



Mears Inline Inspection Services ILI System

MFL Survey

A QUANTA SERVICES COMPANY

Mears Integrity Solutions provides inline inspection services to the liquid pipeline and gas transmission and distribution industry. Our services include proper tool selection, data integration, repair and determination of re-inspection intervals to effectively evaluate the integrity of your pipeline system.

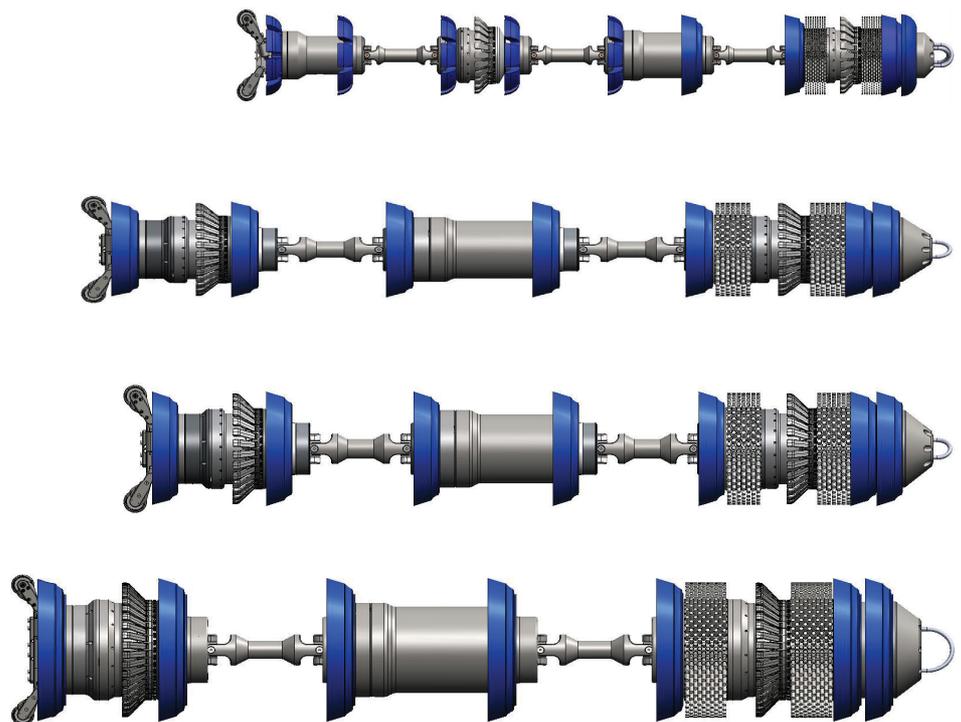
In-Line Inspection Services include:

- Single source in-line inspection services for liquid and gas transmission and distribution pipeline systems
- In-line inspection services featuring metal loss and deformation detection technologies
- Anomaly dig prioritization and verifications
- Tethered ILI services
- Pig trap design and retrofitting

The Mears series of advanced in-line inspection modules deliver maximum performance and flexibility within a highly configurable, 1.5D, instrument system.

The Mears MFL tool incorporates a magnetic flux leakage (MFL) module that deploys Hall-effect sensors in the axial, radial, and circumferential pipe axes. The MFL tool's tri-axial sensor array records a high-resolution map of flux leakage anomalies such as those produced by pipeline appurtenances and metal loss defects. Comprehensive mapping of three discrete magnetic field vectors facilitates superior feature detection, identification, and sizing during the analysis process. The MFL tool series may be run as a stand-alone high-resolution MFL survey or in combination with the deformation tool.

The Mears Inline Inertial Mapping service incorporates a low-drift inertial navigation system to accurately survey pipeline routing and locate pipeline features and appurtenances. When utilized in combination with appropriate above ground marker (AGM) reference locations, the IMU mapping system is capable of mapping the pipeline's three dimensional position to ± 1.0 meter accuracy. Inertial Mapping can be provided as a stand-alone ILI survey, or in combination with the high resolution MFL or Geometry tools.



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MFL Survey Specifications

DESIGN SPECIFICATIONS

DATA ACQUISITION		6 INCH	8 INCH	10 INCH	12 INCH
MFL:	Axial Field Metal Loss Sensors	36	48	60	72
	Radial Field Metal Loss Sensors	54	72	90	108
	Circumferential Field Metal Loss Sensors	54	72	90	108
	Total Field Metal Loss Sensors	144	192	240	288
	ID/OD Discrimination Sensors	54	72	90	108
Odometer:	Axial Sample Resolution	0.10 in (2.5 mm)			
	Caliper/Odometer Channels	2			

OPERATIONAL SPECIFICATIONS				
Length	5.1 ft (1.54 m)	6.2 ft (1.90 m)	5.9 ft (1.80 m)	6.7 ft (2.05 m)
Weight	104 lbs (47 kg)	183 lbs (83 kg)	312 lbs (142 kg)	409 lbs (185 kg)
Velocity Range (Full Axial Resolution)	0 to 10 mph (0 to 4.5 m/s)			
Maximum Pressure	2000 psig (13.78 MPa)			
Operating Temperature	0 to 185 deg F (-18 to 85 deg C)			
Wall Thickness for Full Specification	0.203 - 0.432 in 5.1 - 11.0 mm	0.250 - 0.500 in 6.3 - 12.7 mm	0.250 - 0.593 in 6.3 - 15.1 mm	0.250 - 0.688 in 6.3 - 17.5 mm
Standard Survey Duration at 3 mph (extendable)	45 hours	30 hours	60 hours	55 hours
Maximum Survey Distance	160 miles (255 km)			

