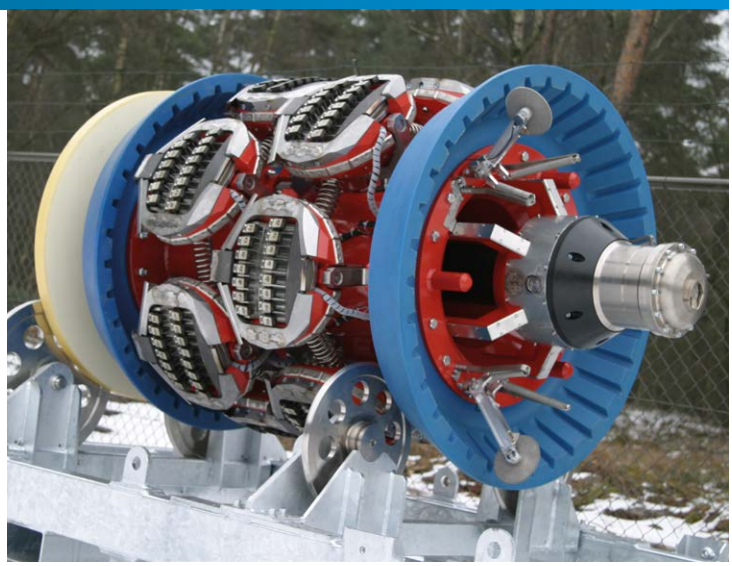
RoCombo MFL-C / XT Service

In-line Combined Axial Feature and Geometry Analysis

Increased probability of detection (POD)

Increased probability of identification (POI)

Superior defect sizing accuracy



Axial-oriented metal loss features and geometry anomalies constitute an integrity threat to pipelines, particularly when coinciding. Therefore, a combined in-line inspection is a very efficient approach for a safe and reliable pipeline operation. ROSEN's RoCombo MFL-C/XT offers the possibility to investigate pipelines for axial-oriented metal loss and geometry anomalies in only one inspection run.

Solution

The RoCombo MFL-C/XT includes not only a Magnetic Flux Leakage unit but also a combination of mechanical calipers with an electronic measurement system based on the Eddy Current principle. This innovative combination enables the RoCombo 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.

The tool measures depth, profile and contour of geometric features, allowing a stress/strain based integrity assessment. XYZ mapping coordinates for advanced integrity management is available optionally.

Benefits

- Optimized for detection and sizing of axial features, such as selective seam weld corrosion (SSWC), top of line corrosion (TOLC), channeling corrosion
- Accurate metal loss characterization in welded and specifically in seamless pipeline by extra high sensor density and high sampling rate
- High-precision geometry mapping and dent sizing using contour following sensor technology even at tough operational conditions
- Accurate discrete stress and strain gridding derived from high-resolution raw inspection data
- Lifetime integrity management supported by full recording of the complete inspection raw data
- Largest tool fleet on the market ensuring global tool availability and flexibility
- Captures the geometric profile and metal loss information required for advanced integrity assessment of deformations, including those with coincident metal loss, for example in compliance with API 1183 Level 3
- High-quality service with certified processes (API 1163), personnel qualification (ASNT) and equipment (CE, ATEX)

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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 analysis
- Multi-Diameter – pipelines with varying diameter
- Offshore – long distance and high pressure
- Post-ILI – data alignment and combined evaluation
- Integrity Assessments – RBI, FFP, CGA
- NIMA – versatile asset integrity software suite

Remarks and Features

- API 1163 compliant services
- CE and ATEX certification available
- Tailored solutions with different specifications upon request: multiple tool sizes or multi-diameter tools, higher pressure rating
- Specifications are subject to change due to specific requirements or tool configuration

Technical Specifications

Standard Operating Specifications

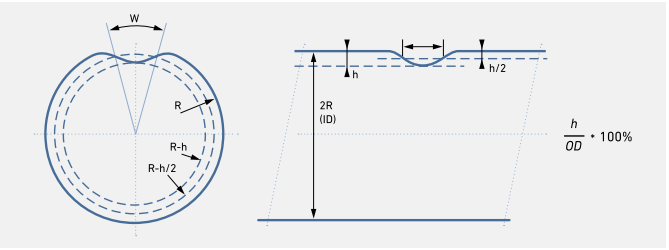
Tool sizes available	6" - 56"
Pipeline product	Gas or liquids
Product temperature range	0 °C - 65 °C (32 °F - 149 °F)
Maximum operating pressure	15 MPa (2,175 psi) 25 MPa (3,625 psi) optional
Operating speed range	Up to 3.0 m/s (9.8 mph)
Product flow range*	Up to 10 m/s (22.4 mph)
Minimum pipeline bend radius	1.5D
Wall thickness range	4 - 32 mm (0.15" - 1.26")
Maximum operating time	400 hours
Maximum inspection length	800 km (500 miles)

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

Performance Specifications – Geometry

Feature		OD [inch]	Accuracy[1]	Detection Threshold
OD[2] Changes			±0.8 mm (0.03")	±0.8 mm (0.03")
Ovalities	Ovality		±0.5 %	0.5 %
	Length		±15 mm (0.59")	
	Orientation		±12°	
Dents[3,4]	Depth	<10" 10"-16" 18"-28" 30"-38" 40"-56"	±0.5 % ±0.5 % ±0.3 % ±0.2 % ±0.15 %	1.0 % 0.8 % 0.5 % 0.3 % 0.2 %
	Length	±7.6 mm (0.3")		
	Width	±25.4 mm (1.0")		
	Orientation	±12°		

[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

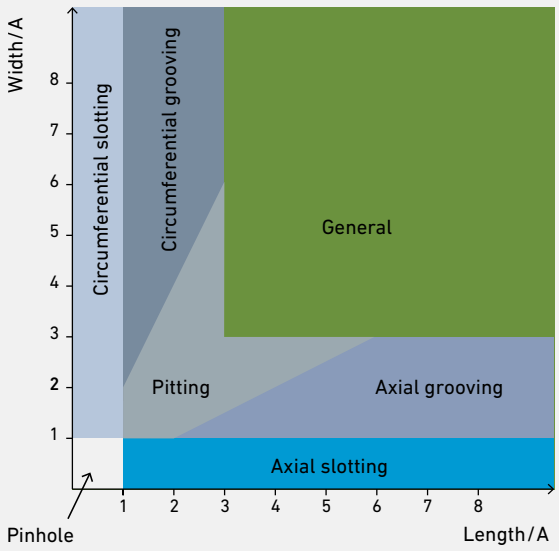
	General metal loss	Pitting	Axial Grooving	Axial Slotting[1]
Depth at POD = 90 %	0.15t	0.15t	0.1t	0.2t
Depth sizing accuracy at 80 % certainty	±0.15 t	±0.19 t	±0.15 t	±0.15 t
Width sizing accuracy at 80 % certainty	±15 mm (0.59")	±15 mm (0.59")	±15 mm (0.59")	±8 mm (0.31")
Length sizing accuracy at 80 % certainty	±15 mm (0.59")	±12 mm (0.47")	±15 mm (0.59")	±15 mm (0.59")

[1] Valid for axial slotting anomaly width ≥ 1 mm (0.04")
Abbreviations: POD = Probability of Detection; t = wall thickness

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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