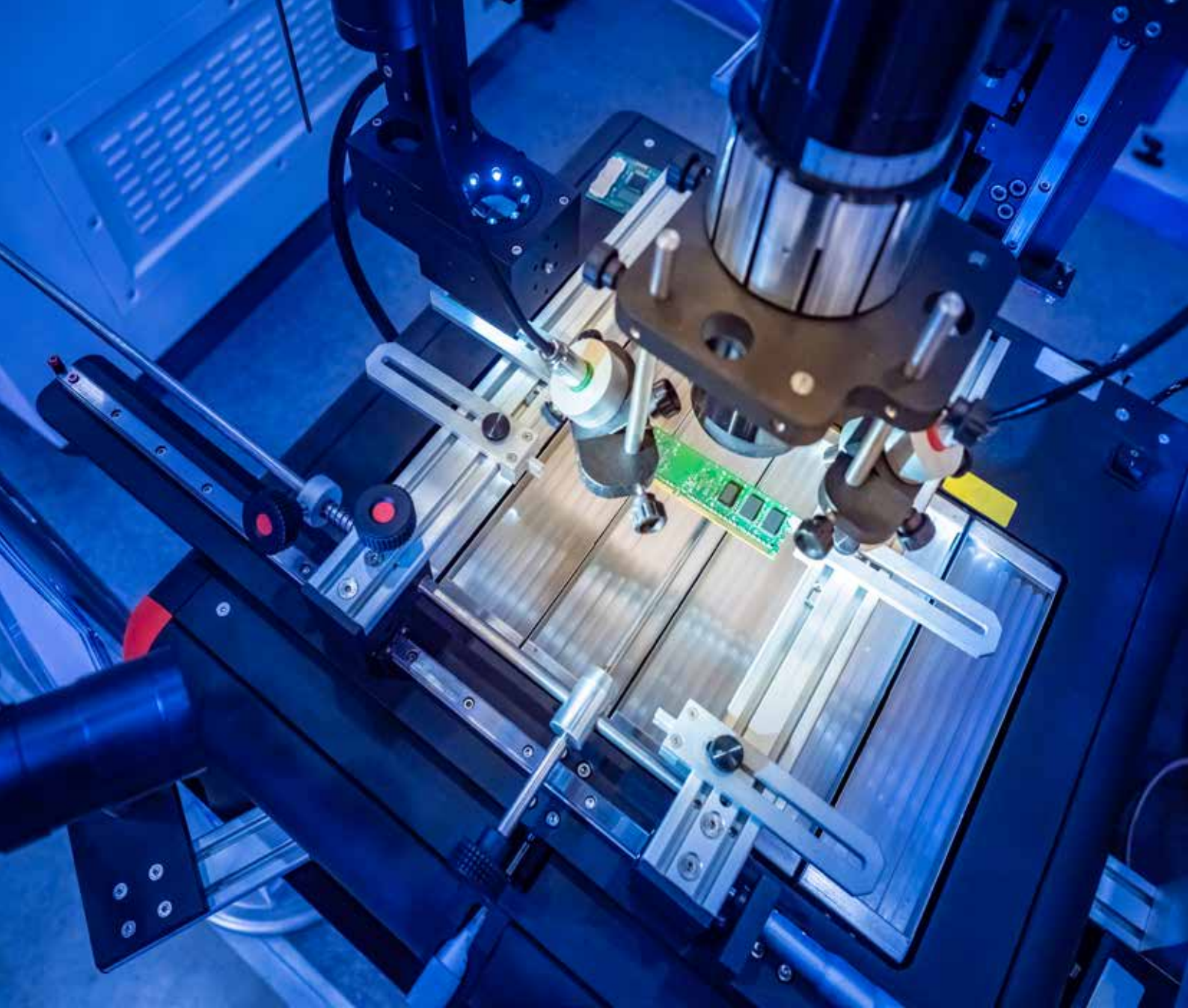




Digitized Automation for a Changing World

Delta Optical Linear Encoder MSR-LE Series



www.deltaww.com



Delta Optical Linear Encoder

With the advance of technology in manufacturing, semiconductors, medical devices, and aerospace engineering, there is a growing demand for higher-precision measuring. Traditional measurement technology falls short for micro / nano-scale and accurate motion applications, leading to production and cost inefficiencies. Aiming for better product quality and smart manufacturing, the Delta Optical Linear Encoder is designed with enhanced stability and reliability.

