as precision encoders using strong fields (for example from a magnet). All AMR sensor components are ROHS compliant.

	 <b>MS32</b>	 <b>KMT32B</b>	 <b>KMT36H</b>	 <b>KMA36</b>	 <b>KMY, KMZ</b>	 <b>MLS</b>
<b>Description</b>	Low Field Switching Sensor	Absolute Angle Sensor	Absolute Angle Sensor	Angular or Linear Sensor Device	Linear Low Field Sensor	Linear Position Sensor
<b>Type</b>	Magneto-Resistive	Magneto-Resistive	Magneto-Resistive	Magneto-Resistive	Magneto-Resistive	Magneto-Resistive
<b>Range</b>	1 to 3kA/m magnetic switch field	180° angle	360° angle	360° angle 10mm absolute	-2 to +2kA/m magnetic field	Absolute within pole pitch, or incremental
<b>Supply voltage</b>	1 to 30VDC	1 to 10 VDC	1 to 12 VDC	2.9 to 6.0 VDC	1 to 10 VDC	1 to 10 VDC
<b>Output</b>	Ratiometric 12 mV/V	Sine/Cosine 22 mV/V	3x120° shifted 20 mV/V	PWM and I <sup>2</sup> C	Ratiometric 22 mV/V	Sine/Cosine 22 mV/V
<b>Accuracy</b>	0.1 KA/m	0.1 to 1°	0.1 to 1°	0.3° 30µm	1% of range	0.1 to 1% of pole pitch
<b>Resolution</b>	0.1 KA/m	0.01 to 0.1°	0.01 to 0.1°	0.1° 5µm	0.1% of range	0.01 to 0.1% of pole pitch
<b>Speed</b>	1 MHz	60,000 RPM	60,000 RPM	Update rate 24-720Hz	1 MHz	12 m/s
<b>Operating Temperature</b>	-25°C to +125°C	-40°C to +150°C	-40°C to +125°C	-25°C to +85°C	-40°C to +150°C	-40°C to +85°C
<b>Package</b>	TDFN 2.5 x 2.5	TDFN 2.5 x 2.5; SO-8	TDFN 2.5 x 2.5	TSSOP20	SOT-223, SOT-4WL	Die or Hybrid
<b>Size, mm</b>	2.5x2.5x0.8	TDFN:2.5x2.5x0.8 SO-8: 5x4x1.75	TDFN:2.5x2.5x0.8	6.5 x 6.4 x 1.2	223: 6.6x7.0x1.6 4WL: 16x4.2x2.4	Die: 5.2x1.2x0.5 HD: 7.6x5.3x1.4 HS: 18 x 8 x 2
<b>Features</b>	<ul style="list-style-type: none"> <li>• Linearized output</li> <li>• Temperature-compensated switching point</li> <li>• Low power consumption</li> <li>• Wheatstone bridge type</li> <li>• Linear field response</li> </ul>	<ul style="list-style-type: none"> <li>• High accuracy</li> <li>• High resolution</li> <li>• High temperature 175°C on request</li> <li>• Low power consumption</li> <li>• Self diagnosis</li> </ul>	<ul style="list-style-type: none"> <li>• High accuracy</li> <li>• High resolution</li> <li>• 360° full turn</li> <li>• Self diagnosis</li> </ul>	<ul style="list-style-type: none"> <li>• Absolute and incremental</li> <li>• Linear mode</li> <li>• Low power mode</li> <li>• Sleep mode</li> <li>• Auto wake-up (I<sup>2</sup>C)</li> <li>• Programmable parameters</li> </ul>	<ul style="list-style-type: none"> <li>• High sensitivity</li> <li>• Very low hysteresis</li> <li>• Linear to uniaxial field strength</li> <li>• Available with internal magnet</li> <li>• High temperature</li> <li>• Full or half bridge</li> </ul>	<ul style="list-style-type: none"> <li>• Pole pitches from 1 to 5mm available</li> <li>• Very high precision</li> <li>• Insensitive to air gap fluctuations</li> </ul>
<b>Typical Applications</b>	<ul style="list-style-type: none"> <li>• Piston position switch</li> <li>• Reed switch replacement</li> <li>• Notebook cover position</li> <li>• Door, window position</li> </ul>	<ul style="list-style-type: none"> <li>• Steering position</li> <li>• Flowmeters</li> <li>• Tachometers</li> <li>• Rotary encoders</li> <li>• Motor motion control</li> <li>• Camera positioning</li> <li>• Medical applications</li> <li>• Torque (automotive)</li> <li>• Robotics</li> </ul>	<ul style="list-style-type: none"> <li>• Steering position</li> <li>• Gauge readings</li> <li>• Rotary encoders</li> <li>• Potentiometer replacement</li> <li>• Camera positioning</li> <li>• Robotics</li> <li>• Motor motion control</li> </ul>	<ul style="list-style-type: none"> <li>• Knobs, potentiometers</li> <li>• Small robots</li> <li>• Angular &amp; linear position encoders</li> <li>• Battery powered applications</li> <li>• Handling machines</li> <li>• Motor motion control</li> </ul>	<ul style="list-style-type: none"> <li>• Non-destructive material testing</li> <li>• Dish washer spray arm detection</li> <li>• Magnetic imaging</li> <li>• Brake pedal position</li> <li>• Gear revolutions</li> <li>• Contactless switch</li> <li>• Displacement sensors</li> <li>• Detection of low magnetic fields</li> </ul>	<ul style="list-style-type: none"> <li>• Roller conveyors</li> <li>• Circular saws</li> <li>• Bending machines</li> <li>• Velocity measurements</li> <li>• Cutting tools (water, laser, wood, stone)</li> </ul>