PIPELINE GEOMETRY				
Continuous Bore - Maximum	6.35 in (161 mm)	8.33 in (212 mm)	10.42 in (265 mm)	12.37 in (314 mm)
Continuous Bore - Minimum	5.50 in (140 mm)	7.19 in (183 mm)	8.75 in (222 mm)	10.75 in (273 mm)
Minimum Local Bore Restriction in Straight Pipe	5.19 in (132 mm)	6.78 in (172 mm)	8.50 in (216 mm)	10.50 in (267 mm)
Minimum Bend Radius Back to Back	1.5D for Sched 80 .432 inch Wall	1.5D for Sched 80 .500 inch Wall	1.5D for Sched 80 .593 inch Wall	1.5D for Sched 80 .688 inch Wall
Barred Tees - Maximum Diameter	6.35 in (161 mm)	8.33 in (212 mm)	10.42 in (265 mm)	12.37 in (314 mm)
Unbarred Tees - Maximum Diameter	5.50 in (140 mm)	7.10 in (180 mm)	9.20 in (234 mm)	11.00 in (279 mm)
Minimum Separation Between Tees	10.00 in (254 mm)	12.50 in (318 mm)	14.25 in (362 mm)	15.75 in (400 mm)
Ball/Gate Valves - Minimum Bore	5.19 in (132 mm)	6.78 in (172 mm)	8.50 in (216 mm)	10.50 in (267 mm)
Axial Void Length - Maximum	8.00 in (203 mm)	8.80 in (224 mm)	11.00 in (279 mm)	12.00 in (305 mm)

REPORTING SPECIFICATIONS

PITTING CORROSION		
$1t \times 1t \leq \text{Defects} < 3t \times 3t$	ERW	SEAMLESS
Minimum Depth for Sizing Accuracy (POD 90%)	0.20t	0.20t
Depth Accuracy (80% Confidence)	$\pm 0.12t$	$\pm 0.12t$
Length Accuracy	± 0.40 in (10 mm)	± 0.40 in (10 mm)
Width Accuracy	± 0.75 in (19 mm)	± 0.75 in (19 mm)

GENERAL CORROSION		
$\text{Defects} \geq 3t \times 3t$	ERW	SEAMLESS
Minimum Depth for Sizing Accuracy (POD 90%)	0.15t	0.15t
Depth Accuracy (80% Confidence)	$\pm 0.12t$	$\pm 0.12t$
Length Accuracy	± 0.40 in (10 mm)	± 0.40 in (10 mm)
Width Accuracy	± 0.75 in (19 mm)	± 0.75 in (19 mm)

FEATURE LOCATION	
Axial Position Accuracy (from Reference Girth Weld)	$\pm 1\%$ or ± 4 in (100 mm)
Circumferential Position Accuracy	± 15 minutes (± 7.5 degrees)



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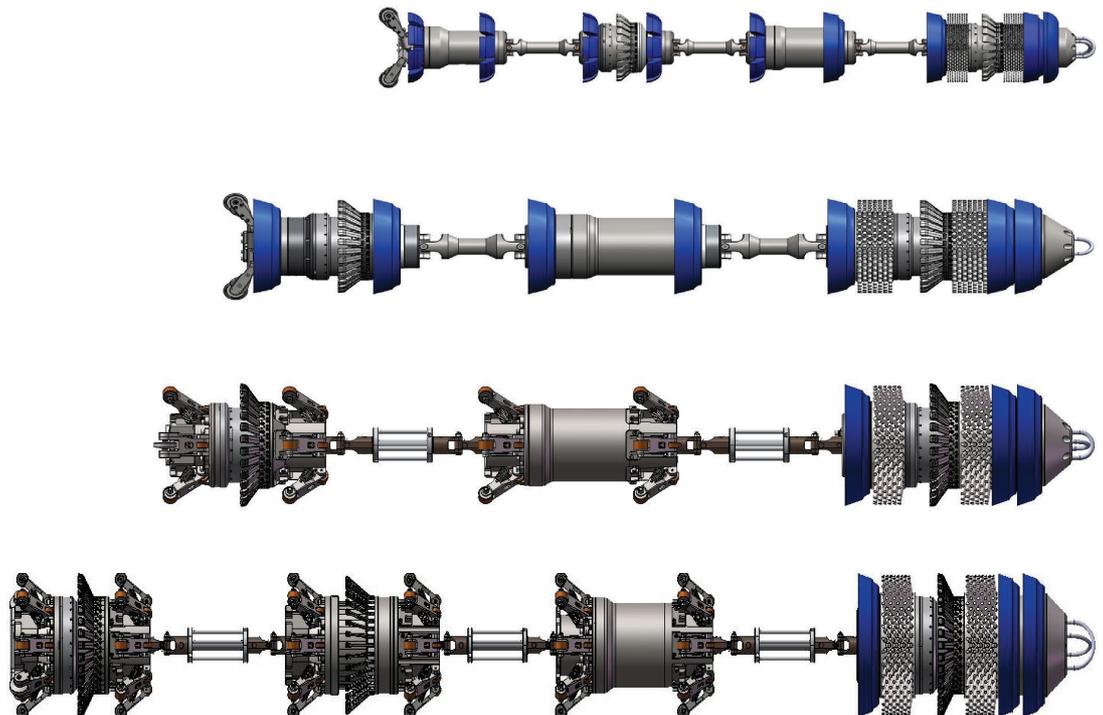
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The Mears Inline Inertial Mapping service incorporates a low-drift inertial navigation system to accurately survey pipeline routing and locate pipeline features and appurtenances. When utilized in combination with appropriate above ground marker (AGM) reference locations, the IMU mapping system is capable of mapping the pipeline's three dimensional position to ± 1.0 meter accuracy. Inertial Mapping can be provided as a stand-alone ILI survey, or in combination with the high resolution MFL or Geometry tools.