The Delta Optical Linear Encoder boasts benefits such as high resolution, non-contact sensing, high dirt immunity, and robust stability. This encoder is applicable to the positioning of linear dynamic motion, and suitable for high-speed and high-precision applications. With these benefits, the Delta Optical Linear Encoder is the top choice for positioning control signal feedback.



Reflective Optical Sensor



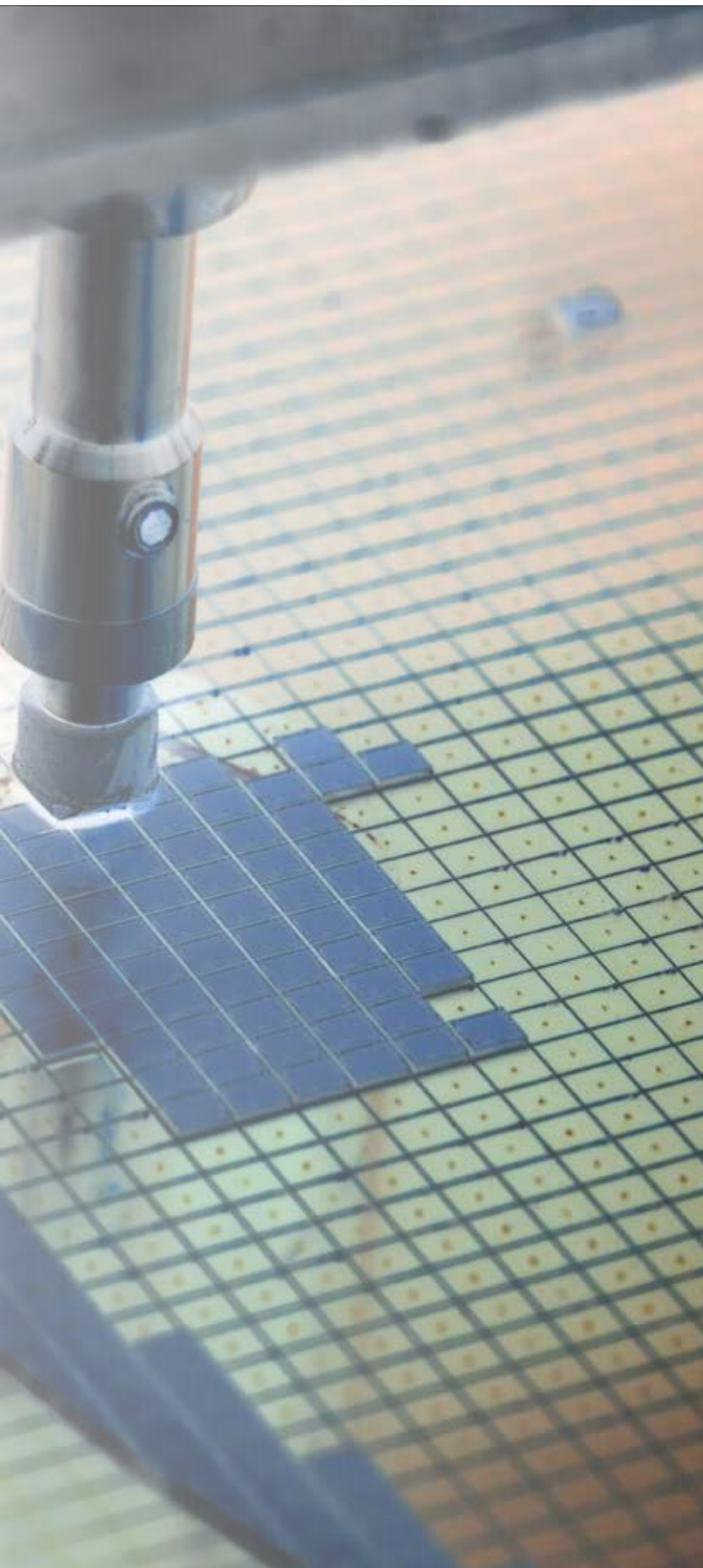
High Precision Measurement



High Immunity to Dirt



Real-time Alarm & Signal Quality Monitoring



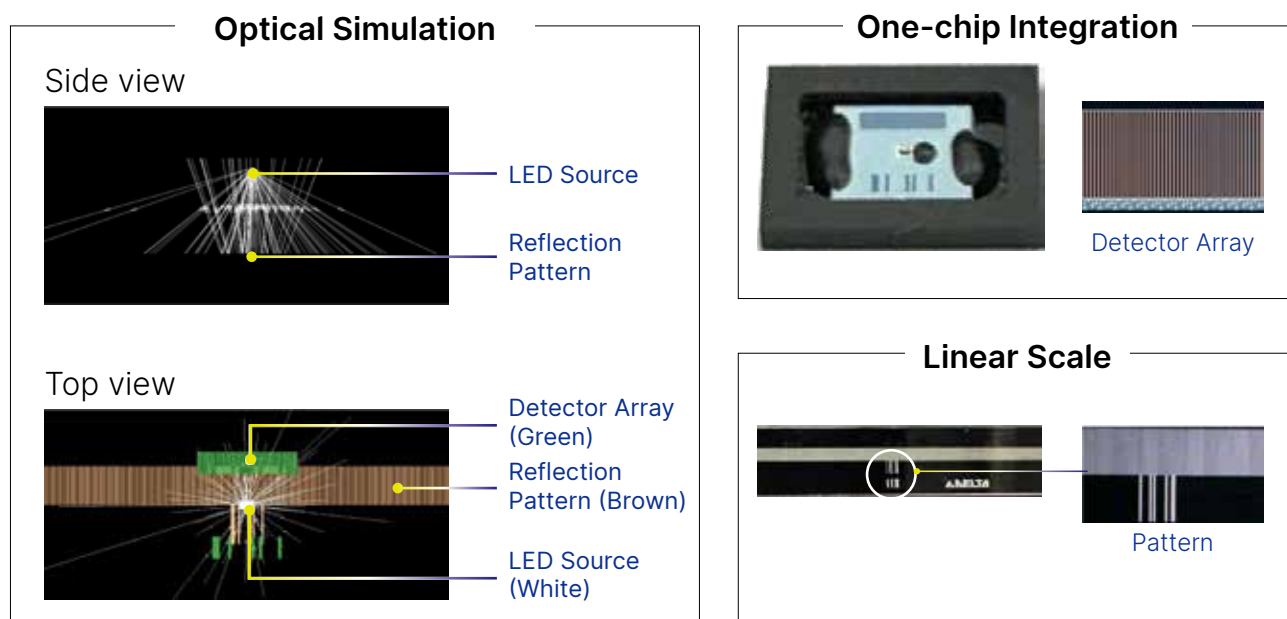
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Features

Reflective Optical Sensor

- Precise optical ray tracing simulation
- One-chip integration of light source and detector
- Achieves high-precision measurement with higher installation tolerance



High Immunity to Dirt

- Patterned array design enhances dirt immunity, such as to light cutting oil stains and dirt particles

Surface	Clean	Fingerprint	Cutting Oil	Marker Pen
Image				
Contaminant Width	-	11mm	4 mm	1mm
Signal Quality (%)	100	58	43	79
Signal Distortion	NO	NO		
		Contaminants lower the signal quality, but Delta's built-in array algorithm ensures signal reconstruction		

Superior Precision Measurement