# POSITION SENSORS PRODUCT GUIDE

## INCLINOMETERS AND TILT PRODUCTS

TE offers capacitive, conductive electrolytic and MEMS tilt sensing technologies in rugged die-cast aluminum, ceramic, or plastic packages. These products feature many analog and digital I/O options, with linearized and temperature compensated outputs. OEM and end-user packaging is available as well as raw sensors for high volume OEM applications.



**E Series**



**AAL Series**



**DPL/DPN Series**



**E2 Series**

Type	Single Axis	Dual Axis	Dual Axis	Dual Axis
Technology	Conductive Liquid Cell	Conductive Liquid Cell	Conductive Liquid Cell	Conductive Liquid Cell
Description	Voltage Output PCB Mountable	Voltage Output OEM Module	Analog & Digital OEM Module	Voltage Output OEM Module
Range(s), degree	±5° or ±15°	±2° to ±30°	±2° to ±30°	±5, ±10, ±15 or ±45°
Supply Voltage	6.5 to 24VDC	4.75 to 5.25VDC	4.75 to 5VDC, or 7 to 30VDC	12 to 24 VDC
Frequency or Time Response at 25°C	2-3 Hz at -3dB	—	Programmable	2s for 99% 5 to 0° step
Output(s)	±1.5VDC (±15°) or ±3VDC (±5°)	0.3 to 4.7VDC	RS232 with/without 0.3 to 4.7VDC; TTL, or SPI	0.5 to 4.5 or ±2VDC
Accuracy (room temperature)	0.3°	0.08° to 0.3°	0.05° to 0.15°	0.08° to 0.15°
Resolution	0.02°	0.001° to 0.01°	0.001°	0.001° to 0.01°
Operating Temperature	-25 to +85°C	-40 to +85°C	-40 to +85°C	0 to +70°C
Dimensions, in	1.14 x 0.67 x .63	1.77 x 1.77 x 0.79	1.77 x 1.77 x 0.79	1.77 x 1.77 x 0.79
Dimensions, mm	29 x 17 x 16	45 x 45 x 20	45 x 45 x 20	45 x 45 x 20
Features	<ul style="list-style-type: none"> <li>• Ceramic housing</li> <li>• SIL solder contacts</li> <li>• Low weight</li> <li>• Small form factor</li> <li>• Easy to integrate</li> </ul>	<ul style="list-style-type: none"> <li>• High accuracy</li> <li>• Temperature Compensated</li> <li>• High resolution</li> <li>• I<sup>2</sup>C-EEPROM on board</li> </ul>	<ul style="list-style-type: none"> <li>• High accuracy</li> <li>• High resolution</li> <li>• Fast response time</li> <li>• Programmable digital filtering, zero point, baud rate, and output rate</li> </ul>	<ul style="list-style-type: none"> <li>• High resolution</li> <li>• Fast response time</li> <li>• Low drift</li> <li>• Low noise level</li> </ul>
Typical Applications	<ul style="list-style-type: none"> <li>• Platform leveling</li> <li>• Building monitoring</li> <li>• Weighing systems</li> <li>• Mobile/stationary cranes</li> <li>• Road construction machines</li> </ul>	<ul style="list-style-type: none"> <li>• Building monitoring</li> <li>• Weighing systems</li> <li>• Truck chassis leveling</li> <li>• Mobile/stationary cranes</li> <li>• Lift platforms</li> <li>• Vehicle applications</li> <li>• Road construction machines</li> </ul>	<ul style="list-style-type: none"> <li>• Platform leveling</li> <li>• Drilling machines</li> <li>• Weighing systems</li> <li>• Mobile/stationary cranes</li> <li>• Hydraulic leveling</li> <li>• Wind power</li> <li>• Road construction machines</li> </ul>	<ul style="list-style-type: none"> <li>• Mobile/stationary cranes</li> <li>• Platform leveling</li> <li>• Building monitoring</li> <li>• Hydraulic leveling</li> <li>• Drilling machines</li> <li>• Vehicle applications</li> <li>• Road construction machines</li> </ul>