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Weight	104 lbs (47 kg)	183 lbs (83 kg)	298 lbs (135 kg)	474 lbs (215 kg)
Velocity Range (Full Axial Resolution)	0 to 10 mph (0 to 4.5 m/s)			
Maximum Pressure	2000 psig (13.78 MPa)			
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Defects ≥ 3t x 3t		
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FEATURE LOCATION	
Axial Position Accuracy (from Reference Girth Weld)	± 1% or ± 4 in (100 mm)
Circumferential Position Accuracy	± 15 minutes (± 7.5 degrees)



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Geometry Survey

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The Mears Geometry tool incorporates a dense caliper arm array possessing high radial sensitivity to accurately detect and quantify pipeline geometry features such as dents, ovalities, and wall thickness changes. The deformation tool series may be run as a stand-alone ILI survey or the geometry module may be run in combination with the high-resolution MFL tool.

The Mears Inline Inertial Mapping service incorporates a low-drift inertial navigation system to accurately survey pipeline routing and locate pipeline features and appurtenances. When utilized in combination with appropriate above ground marker (AGM) reference locations, the IMU mapping system is capable of mapping the pipeline's three dimensional position to ± 1.0 meter accuracy. Inertial Mapping can be provided as a stand-alone ILI survey, or in combination with the high resolution MFL or Geometry tools.

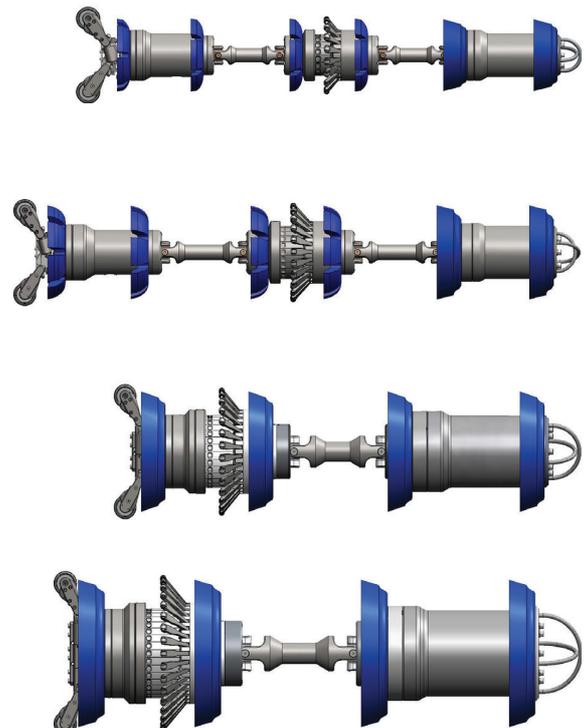


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Geometry Survey Specifications

DESIGN SPECIFICATIONS

DATA ACQUISITION		6 INCH	8 INCH	10 INCH	12 INCH
Caliper:	Caliper Arms	18	24	30	36
	Axial Sample Resolution	0.10 in (2.5 mm)			
	Circumferential Arm Resolution	1.0 in (25.4 mm)			
	Radial Measurement Resolution	± 0.02 in (0.5 mm)			
Odometer:	Odometer Channels	2			

OPERATIONAL SPECIFICATIONS				
Length	3.6 ft (1.09 m)	4.2 ft (1.26 m)	3.5 ft (1.08 m)	3.9 ft (1.18 m)
Weight	56 lbs (25 kg)	99 lbs (45 kg)	158 lbs (72 kg)	148 lbs (67 kg)
Velocity Range (Full Axial Resolution)	0 - 10 mph (0 - 4.5 m/s)			
Maximum Pressure	2000 psig (13.78 MPa)			
Operating Temperature	0 to 185 deg F (-18 to +85 deg C)			
Wall Thickness for Full Specification	0.203 - 0.432 in 5.1 - 11.0 mm	0.250 - 0.500 in 6.3 - 12.7 mm	0.250 - 0.593 in 6.3 - 15.1 mm	0.250 - 0.688 in 6.3 - 17.5 mm
Standard Survey Duration at 3 mph (extendable)	60 hours	55 hours	110 hours	105 hours
Maximum Survey Distance	150 miles 240 km	115 miles 185 km	95 miles 150 km	80 miles 125 km

PIPELINE GEOMETRY				
Minimum Bore	4.65 in 118 mm	6.00 in 152 mm	7.50 in 190 mm	8.90 in 226 mm
Continuous Minimum Bore	5.00 in 127mm	6.25 in 158 mm	8.00 in 203 mm	9.38 in 238 mm
Bore Restrictions (% of OD)	30%			
Minimum Bend Radius Back to Back	1.5D for Sched 80 .432 inch Wall	1.5D for Sched 80 .500 inch Wall	1.5D for Sched 80 .593 inch Wall	1.5D for Sched 80 .688 inch Wall
Unbarred Tees - Maximum Diameter	5.50 in 140 mm	7.19 in 183 mm	8.75 in 222 mm	11.00 in 279 mm

