

# RoCombo MFL-A/MX Service

## In-line Combined Metal Loss and High-Resolution Geometry Analysis with Absolute ID Measurement



Detect pipeline corrosion and deformation before it impacts performance



Cost-effective combination for high-resolution corrosion and deformation assessments



Assess the integrity of your onshore and offshore pipeline assets

**Metal loss and geometry anomalies constitute an integrity threat to pipelines, particularly when coinciding. Therefore, a combined in-line inspection is a very efficient approach for safe and reliable pipeline operation. ROSEN's RoCombo MFL-A/MX offers the possibility to investigate pipelines for metal loss and geometry anomalies with absolute ID measurement in only one inspection run.**



## Solution

The RoCombo MFL-A/MX includes not only a Magnetic Flux Leakage unit but also our high-resolution geometry in-line inspection solution. This combination enables us to check for both – metal loss and geometry anomalies – in only one inspection run. Unique magnet and sensor designs ensure high sensitivity and precision for the detection of corrosion, erosion, gouging and a huge variety of other metal loss features. A high number of mechanical calipers provide full circumferential and axial coverage and enables us to map the location and details of internal diameter (ID) anomalies to an exceptional level of detail.

## Benefits

- High resolution tri-axial magnetic field analysis ensuring accurate and precise feature classification & sizing in accordance with API and POF regulations
- Operates in liquid and gas pipelines both at high and low medium velocities

- Industry-leading accuracy and data quality through highest circumferential and axial resolution
- Minimizes conservatism of integrity assessments based on exceptionally detailed anomaly profiles that uncover ovality, dents, buckles, bending and stress-induced features
- Absolute ID measurement providing unprecedented precision about internal pipeline profiles and features
- Accurate assessments of dents with metal loss
- Lifetime integrity management supported by full recording of the complete raw inspection data
- Largest tool fleet on the market ensuring global tool availability and flexibility
- Well-proven tools deliver consistent data quality with a first run success rate of 95%
- Minimizing the impact of inspections on daily operations through speed control units to maintain full production flow during inspection
- High-quality service with certified processes (API 1163), personnel qualification (ASNT) and equipment (CE, ATEX)

# Service Options

All aspects from the inspection request to the final report are covered with the flexibility to choose from various service options.

- Cleaning – operational and pre-inspection
- Speed Control – inspection at high flow rates
- XYZ – route mapping and strain assessment
- Multi-Diameter – pipelines with varying diameter
- Offshore – long distance and high pressure
- Post-ILI – data alignment and combined evaluation
- Integrity Assessments – FFP, CGA, when equipped with IMU: Bending Strain & Pipeline Movement
- NIMA – versatile asset integrity software suite

# Remarks and Features

- API 1163 compliant services
- CE certification available, ATEX on request
- Tailored solutions with different specifications upon request: multiple tool sizes or multi-diameter tools, higher pressure rating
- Contact ROSEN for more detailed information about the service presented
- Specifications are subject to change, depending on specific requirements or tool configurations

# Technical Specifications

## Standard Operating Specifications

<b>Tool sizes available</b>	6" - 56"
<b>Pipeline product</b>	Gas or liquids
<b>Product temperature range</b>	0 °C - 65 °C (32 °F - 150 °F)
<b>Maximum operating pressure</b>	15 MPa (2,175 psi)
<b>Operating speed range</b>	Up to 3.0 m/s (9.8 mph)
<b>Product flow range*</b>	Up to 12 m/s (26.8 mph)
<b>Minimum pipeline bend radius</b>	1.5D
<b>Wall thickness range</b>	4 - 32 mm (0.15" - 1.26")
<b>Maximum operating time</b>	400 hours
<b>Maximum inspection length</b>	800 km (500 miles)

\* Fitted with optional speed control system (gas lines only)  
 Note: Please contact ROSEN for conditions outside of these specifications.