- With laser interferometer verification, the Delta Linear Motion Module* achieves the repeatability precision of 0.128 μm
- In general applications, a common stage requires 2 μm repeatability, while an advanced stage requires 1 μm . The Delta Linear Motion Module* solution meets the requirements

Unit	(+) μm	(-) μm	(Bidir) μm
Repeatability	0.105	0.073	0.128

* The Delta Linear Motion Module is comprised of a Delta Linear Motor, Delta Optical Linear Encoder, and air-bearing stage.



Air-bearing stage

Optical Linear Encoder

U type Linear Motor

Real-time Monitoring of Alarm Type & Signal Quality

- Provides signal quality diagnosis, status alarm, and unintended acceleration prevention; real-time monitoring of Alarm Code and Signal Quality Percentage
- With the Delta Servo Drive, it detects whether the encoder signal is too high, too low, or has a missing pulse
- When an anomaly occurs, the Linear Encoder reacts promptly, sending the Alarm Code to the servo drive for servo-off to prevent an unintended collision during a sudden position change

Alarm-code	Alarm 25*	Alarm 33*
Description	Abnormal pulse count	Abnormal A/B signals
Recovery	Check scale guideway cleanness and confirm no alarm in the overall distance, then turn it on.	Check encoder installation and confirm no alarm in the overall distance then turn it on.

