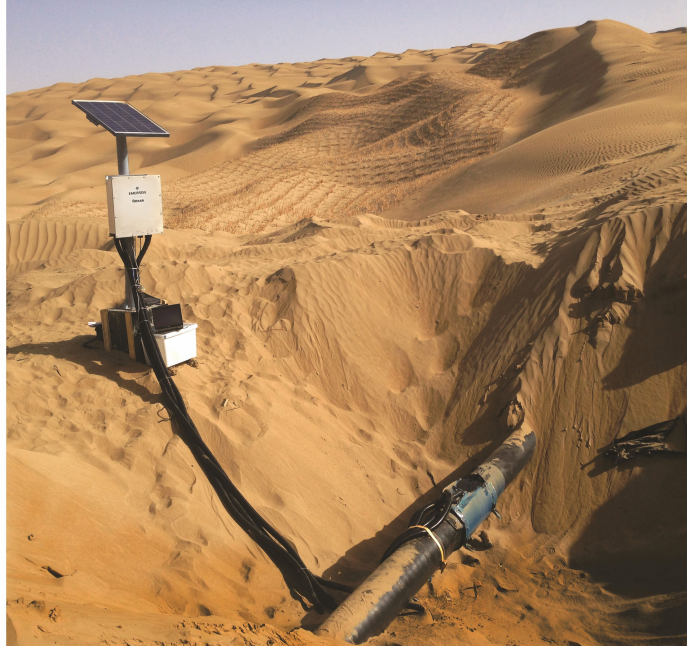


Roxar FSM Log 48 Area Corrosion Monitor™



The Roxar FSM Log 48 Area Corrosion Monitor allows you to gain more control over the integrity of your pipeline, maximize transportation capacity and reduce operating expenses. The Roxar non-intrusive area monitoring technology provides unmatched capabilities for detecting general and localized internal corrosion.

Online area corrosion

The Roxar FSM Log 48 Area Corrosion Monitor provides the following benefits:

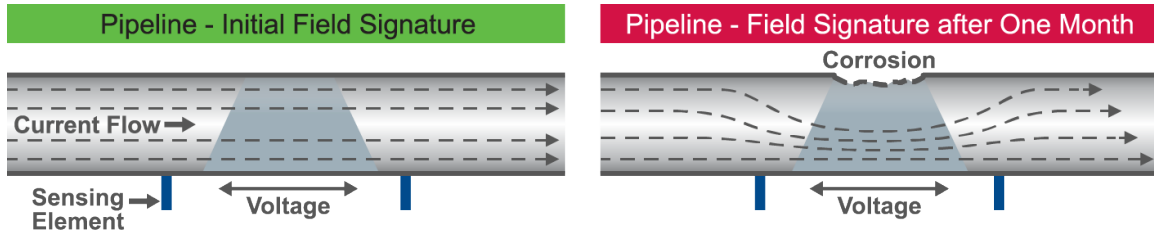
- Continuous metal loss trending
- General and localized corrosion detection capabilities
- Historic data trending and storage using the Roxar Fieldwatch™ data management software