## Location and Orientation Capabilities

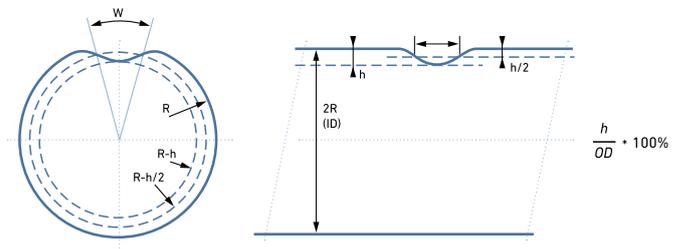
<b>Axial position accuracy from reference marker 1 m on 1000 m (1 ft on 1000 ft) marker distance</b>	1:1000
<b>Axial position from closest weld</b>	±0.1 m (±4")
<b>Circumferential position accuracy</b>	±5°

The axial positioning accuracy is given at 90 % certainty and is based on following conditions:  
 1. Distance between upstream (u/s) and downstream (d/s) marker/reference point < 2,000 m (6,500 ft).  
 2. Actual aboveground distance to both u/s and d/s marker/reference points have been measured and correlated.  
 3. Marker points are placed correctly according to respective ROSEN marker specification.

## Performance Specifications – Geometry

Feature	OD [inch]	Accuracy <sup>1</sup>	Detection Threshold
<b>OD<sup>2</sup> Changes</b>		±0.8 mm (0.03")	0.8 mm (0.03")
<b>Absolute ID</b> (Only valid in straight pipe)	6"-24" >24"-38" ≥40"	1 mm (0.04") 2 mm (0.08") 3 mm (0.12")	
<b>Ovalities</b>	Ovality	1.0 %	0.5 %
	Length	±100.0 mm (4")	
<b>Dents<sup>3,4</sup></b>	Depth	≤16" ±0.5 % >16" ±0.3 %	0.5 % 0.3 %
	Length	±10 mm (0.39")	
	Width	±15 mm (0.59")	
	Orientation	±15°	

1 Values are given for a certainty level of 80 % and a POD of 95 %  
 2 Or ID, respectively  
 3 Including wrinkles and buckles  
 4 Dent definition:



## Performance Specifications – MFL

	General metal loss	Pitting	Axial Grooving	Circumf. Grooving	Circumf. Slotting <sup>1</sup>
Depth at POD = 90%	0.1t	0.1t	0.1t	0.1t	0.15 t
Depth sizing accuracy at 80 % certainty	±0.1t	±0.1t	±0.15 t	±0.1t	±0.1t
Width sizing accuracy at 80 % certainty	±15 mm (0.59")	±12 mm (0.47")	±12 mm (0.47")	±12 mm (0.47")	±15 mm (0.59")
Length sizing accuracy at 80 % certainty	±15 mm (0.59")	±10 mm (0.39")	±10 mm (0.39")	±10 mm (0.39")	±10 mm (0.39")

Abbreviations: POD = Probability of Detection; t = wall thickness

<sup>1</sup> Min (L, W)±½

### Metal Loss Feature Classification

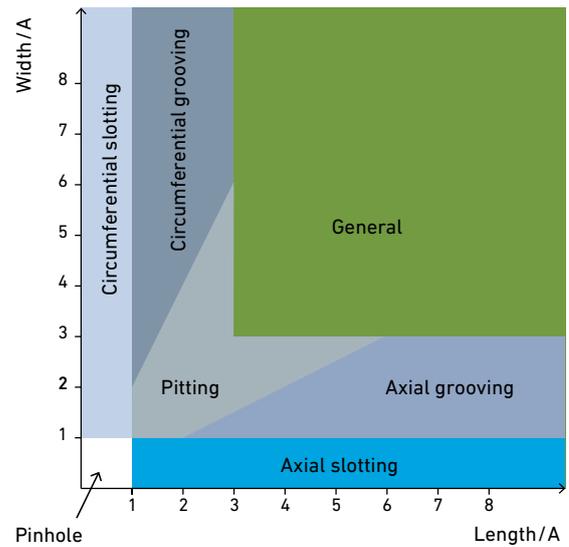
All reported metal loss features are classified according to the dimensions shown in the following Pipeline Operators' Forum (POF) specification graph.

A = wall thickness or 10 mm (0.39"), whichever value is greater

### Wall Thickness Detection

±1 mm (± 0.04") or ±0.1t, whichever value is greater at 80 % certainty

t = wall thickness



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