* Communication output required



Signal quality monitoring



Screen Display	Delta	Others
Alarm Code	O	O
Signal Quality (%)	O	X

Applications

Electronics SMT Line Equipment



Pain Points

- To reduce surface mounting cycle time, high multi-axis efficiency is required
- Inaccurate force control leads to unstable yields
- Machine parameters require frequent adjustment, which sacrifices the simultaneous multi-axis control

Benefits

- Precision and productivity increase by **15%**
 - Real-time position feedback control saves commissioning time
 - Multi-axis controls enhance throughput
-

Optics Assembly Equipment



Pain Points

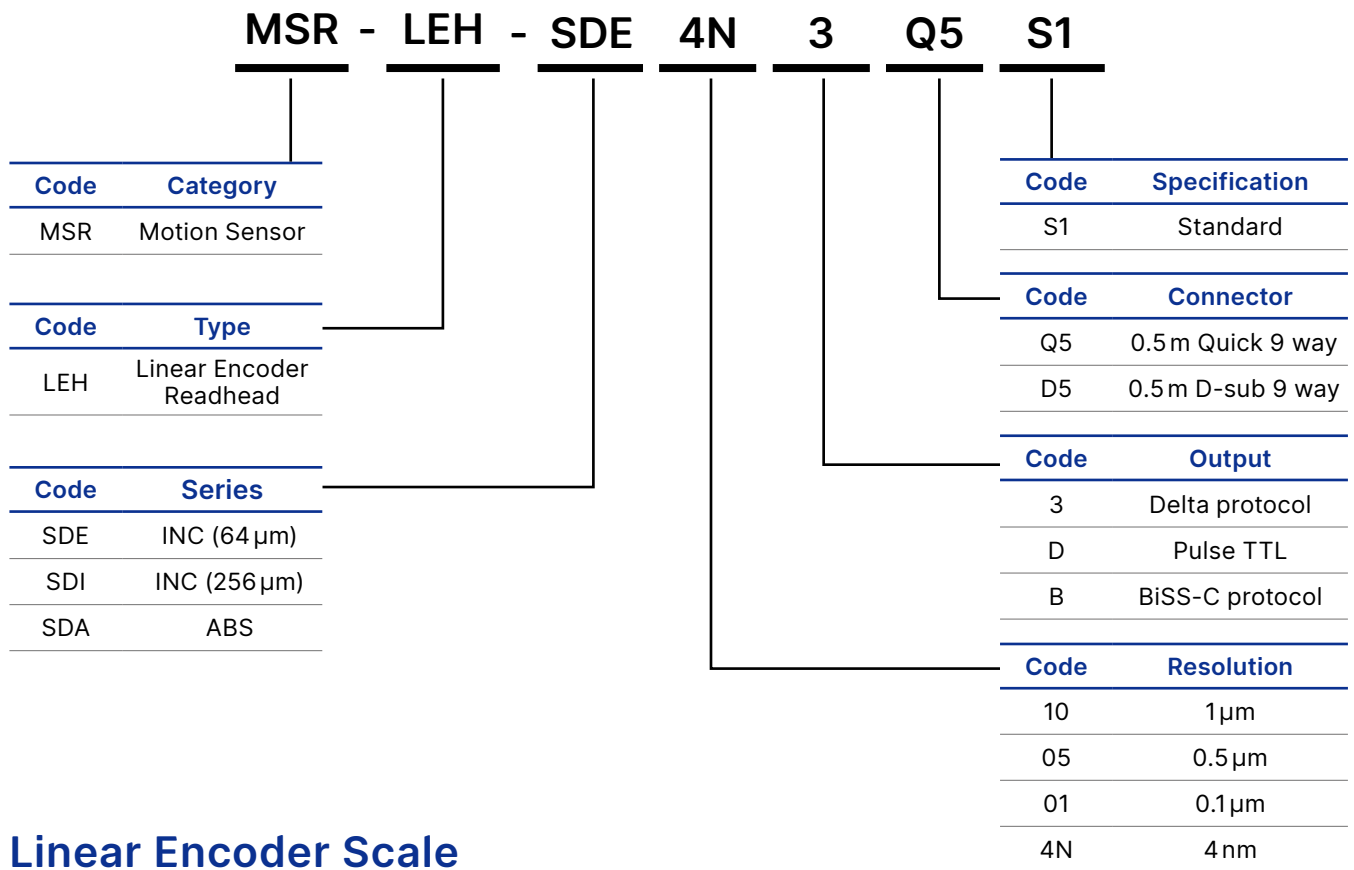
- Maximize production efficiency
- For a traditional air cylinder, it is difficult to automatically adjust positioning and record the pressing parameters for traceability