REPORTING SPECIFICATIONS

GEOMETRY	
Reporting Threshold	2% OD (Standard)
Deformation	± 0.08 in (2 mm)
Ovality	± 0.08 in (2 mm)

FEATURE LOCATION	
Axial Position Accuracy (from Reference Girth Weld)	± 1% or ± 4 in (100 mm)



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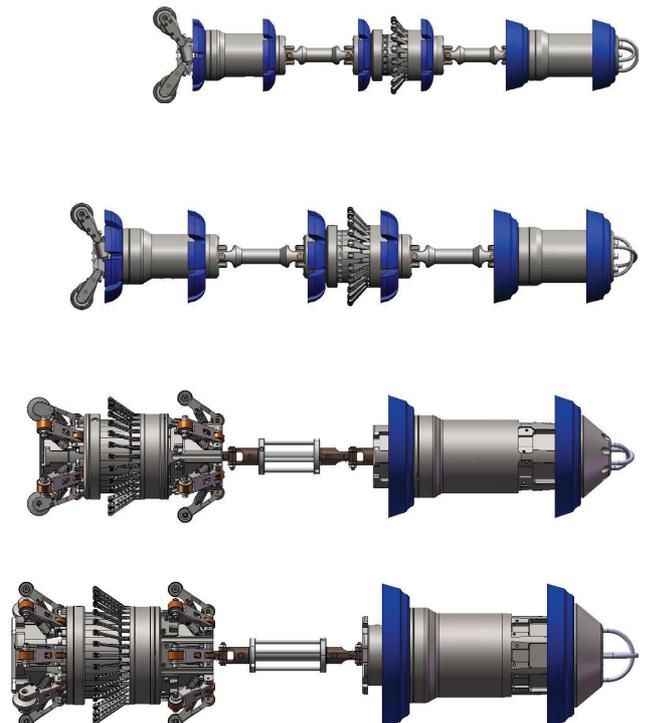


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OPERATIONAL SPECIFICATIONS				
Length	3.6 ft (1.09 m)	4.2 ft (1.26 m)	4.4 ft (1.33 m)	4.5 ft (1.37 m)
Weight	56 lbs (25 kg)	99 lbs (45 kg)	125 lbs (57 kg)	178 lbs (81 kg)
Velocity Range (Full Axial Resolution)	0 - 10 mph (0 - 4.5 m/s)			
Maximum Pressure	2000 psig (13.78 MPa)			
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FEATURE LOCATION	
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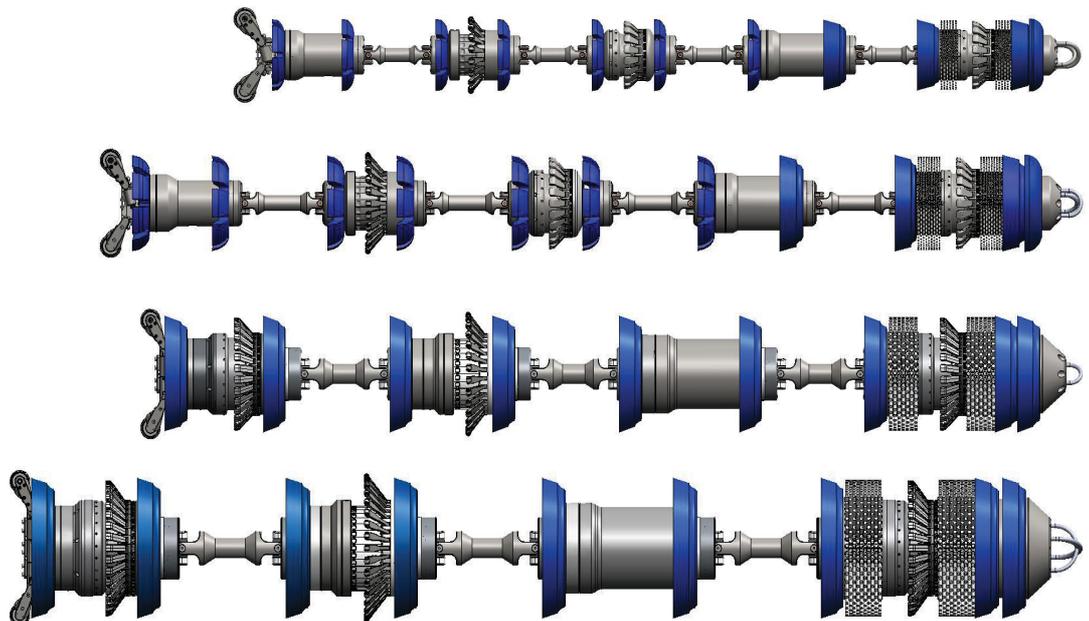
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The Mears Geometry tool incorporates a dense caliper arm array possessing high radial sensitivity to accurately detect and quantify pipeline geometry features such as dents, ovalities, and wall thickness changes. The deformation tool series may be run as a stand-alone ILI survey or the geometry module may be run in combination with the high-resolution MFL tool.