Best fit for application

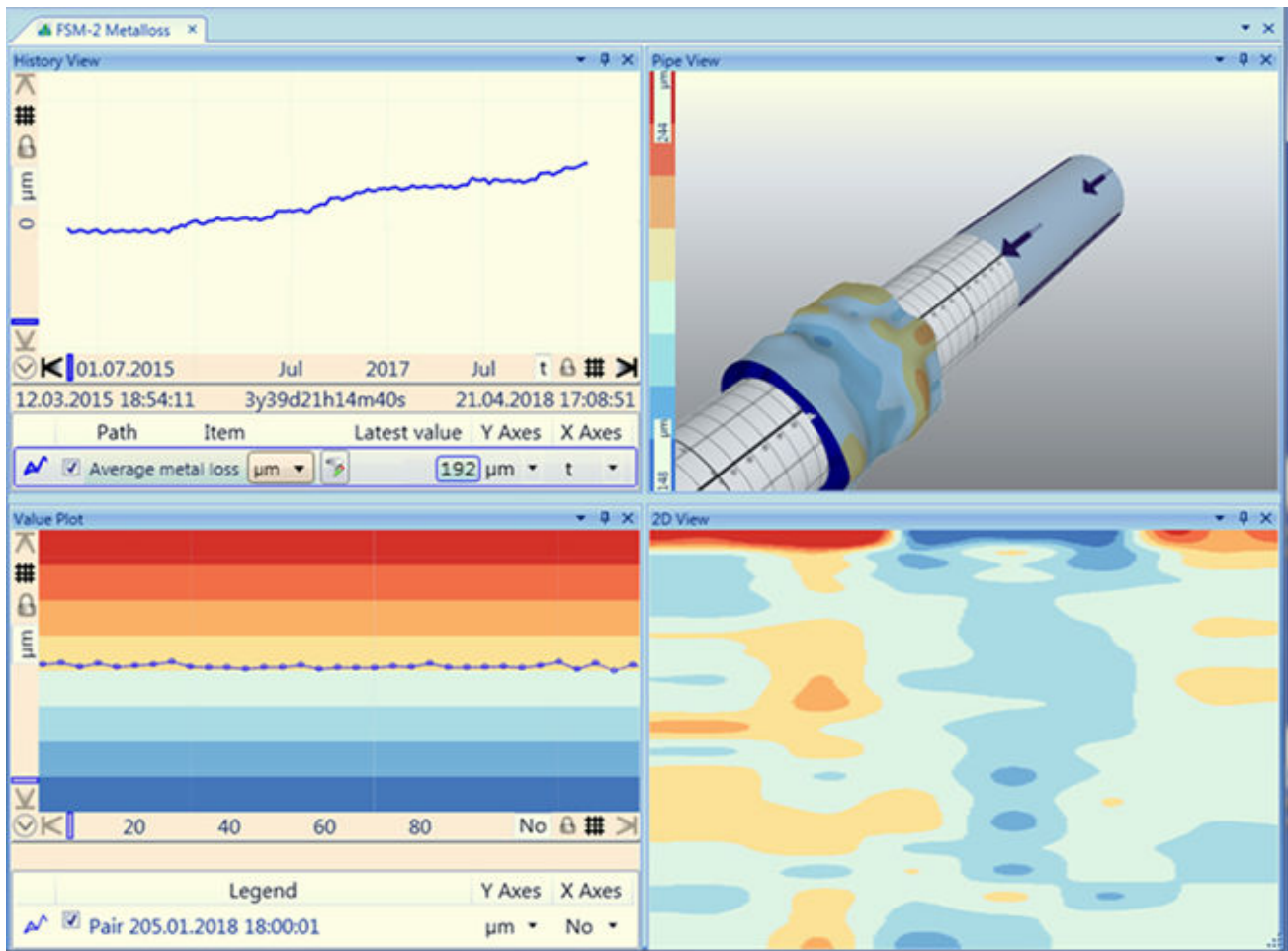
- Easy to retrofit over any existing pipeline
- Available for uncovered or buried pipelines from 6" to 48" outer diameter
- Multiple communication options, including wired, cellular, and WiFi
- Remote power capabilities using solar photovoltaic technology

Measurement principle

The Roxar FSM Log 48 Area Corrosion Monitor feeds current into a pre-defined pipeline section, and through a permanently installed sensing pin array to produce an electric field. Hydrocarbon transportation generates an internal general or localized metal loss, and triggers a change in the monitored area's electric field.



The Roxar FSM Log 48 Area Corrosion Monitor continuously detects those changes and quantifies the loss of metal in micrometers or mils over each pin-pair, or the total average loss. The Fieldwatch software is used for collecting, storing and evaluating FSM Log 48 Area Corrosion Monitor data.



Performance specifications

The Roxar FSM Log 48 Area Corrosion Monitor possesses unmatched capabilities for detecting general and localized corrosion over an area by quantifying the loss of metal over time.