Benefits

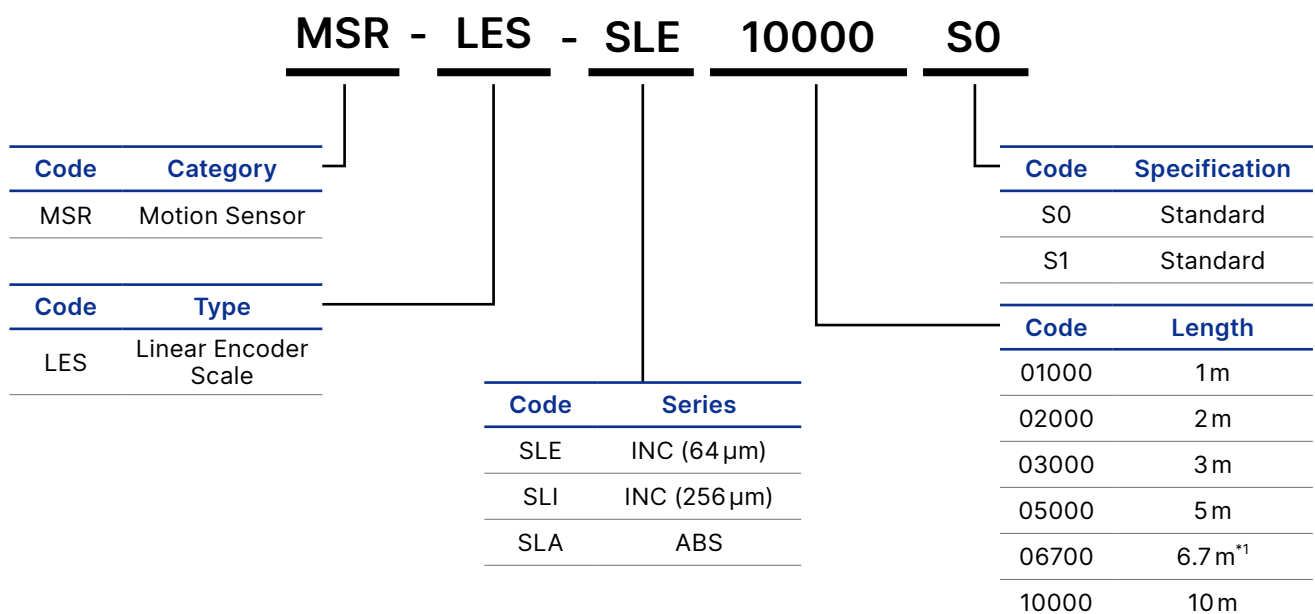
- Assembly speed and production yield up **25%**
 - Equipment parameters can be stored for anomaly analysis
-

Model Information

Linear Encoder Readhead



Linear Encoder Scale



*1: 6.7 m is the max. length of ABS, which is why 10 m of ABS can't be offered

Specifications

Linear Encoder Readhead

Series		MSR-LEH-SDI			MSR-LEH-SDE		MSR-LEH-SDA	
Model		MSR-LEH-SDIxxDD5S1			MSR-LEH-SDE4N3Q5S1		MSR-LEH-SDA4Nx5S1	
		xx=			-		x=	
		10	05	01	-		3	B
Dimensions (L × W × H)		35 × 13.5 × 11.5 mm			36.4 × 15.2 × 14.2 mm		36 × 16.5 × 16.5 mm	
Pitch		256 μm			64 μm		204.8 μm	
Max. Scale Length		10 m			10 m		6.7 m (Max.)	
Coefficient of Thermal Expansion (CTE)		11 μm/m/°C						
Scale Accuracy		± 5 μm/m [at 20°C]						
Max. Speed		Depends on Output Resolution*1			10 m/s		10 m/s	
Output		TTL, Differential A/B/Z			Comm., Delta protocol		Comm., Delta protocol	Comm., BiSS-C protocol
Resolution		1 μm	0.5 μm	0.1 μm	4 nm		4 nm	
Power Supply		5 V ± 5%, 170 mA (Max.)			5 V ± 5%, 170 mA (Max.)		5 V ± 5%, 250 mA (Max.)	
		5 V _{DC} supply complies with SELV requirements of IEC 60950-1						
EMC Compliance		IEC 61326-1						
Sub-Divisional Error		± ~ 0.5 μm			± ~ 80 nm		± ~ 160 nm	
Vibration (Operating)		≤ 100 m/s ² (55~2,000 Hz, 3 axes, EN 60068-2-6)						
Shock (Operating)		≤ 500 m/s ² (11 ms, ½ sine, 3 axes, EN 60068-2-27)						
Temperature (Storage)		-20 ~ +70°C					-20 ~ +80°C	
Temperature (Operating)		0 ~ +70°C					0 ~ +80°C	
Humidity		95% relative humidity (non-condensing) to IEC 60068-2-78						
IP Protection		IP40					IP64	
Cable		5 pairs, tinned and annealed copper, 30 AWG - Single-shielded, outside diameter 3.9 ± 0.2 mm - Flex life >40 × 10⁶ cycles at 50 mm bend radius - UL recognized component 			2 pairs, tinned and annealed copper, 30 AWG - Single-shielded, outside diameter 4.2 ± 0.2 mm - Flex life >10 × 10⁶ cycles at 50 mm bend radius - UL recognized component 		4 pairs, tinned and annealed copper, 30 AWG - Single-shielded, outside diameter 3.6 ± 0.2 mm - Flex life >40 × 10⁶ cycles at 50 mm bend radius - UL recognized component 	
Approvals								
Installation Tolerance	Y	± 0.2 mm			± 0.5 mm		± 0.4 mm	
	Z	± 0.2 mm						
	Roll ØX	± 0.5°			± 1.5°		± 1.5°	
	Pitch ØY	± 1.0°			± 1.5°		± 0.5°	
	Yaw ØZ	± 1°					± 2°	