## INCLINOMETERS AND TILT PRODUCTS



	<b>P Series</b>	<b>V Series</b>	<b>G Series</b>	<b>D Series</b>	<b>DPG Series</b>
<b>Type</b>	Single or Dual Axis	Single or dual Axis	Single Axis	Dual Axis	Dual Axis
<b>Technology</b>	Conductive Liquid Cell	Conductive Liquid Cell	Conductive Liquid Cell	Conductive Liquid Cell	Conductive Liquid Cell
<b>Description</b>	Analog & RS-232 Aluminum Housing	Voltage or Current Aluminum Housing	Switch Outputs Aluminum Enclosure	Voltage & Digital Out Aluminum Housing	Voltage & RS232 Out Aluminum Housing
<b>Range(s), degree</b>	±5°, ±15°, or ±45°	±5°, ±15°, or ±45°	±10°	±5°, ±15°, or ±30°	±5°, ±15°, or ±30°
<b>Supply Voltage</b>	6.5 to 24 VDC	12 to 24 VDC	14.4 to 30VDC	10 to 30 VDC	7 to 30 VDC
<b>Frequency or Time Response at 25°C</b>	2-3 Hz @-3dB	2-3 Hz @-3dB	2-3 Hz @-3dB	-0.3s for 90% 0 to 5° step	+0.3s for 90% 0 to 5° step
<b>Output(s)</b>	RS 232 with/without ±1.5VDC or 4-20mA	+/-2 V , 0.5 to 4.5V or 4-20mA	Solid state switch	RS232 with 0.3 to 4.7VDC, 4-20mA, or PWM, or CANopen	0.3 to 4.7 VDC & RS232
<b>Accuracy (room temperature)</b>	0.02° to 0.8°	0.08° to 0.9°	0.25°	0.04° to 0.15°	0.06° to 0.5°
<b>Resolution</b>	0.001° to 0.005°	0.01° to 0.001°	0.001°	0.001° to 0.005°	0.001°
<b>Operating Temperature</b>	-25 to +85°C	0 to +70°C	-25 to +85°C	-40 to +85°C	-40 to +85°C
<b>Dimensions, in</b>	Single 3.54x1.57x1.79 Dual 3.54x2.36x1.79	3.54 x 2.36 x 1.79	3.15 x 2.24 x 2.95	3.31 x 2.76 x 1.81	3.31 x 2.76 x 1.22
<b>Dimensions, mm</b>	Single 90 x 40 x 45.5 Dual 90 x 60 x 45.5	90 x 60 x 45.5	80 x 57 x 75	84 x 70 x 46	84 x 70 x 31
<b>Features</b>	<ul style="list-style-type: none"> <li>• High accuracy</li> <li>• High resolution</li> <li>• Robust metal housing</li> <li>• Programmable zero &amp; baud rate</li> <li>• Temperature compensated</li> <li>• RS232 output</li> </ul>	<ul style="list-style-type: none"> <li>• Robust metal housing</li> <li>• M9, 7-Pin connector</li> <li>• Voltage or current output</li> <li>• High resolution</li> </ul>	<ul style="list-style-type: none"> <li>• Robust housing</li> <li>• High accuracy</li> <li>• Programmable switch thresholds</li> <li>• Temperature compensated</li> <li>• EMC protected</li> <li>• Wall mounted</li> </ul>	<ul style="list-style-type: none"> <li>• High accuracy</li> <li>• High resolution</li> <li>• Robust metal housing</li> <li>• EMI protected</li> <li>• M12 male connector</li> <li>• Programmable digital filtering, zero point, baud rate, output rate</li> </ul>	<ul style="list-style-type: none"> <li>• High accuracy and resolution</li> <li>• Robust metal housing</li> <li>• EMI protected</li> <li>• Temperature compensated</li> <li>• High output data transfer</li> <li>• Programmable digital filtering</li> </ul>
<b>Certifications</b>	—	—	—	CE	CE
<b>IP Rating</b>	IP65	IP65	IP67	IP67	IP67
<b>Typical Applications</b>	<ul style="list-style-type: none"> <li>• Building monitoring</li> <li>• Drilling machines</li> <li>• Weighing systems</li> <li>• Mobile/stationary cranes</li> <li>• Hydraulic leveling</li> <li>• Platform leveling</li> <li>• Road construction machines</li> </ul>	<ul style="list-style-type: none"> <li>• Drilling machines</li> <li>• Vehicle applications</li> <li>• Building monitoring</li> <li>• Mobile/stationary cranes</li> <li>• Hydraulic leveling</li> <li>• Platform leveling</li> <li>• Road construction machines</li> </ul>	<ul style="list-style-type: none"> <li>• Alarm switch</li> <li>• Building monitoring</li> <li>• Mobile/stationary cranes</li> <li>• Forklift trucks &amp; hoists</li> <li>• Road construction machines</li> </ul>	<ul style="list-style-type: none"> <li>• Building monitoring</li> <li>• Construction machines</li> <li>• Wind power</li> <li>• Weighing systems</li> <li>• Mobile/stationary cranes</li> <li>• Hydraulic leveling</li> <li>• Platform leveling</li> <li>• Drilling machines</li> </ul>	<ul style="list-style-type: none"> <li>• Mobile/stationary cranes</li> <li>• Lift platforms</li> <li>• Building monitoring</li> <li>• Weighing systems</li> <li>• Truck chassis leveling</li> <li>• Vehicle applications</li> <li>• Road construction machines</li> </ul>