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Odometer:	Axial Sample Resolution	0.10 in (2.5 mm)			
	Odometer Channels	2			
Caliper:	Caliper Arms	18	24	30	36
	Circumferential Arm Resolution	1.0 in	1.0 in	1.0 in	1.0 in
		25.4 mm	25.4 mm	25.4 mm	25.4 mm
	Radial Measurement Resolution	± 0.02 in	± 0.02 in	± 0.02 in	± 0.02 in
0.5 mm		0.5 mm	0.5 mm	0.5 mm	

OPERATIONAL SPECIFICATIONS				
Length	6.3 ft (1.92 m)	9.3 ft (2.84 m)	7.8 ft (2.39 m)	8.9 ft (2.71 m)
Weight	122 lbs (55 kg)	214 lbs (97 kg)	398 lbs (181 kg)	475 lbs (215 kg)
Velocity Range (Full Axial Resolution)	0 - 10 mph (0 - 4.5 m/s)			
Maximum Pressure	2000 psig (13.78 MPa)			
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Axial Position Accuracy (from Reference Girth Weld)	± 1% or ± 4 in (100 mm)
Circumferential Position Accuracy (MFL)	± 15 minutes (± 7.5 degrees)



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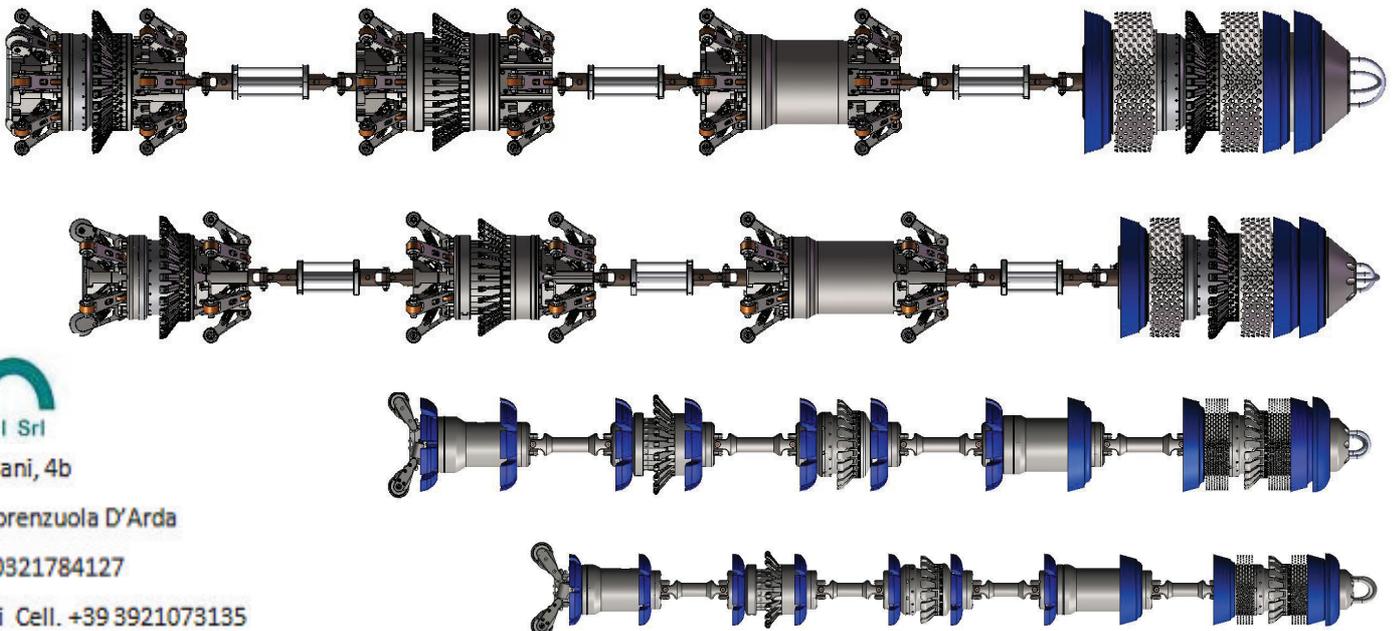
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The Mears Geometry tool incorporates a dense caliper arm array possessing high radial sensitivity to accurately detect and quantify pipeline geometry features such as dents, ovalities, and wall thickness changes. The deformation tool series may be run as a stand-alone ILI survey or the geometry module may be run in combination with the high-resolution MFL tool.

The Mears Inline Inertial Mapping service incorporates a low-drift inertial navigation system to accurately survey pipeline routing and locate pipeline features and appurtenances. When utilized in combination with appropriate above ground marker (AGM) reference locations, the IMU mapping system is capable of mapping the pipeline's three dimensional position to ± 1.0 meter accuracy. Inertial Mapping can be provided as a stand-alone ILI survey, or in combination with the high resolution MFL or Geometry tools.



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MFL / Geometry Survey Specifications

DESIGN SPECIFICATIONS

DATA ACQUISITION		6 INCH	8 INCH	10 INCH	12 INCH
MFL:	Axial Field Metal Loss Sensors	36	48	60	72
	Radial Field Metal Loss Sensors	54	72	90	108
	Circumferential Field Metal Loss Sensors	54	72	90	108
	Total Field Metal Loss Sensors	144	192	240	288
	ID/OD Discrimination Sensors	54	72	90	108
Odometer:	Axial Sample Resolution	0.10 in (2.5 mm)			
	Odometer Channels	2			
Caliper:	Caliper Arms	18	24	30	36
	Circumferential Arm Resolution	1.0 in	1.0 in	1.0 in	1.0 in
		25.4 mm	25.4 mm	25.4 mm	25.4 mm
	Radial Measurement Resolution	± 0.02 in	± 0.02 in	± 0.02 in	± 0.02 in
0.5 mm		0.5 mm	0.5 mm	0.5 mm	