*1: Max. Speed Table (P9)

Linear Encoder Scale

Series	MSR-LES-SLI Series	MSR-LES-SLE Series	MSR-LES-SLA Series
Dimensions (T × W)	0.4 × 8 mm		
Pitch	256 μm	64 μm	204.8 μm
Scale Accuracy (20 °C)	±5 μm/m		
Max. Length	10 m	10 m	6.7 m
Material	Stainless Steel, Back Adhesive		
Weight	12.3 g/m		
Coefficient of Thermal Expansion (CTE) (20 °C)	11 μm/m/°C		
Temperature	Operating	0 °C ~ +70 °C	
	Storage	−20 °C ~ +70 °C	
Humidity	95% RH (non-condensing)		

Max. Speed Table (TTL Type Output)

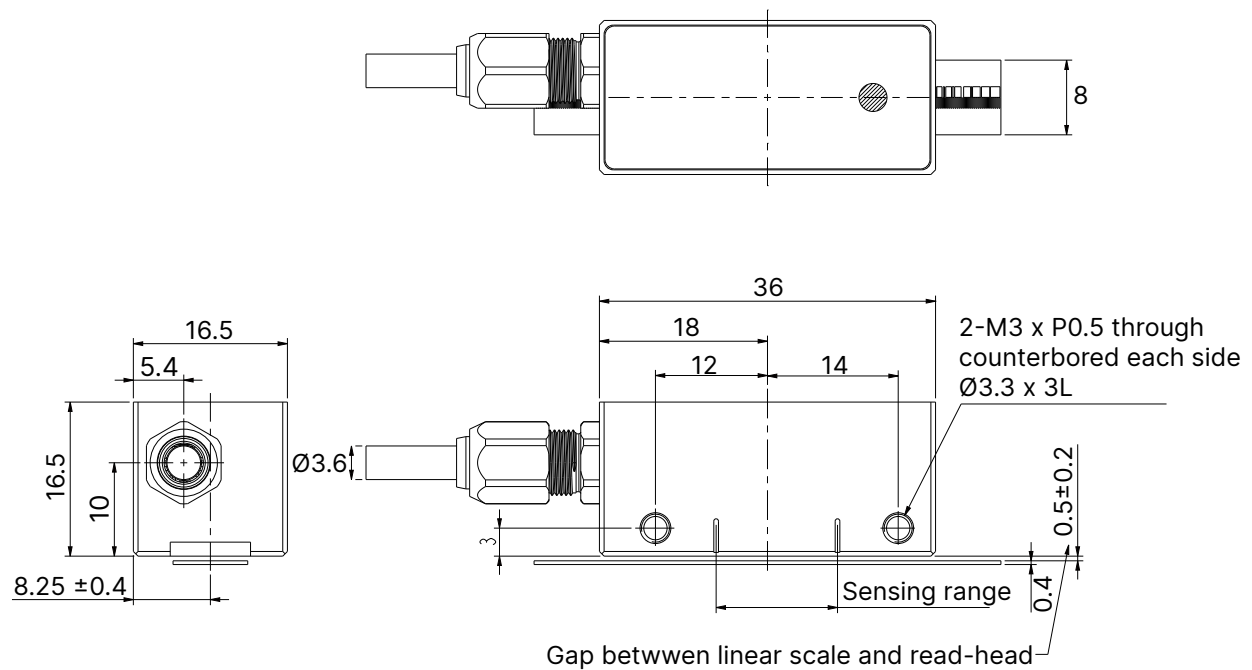
Resolution	1 μm	0.5 μm	0.1 μm
Clock Output Option (MHz)	Max. Speed (m/s)		
40	20 m/s	10 m/s	2 m/s
20	10 m/s	5 m/s	1.5 m/s
2	1 m/s	0.5 m/s	0.15 m/s