## INCLINOMETERS AND TILT PRODUCTS



**Ibox Series**



**Ibox Series**



**Ibox Series**



**Ibox Series**

Type	Dual Axis	Single Axis	Dual Axis	Dual Axis
Technology	MEMS	MEMS	MEMS	MEMS
Description	Voltage Output PA 6.6 housing	Voltage Output PA 6.6 housing	USB Interface PA 6.6 housing	CAN J1939 Interface PA 6.6 housing
Range(s), degree	±25°, ±45°, or ±90°	±180°, or 0 to 360°	±90°	±90°
Supply Voltage	8 to 30 VDC	8 to 30 VDC	5 VDC USB	5 VDC
Frequency or Time Response at 25°C	~ 0.1s for 90% full step	~ 0.1s for 90% full step	~ 0.1s for 90% full step	~ 0.1s for 90% full step
Output(s)	0.5 to 4.5VDC	0.5 to 4.5VDC	USB	J1939
Accuracy (room temperature)	0.15°	0.2°	0.15°	0.15°
Resolution	0.006° to 0.02°	0.04°	0.01°	0.01°
Operating Temperature	-40 to +85°C	-40 to +85°C	-40 to +85°C	-40 to +85°C
Dimensions, in	2.77 x 1.77 x 0.59	2.77 x 1.77 x 0.59	2.77 x 1.77 x 0.59	2.77 x 1.77 x 0.59
Dimensions, mm	70.5 x 45 x 15	70.5 x 45 x 15	70.5 x 45 x 15	70.5 x 45 x 15
Features	<ul style="list-style-type: none"> <li>• High resolution</li> <li>• Fast response time</li> <li>• Robust PA 6.6 housing</li> <li>• Integrated filtering</li> <li>• Temperature compensated</li> <li>• Voltage output</li> <li>• Robust 4-Pin AMP connector</li> </ul>	<ul style="list-style-type: none"> <li>• Fast response time</li> <li>• Robust PA 6.6 housing</li> <li>• Integrated filtering</li> <li>• Temperature compensated</li> <li>• Voltage output</li> <li>• Robust 3-Pin AMP connector</li> </ul>	<ul style="list-style-type: none"> <li>• Programmable filtering</li> <li>• Fast response time</li> <li>• High resolution</li> <li>• Robust PA 6.6 housing</li> <li>• Temperature compensated</li> <li>• USB output</li> </ul>	<ul style="list-style-type: none"> <li>• Integrated filtering</li> <li>• Fast response time</li> <li>• High resolution</li> <li>• Robust PA 6.6 housing</li> <li>• Temperature compensated</li> <li>• CAN interface</li> <li>• Robust 4-Pin AMP connector</li> </ul>
IP Rating	IP67	IP67	IP67	IP67
Typical Applications	<ul style="list-style-type: none"> <li>• Forklift trucks &amp; hoists</li> <li>• Vehicle applications</li> <li>• Building monitoring</li> <li>• Drilling machines</li> <li>• Mobile/stationary cranes</li> <li>• Hydraulic leveling</li> <li>• Programmable filtering</li> <li>• Road construction machines</li> </ul>	<ul style="list-style-type: none"> <li>• Drilling machines</li> <li>• Vehicle applications</li> <li>• Building monitoring</li> <li>• Mobile/stationary cranes</li> <li>• Hydraulic leveling</li> <li>• Platform leveling</li> <li>• Road construction machines</li> <li>• Truck chassis leveling</li> </ul>	<ul style="list-style-type: none"> <li>• Test &amp; Measurement</li> <li>• Building monitoring</li> <li>• Mobile/stationary cranes</li> <li>• Vehicle applications</li> <li>• Platform monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Vehicle applications</li> <li>• Forklift trucks &amp; hoists</li> <li>• Automation applications</li> <li>• Building monitoring</li> <li>• Mobile/stationary cranes</li> <li>• Platform monitoring</li> <li>• Truck applications</li> </ul>