OPERATIONAL SPECIFICATIONS				
Length	6.3 ft (1.92 m)	9.3 ft (2.84 m)	9.3 ft (2.84 m)	9.9 ft (3.03 m)
Weight	122 lbs (55 kg)	214 lbs (97 kg)	362 lbs (164 kg)	562 lbs (255 kg)
Velocity Range (Full Axial Resolution)	0 - 10 mph (0 - 4.5 m/s)			
Maximum Pressure	2000 psig (13.78 MPa)			
Operating Temperature	0 to 185 deg F (-18 to +85 deg C)			
Wall Thickness for Full Specification	0.203 - 0.432 in 5.1 - 11.0 mm	0.250 - 0.500 in 6.3 - 12.7 mm	0.250 - 0.593 in 6.3 - 15.1 mm	0.250 - 0.688 in 6.3 - 17.5 mm
Standard Survey Duration at 3 mph (extendable)	25 hours	20 hours	45 hours	40 hours
Maximum Survey Distance	150 miles 240 km	115 miles 185 km	95 miles 150 km	80 miles 125 km

PIPELINE GEOMETRY				
Continuous Bore - Minimum	5.50 in (140 mm)	7.19 in (183 mm)	8.75 in (222 mm)	10.75 in (273 mm)
Continuous Bore - Maximum	6.35 in (161 mm)	8.33 in (212 mm)	10.42 in (265 mm)	12.37 in (314 mm)
Minimum Local Bore Restriction in Straight Pipe	5.19 in (132 mm)	6.78 in (172 mm)	8.50 in (216 mm)	10.50 in (267 mm)
Minimum Bend Radius Back to Back	1.5D in Sched 80 .432 inch Wall	1.5D in Sched 80 .500 inch Wall	1.5D in Sched 80 .593 inch Wall	1.5D in Sched 80 .688 inch Wall
Unbarred Tees - Maximum Diameter	5.50 in (140 mm)	7.19 in (183 mm)	9.20 in (234 mm)	11.00 in (279 mm)
Ball/Gate Valves - Minimum Bore	5.19 in (132 mm)	6.78 in (172 mm)	8.50 in (216 mm)	10.50 in (267 mm)

REPORTING SPECIFICATIONS

PITTING CORROSION 1T X 1T ≤ DEFECTS < 3T X 3T		
	ERW	SEAMLESS
Minimum Depth for Sizing Accuracy (POD 90%)	0.20t	0.20t
Depth Accuracy (80% Confidence)	± 0.12t	± 0.12t
Length Accuracy	± 0.40 in (10 mm)	± 0.40 in (10 mm)
Width Accuracy	± 0.75 in (19 mm)	± 0.75 in (19 mm)

GENERAL CORROSION DEFECTS ≥ 3T X 3T		
	ERW	SEAMLESS
Minimum Depth for Sizing Accuracy (POD 90%)	0.15t	0.15t
Depth Accuracy (80% Confidence)	± 0.12t	± 0.12t
Length Accuracy	± 0.40 in (10 mm)	± 0.40 in (10 mm)
Width Accuracy	± 0.75 in (19 mm)	± 0.75 in (19 mm)

GEOMETRY	
Reporting Threshold	2% OD (standard)
Deformation	± 0.08 in (2 mm)
Ovality	± 0.08 in (2 mm)

FEATURE LOCATION	
Axial Position Accuracy (from Reference Girth Weld)	± 1% or ± 4 in (100 mm)
Circumferential Position Accuracy (MFL)	± 15 minutes (± 7.5 degrees)



A QUANTA SERVICES COMPANY



Mears Inline Inspection Services ILI System

MFL Survey

A QUANTA SERVICES COMPANY

Mears Integrity Solutions provides inline inspection services to the liquid pipeline and gas transmission and distribution industry. Our services include proper tool selection, data integration, repair and determination of re-inspection intervals to effectively evaluate the integrity of your pipeline system.

In-Line Inspection Services include:

- Single source in-line inspection services for liquid and gas transmission and distribution pipeline systems
- In-line inspection services featuring metal loss and deformation detection technologies
- Anomaly dig prioritization and verifications
- Tethered ILI services
- Pig trap design and retrofitting

The Mears series of advanced in-line inspection modules deliver maximum performance and flexibility within a highly configurable, 1.5D, instrument system.

The Mears MFL tool incorporates a magnetic flux leakage (MFL) module that deploys Hall-effect sensors in the axial, radial, and circumferential pipe axes. The MFL tool's tri-axial sensor array records a high-resolution map of flux leakage anomalies such as those produced by pipeline appurtenances and metal loss defects. Comprehensive mapping of three discrete magnetic field vectors facilitates superior feature detection, identification, and sizing during the analysis process. The MFL tool series may be run as a stand-alone high-resolution MFL survey or in combination with the deformation tool.

The Mears Inline Inertial Mapping service incorporates a low-drift inertial navigation system to accurately survey pipeline routing and locate pipeline features and appurtenances. When utilized in combination with appropriate above ground marker (AGM) reference locations, the IMU mapping system is capable of mapping the pipeline's three dimensional position to ± 1.0 meter accuracy. Inertial Mapping can be provided as a stand-alone ILI survey, or in combination with the high resolution MFL or Geometry tools.