MSR-LEH-SDI



Linear Encoder Readhead

MSR-LEH-SDA

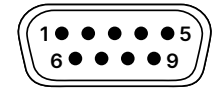


Output Pin Definition

INC TTL Output

MSR-LEH-SDIxxDD5S1, MSR-LEH-SDExxDD5S1 (D-sub 9 way)

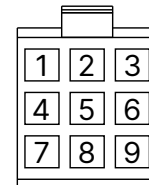
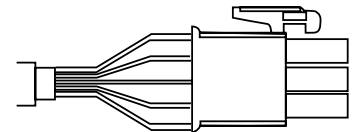
Function	Signal	D-sub 9 way
Power	5V	5
	GND	1
Output	A+	2
	A-	6
	B+	4
	B-	8
	Z+	3
	Z-	7
Calibration	CAL	9
Shielding	Shielding	Case



Read head Cable
is Male

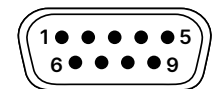
INC with Delta Protocol Output

Function	Signal	Quick 9 way
Power	5V	7
	GND	8
Output (Serial Comm.)	T+	1
	T-	4
	Reserved	2, 3, 5, 6
Shielding	Shielding	9



ABS with Communication Output

Function	Signal	D-sub 9 way
Power	5V	4
	GND	8
Output (Serial Comm.)	T+	5
	T-	9
	SLO+	6
	SLO-	7
	MA+	2
	MA-	3
Shielding	Shielding	Case



Read head Cable
is Male

Ordering Information

Linear Encoder Readhead

ABS/INC	Signal Output	Resolution	Compatible Servo Drive	Delta Model
INCremental 	A/B/Z TTL	1 μ m	All Servo-Drives	MSR-LEH-SDI10DD5S1
		0.5 μ m		MSR-LEH-SDI05DD5S1
		0.1 μ m		MSR-LEH-SDI01DD5S1
	Communication (Delta Protocol)	4 nm	Delta Servo Drive A3/W3 Series	MSR-LEH-SDE4N3Q5S1
ABSolute 	Communication (Delta Protocol)	4 nm	Delta Servo Drive A3/W3 Series	MSR-LEH-SDA4N3D5S1
	Communication (BiSS-C Protocol)	4 nm	Servo-Drives that support BiSS-C	MSR-LEH-SDA4NBD5S1