## INCLINOMETERS AND TILT PRODUCTS



**Accustar**



**Accustar IP66**



**AngleStar System**



**AngleStar DP-45**

Type	Single Axis	Single Axis	Digital Protractor	Digital Protractor
Technology	Capacitive Fluid-Filled	Capacitive Fluid-Filled	Capacitive Fluid-Filled	Capacitive Fluid-Filled
Description	Voltage or Digital Out Light Weight	Voltage or current out Water Tight Enclosure	System with Accustar for Remote Sensing	All-In-One Protractor with Hold Function
Range(s), degree	±45°	±3° to ±45°	±19.99 °, ±45 ° and 0 to 90°	±45°
Supply Voltage	5 to 15, ±8 to ±15, or 4.75 to 5.25VDC	12 to 30 VDC (24 VDC min for 4-20mA)	9V battery or external 9 to 15 VDC	9V battery
Frequency Response at 25°C	0.5 Hz @-3dB	0.5 Hz @-3dB	0.5 Hz @-3dB	—
Output(s)	0.3 V/VDC, ±2.7VDC, digital, or PWM	0.5 to 4.5VDC or 4-20mA	3 digit LCD display	3 digit LCD display
Accuracy (room temperature)	0.9°	0.1° to 0.45°	—	0.1° to 0.7°
Resolution	0.002°	—	0.01° to 0.45°	0.1°
Operating Temperature	-30 to +65°C	-25 to +60°C	-18 to +55°C	0 to +65°C
Dimensions, in	Ø2 x 1.2 High	3.86 x 2.48 x 1.38	5.04 x 3.47 x 1.30	5.45 x 3.21 x 1.5
Dimensions, mm	Ø51 x 31 High	98 x 63 x 35	128 x 88 x 33	139 x 82 x 38
Features	<ul style="list-style-type: none"> <li>• Low 2oz (57g) weight</li> <li>• Rugged plastic housing</li> </ul>	<ul style="list-style-type: none"> <li>• Die-cast aluminum Housing</li> <li>• 2-Meter cable</li> </ul>	<ul style="list-style-type: none"> <li>• Separate sensor &amp; readout</li> <li>• External power jack</li> <li>• Remote sensing up to 200 feet from display</li> </ul>	<ul style="list-style-type: none"> <li>• 100 hours approx on 9V battery</li> <li>• Alternate reference (floating zero) function</li> <li>• Display hold button</li> <li>• High impact carrying case</li> <li>• Low battery &amp; over-range indicator</li> </ul>
Certifications	CE	—	—	—
IP Rating	—	IP66	—	—
Typical Applications	<ul style="list-style-type: none"> <li>• Wheel alignment machines</li> <li>• Robotics</li> <li>• Antenna positioning</li> <li>• Road construction machines</li> </ul>	<ul style="list-style-type: none"> <li>• Tower crane safety systems</li> <li>• RV leveling systems</li> <li>• Machine tool angle</li> <li>• Medical trailer leveling system for mobile CT scanners and MRI</li> <li>• Barge load distribution</li> <li>• Well drilling rigs</li> <li>• Mining equipment</li> </ul>	<ul style="list-style-type: none"> <li>• Platform leveling systems</li> <li>• Antenna Positioning systems</li> <li>• Mining Equipment</li> <li>• Machine Tooling</li> </ul>	<ul style="list-style-type: none"> <li>• Driveshaft maintenance</li> <li>• Antenna positioning systems</li> <li>• Race cars</li> <li>• Machine tooling</li> </ul>

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