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MFL Survey Specifications

DESIGN SPECIFICATIONS

DATA ACQUISITION		24 INCH
MFL:	Axial Field Metal Loss Sensors	240
	Radial Field Metal Loss Sensors	240
	Circumferential Field Metal Loss Sensors	240
	Total Field Metal Loss Sensors	720
	ID/OD Discrimination Sensors	96
Odometer:	Axial Sample Resolution	0.10 in (2.5 mm)
	Caliper/Odometer Channels	3

OPERATIONAL SPECIFICATIONS	
Length	4.0 ft (1.54 m)
Weight	1476 lbs (670 kg)
Velocity Range (Full Axial Resolution)	0 to 10 mph (0 to 4.5 m/s)
Maximum Pressure	2175 psig (15.0 MPa)
Operating Temperature	0 to 185 deg F (-18 to 85 deg C)
Wall Thickness for Full Specification	0.188 - 0.75 in
	4.8 - 19.0 mm
Standard Survey Duration at 3 mph (extendable)	120 hours
	60 with IMU

PIPELINE GEOMETRY	
Continuous Bore - Minimum	22.06 in
	560 mm
Continuous Bore - Maximum	23.56 in
	599 mm
Minimum Local Bore Restriction in Straight Pipe	15%
Minimum Bend Radius Back to Back	1.5D for Sched 80 .75 inch Wall
Barred Tees - Maximum Diameter	23.56 in
	599 mm
Unbarred Tees - Maximum Diameter	14.4 in
	366 mm
Minimum Separation Between Tees	30 in
	762 mm
Ball/Gate Valves - Minimum Bore	20.4 in
	518 mm

REPORTING SPECIFICATIONS

PITTING CORROSION		
1t x 1t ≤ Defects < 3t x 3t	ERW	SEAMLESS
Minimum Depth for Sizing Accuracy (POD 90%)	0.20t	0.20t
Depth Accuracy (80% Confidence)	± 0.12t	± 0.12t
Length Accuracy	± 0.40 in (10 mm)	± 0.40 in (10 mm)
Width Accuracy (Expected)	± 0.75 in (19 mm)	± 0.75 in (19 mm)

GENERAL CORROSION		
Defects ≥ 3t x 3t		
Minimum Depth for Sizing Accuracy (POD 90%)	0.15t	0.15t
Depth Accuracy (80% Confidence)	± 0.12t	± 0.12t
Length Accuracy	± 0.40 in (10 mm)	± 0.40 in (10 mm)
Width Accuracy (Expected)	± 0.75 in (19 mm)	± 0.75 in (19 mm)

FEATURE LOCATION	
Axial Position Accuracy (from Reference Girth Weld)	± 1% or ± 4 in (100 mm)
Circumferential Position Accuracy	± 15 minutes (± 7.5 degrees)



A QUANTA SERVICES COMPANY



Mears Inline Inspection Services ILI System

Geometry Survey

A QUANTA SERVICES COMPANY

Mears Integrity Solutions provides inline inspection services to the liquid pipeline and gas transmission and distribution industry. Our services include proper tool selection, data integration, repair and determination of re-inspection intervals to effectively evaluate the integrity of your pipeline system.

In-Line Inspection Services include:

- Single source in-line inspection services for liquid and gas transmission and distribution pipeline systems
- In-line inspection services featuring metal loss and deformation detection technologies
- Anomaly dig prioritization and verifications
- Tethered ILI services
- Pig trap design and retrofitting

The Mears series of advanced in-line inspection modules deliver maximum performance and flexibility within a highly configurable, 1.5D, instrument system.

The Mears Geometry tool incorporates a dense caliper arm array possessing high radial sensitivity to accurately detect and quantify pipeline geometry features such as dents, ovalities, and wall thickness changes. The deformation tool series may be run as a stand-alone ILI survey or the geometry module may be run in combination with the high-resolution MFL tool.

The Mears Inline Inertial Mapping service incorporates a low-drift inertial navigation system to accurately survey pipeline routing and locate pipeline features and appurtenances. When utilized in combination with appropriate above ground marker (AGM) reference locations, the IMU mapping system is capable of mapping the pipeline's three dimensional position to ± 1.0 meter accuracy. Inertial Mapping can be provided as a stand-alone ILI survey, or in combination with the high resolution MFL or Geometry tools.



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Geometry Survey Specifications

DESIGN SPECIFICATIONS

DATA ACQUISITION		24 INCH
Caliper:	Caliper Arms	60
	Axial Sample Resolution	0.10 in (2.5 mm)
	Circumferential Arm Resolution	1.0 in (25.4 mm)
	Radial Measurement Resolution	± 0.02 in (0.5 mm)
Odometer:	Odometer Channels	3

OPERATIONAL SPECIFICATIONS	
Length	7.8 ft (2.39 m)
Weight	722 lbs (328 kg)
Velocity Range (Full Axial Resolution)	0 - 10 mph 0 - 4.5 m/s
Maximum Pressure	2175 psig 15.0 MPa
Operating Temperature	0 to 185 deg F -18 to +85 deg C
Wall Thickness for Full Specification	0.219 - 0.969 in 5.6 - 24.6 mm
Standard Survey Duration at 3 mph (extendable)	240 hours 90 with IMU

PIPELINE GEOMETRY	
Local Bore Restriction	30% of bore
Continuous Minimum Bore	22.07 in. 560 mm
Bore Restrictions (% of OD)	21% @ .219 WT - 27% @ .969 WT
Minimum Bend Radius Back to Back	1.5D for Sched 80 .969 inch Wall
Unbarred Tees - Maximum Diameter	14.4 in 365 mm

REPORTING SPECIFICATIONS

GEOMETRY	
Reporting Threshold (Minimum detectable dent)	1% OD
Caliper Deflection Resolution	0.04 in (1 mm)
Caliper Bore Accuracy	± 0.5% of bore

FEATURE LOCATION	
Axial Position Accuracy (from Reference Girth Weld)	± 1% or ± 4 in (100 mm)



A QUANTA SERVICES COMPANY



Mears Inline Inspection Services ILI System

MFL / Geometry Survey

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Mears Integrity Solutions provides inline inspection services to the liquid pipeline and gas transmission and distribution industry. Our services include proper tool selection, data integration, repair and determination of re-inspection intervals to effectively evaluate the integrity of your pipeline system.