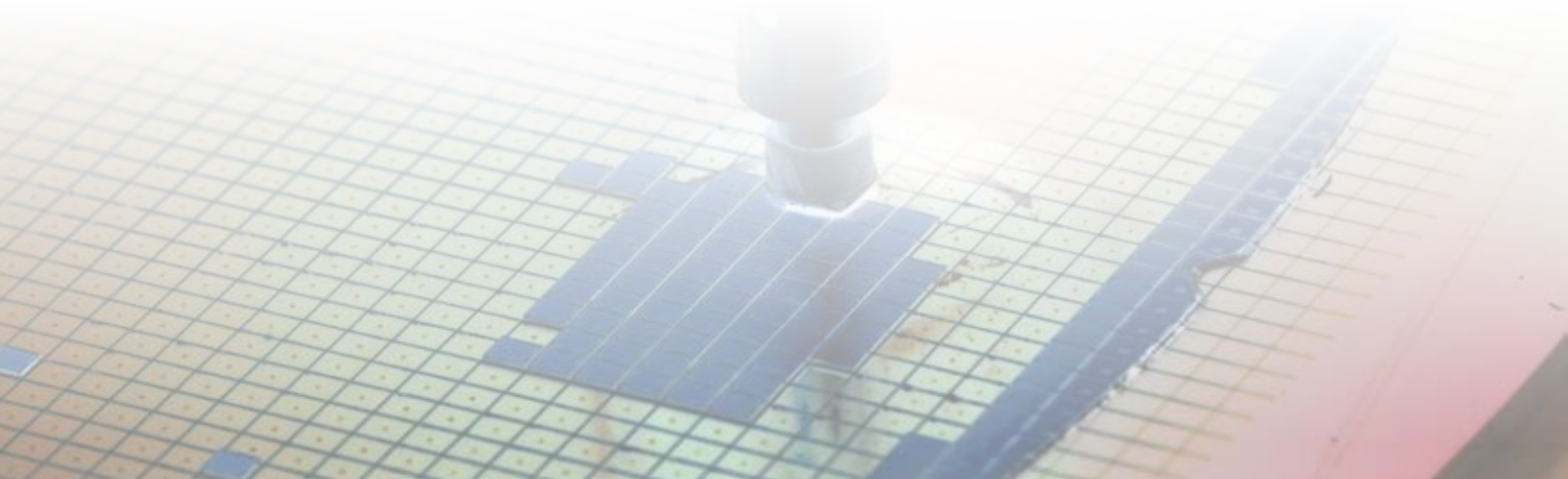
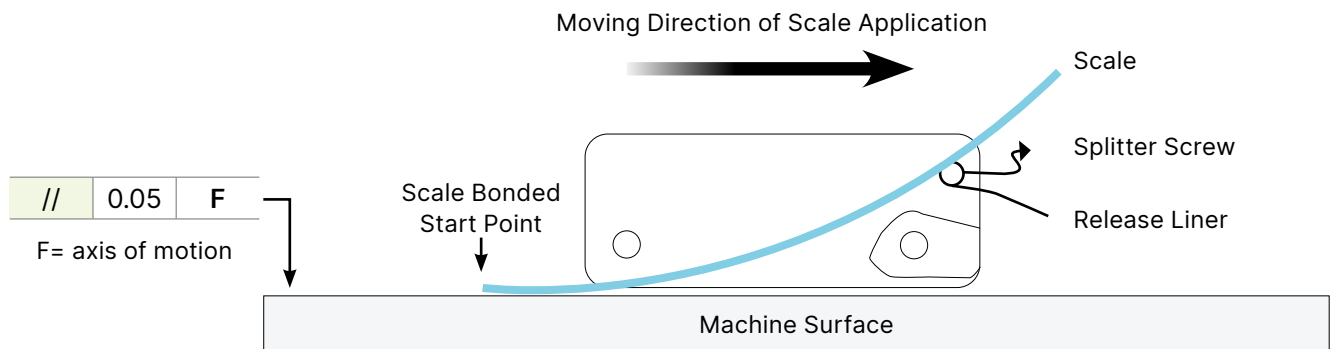
Linear Scale

ABS/INC	Delta Model	Scale Length	Delta Readhead
TTL- INC 	MSR-LES-SLI10000S1	10 m	MSR-LEH-SDI10DD5S1 MSR-LEH-SDI05DD5S1 MSR-LEH-SDI01DD5S1
	MSR-LES-SLI05000S1	5 m	
	MSR-LES-SLI03000S1	3 m	
	MSR-LES-SLI02000S1	2 m	
	MSR-LES-SLI01000S1	1 m	
Comm.- INC 	MSR-LES-SLE10000S0	10 m	MSR-LEH-SDE4N3Q5S1
	MSR-LES-SLE05000S0	5 m	
	MSR-LES-SLE03000S0	3 m	
	MSR-LES-SLE02000S0	2 m	
	MSR-LES-SLE01000S0	1 m	
Comm.- ABS 	MSR-LES-SLA06700S1	6.7 m	MSR-LEH-SDA4N3D5S1 MSR-LEH-SDA4NBD5S1
	MSR-LES-SLA05000S1	5 m	
	MSR-LES-SLA03000S1	3 m	
	MSR-LES-SLA02000S1	2 m	
	MSR-LES-SLA01000S1	1 m	

Ordering Information

Accessories

ABS/INC	Delta Model	Description	Delta Readhead
TTL- INC	 MSR-LEH-KSIS1	The scale applicator is used to place the scale by adhesive bonding onto the machine surface for proper alignment of the MSR-LEH-SDI readhead	MSR-LEH-SDI10DD5S1 MSR-LEH-SDI05DD5S1 MSR-LEH-SDI01DD5S1
Comm.- INC	 MSR-LEH-KSES1	The scale applicator is used to place the scale by adhesive bonding onto the machine surface for proper alignment of the MSR-LEH-SDE readhead	MSR-LEH-SDE4N3Q5S1
Comm.- ABS	 MSR-LEH-KSAS1	The scale applicator is used to place the scale by adhesive bonding onto the machine surface for proper alignment of the MSR-LEH-SDA readhead	MSR-LEH-SDA4N3D5S1 MSR-LEH-SDA4NBD5S1





Smarter. Greener. Together.

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