In-Line Inspection Services include:

- Single source in-line inspection services for liquid and gas transmission and distribution pipeline systems
- In-line inspection services featuring metal loss and deformation detection technologies
- Anomaly dig prioritization and verifications
- Tethered ILI services
- Pig trap design and retrofitting

The Mears series of advanced in-line inspection modules deliver maximum performance and flexibility within a highly configurable, 1.5D, instrument system.

The Mears MFL tool incorporates a magnetic flux leakage (MFL) module that deploys Hall-effect sensors in the axial, radial, and circumferential pipe axes. The MFL tool's tri-axial sensor array records a high-resolution map of flux leakage anomalies such as those produced by pipeline appurtenances and metal loss defects. Comprehensive mapping of three discrete magnetic field vectors facilitates superior feature detection, identification, and sizing during the analysis process. The MFL tool series may be run as a stand-alone high-resolution MFL survey or in combination with the deformation tool.

The Mears Geometry tool incorporates a dense caliper arm array possessing high radial sensitivity to accurately detect and quantify pipeline geometry features such as dents, ovalities, and wall thickness changes. The deformation tool series may be run as a stand-alone ILI survey or the geometry module may be run in combination with the high-resolution MFL tool.

The Mears Inline Inertial Mapping service incorporates a low-drift inertial navigation system to accurately survey pipeline routing and locate pipeline features and appurtenances. When utilized in combination with appropriate above ground marker (AGM) reference locations, the IMU mapping system is capable of mapping the pipeline's three dimensional position to ± 1.0 meter accuracy. Inertial Mapping can be provided as a stand-alone ILI survey, or in combination with the high resolution MFL or Geometry tools.



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MFL / Geometry Survey Specifications

DESIGN SPECIFICATIONS

DATA ACQUISITION		24 INCH
MFL:	Axial Field Metal Loss Sensors	240
	Radial Field Metal Loss Sensors	240
	Circumferential Field Metal Loss Sensors	240
	Total Field Metal Loss Sensors	720
	ID/OD Discrimination Sensors	96
Odometer:	Axial Sample Resolution	0.10 in (2.5 mm)
	Odometer Channels	3
Caliper:	Caliper Arms	60
	Circumferential Arm Resolution	1.0 in 25.4 mm
	Radial Measurement Resolution	± 0.02 in 0.5 mm

OPERATIONAL SPECIFICATIONS	
Length	7.83 ft (2.39 m)
Weight	
Velocity Range (Full Axial Resolution)	0 - 10 mph (0 - 4.5 m/s)
Maximum Pressure	2175 psig (15.0 MPa)
Operating Temperature	0 to 185 deg F (-18 to +85 deg C)
Wall Thickness for Full Specification	0.188 - 0.75 in (4.8 - 19.0 mm)
Standard Survey Duration at 3 mph (extendable)	80 hours
	45 with IMU

PIPELINE GEOMETRY	
Continuous Bore - Minimum	22.07 in 561 mm
	23.56 in 599 mm
Continuous Bore - Maximum	
Minimum Local Bore Restriction in Straight Pipe	15%
Minimum Bend Radius Back to Back	1.5D in .75 inch Wall
Unbarred Tees - Maximum Diameter	30 in 762 mm
	20.4 in 518 mm
Ball/Gate Valves - Minimum Bore	

REPORTING SPECIFICATIONS

PITTING CORROSION		
1T X 1T ≤ DEFECTS < 3T X 3T	ERW	SEAMLESS
Minimum Depth for Sizing Accuracy (POD 90%)	0.20t	0.20t
Depth Accuracy (80% Confidence)	± 0.12t	± 0.12t
Length Accuracy	± 0.40 in (10 mm)	± 0.40 in (10 mm)
Width Accuracy (Expected)	± 0.75 in (19 mm)	± 0.75 in (19 mm)

GENERAL CORROSION		
DEFECTS ≥ 3T X 3T		
Minimum Depth for Sizing Accuracy (POD 90%)	0.15t	0.15t
Depth Accuracy (80% Confidence)	± 0.12t	± 0.12t
Length Accuracy	± 0.40 in (10 mm)	± 0.40 in (10 mm)
Width Accuracy (Expected)	± 0.75 in (19 mm)	± 0.75 in (19 mm)

GEOMETRY	
Reporting Threshold	2% OD (standard)
Deformation	± 0.08 in (2 mm)
Ovality	± 0.08 in (2 mm)

FEATURE LOCATION	
Axial Position Accuracy (from Reference Girth Weld)	± 1% or ± 4 in (100 mm)
Circumferential Position Accuracy (MFL)	± 15 minutes (± 7.5 degrees)



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