Item	Microns	Percentage wall thickness
Resolution	10	0.10%
Accuracy ⁽¹⁾	1	0.01%
Repeatability ⁽¹⁾	2	0.02%

(1) *Surface average corrosion values based on a test over a 10 mm wall thickness subject controlled room temperature.*

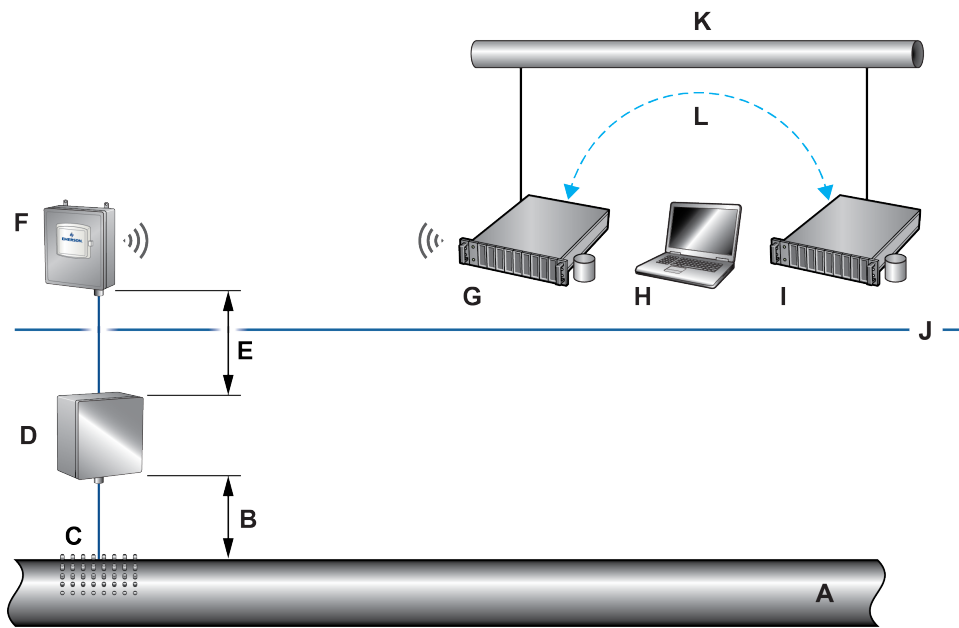
Hazardous area classifications

The Roxar FSM Log 48 Area Corrosion Monitor is available in configurations suitable for hazardous and non-hazardous areas.

Type	Certification	Element	Approval
Hazardous area	ATEX and IECEx	Sensing Pin Matrix	Ex e ia mb IIC T4 Gb -40 °F (-40 °C) < Ta 266 °F (130 °C)
		Roxar FSM Log Data Unit	II 2 G Ex e ia mb IIC T4 Gb -40 °F (-40 °C) < Ta < 140 °F (60 °C)
Non-hazardous area	Not applicable	Not applicable	Not applicable

Block diagram

Gathering, flow and transportation lines possess different corrosion monitoring needs related to location, communication, and power availability. The Roxar FSM Log 48 Area Corrosion Monitor provides a modular configuration satisfying several use cases. The following figure shows an example with cellular communication and solar power supply. Other possible modes and corresponding elements are described in the [Simplified product matrix](#) section.



- A. Pipeline (Uncovered or buried)
- B. Maximum Distance = 32 feet/10 meters
- C. Sensing Pin Matrix
- D. Roxar FSM Log Data Unit
- E. Maximum Distance = 1640 feet/500 meters
- F. Field Interface Unit and Cellular Modem in IP 66 enclosure and Solar Panel Kit
- G. Fieldwatch on server
- H. Fieldwatch data management software
- I. Existing SCADA/Control system
- J. Hazardous Area Limit
- K. Customer network
- L. Modbus TCP (or OPC if OPC server is available)

Roxar FSM Log 48 building blocks

The Roxar FSM Log 48 Area Corrosion Monitor is based on three elements:

- Sensing Pin Matrix
- Roxar FSM Log Data Unit
- Fieldwatch data management software

Depending on the hazardous area, communication requirements, and proximity to power sources, additional modules can be easily configured in the product matrix.

Simplified product matrix

The following table shows a simplified product matrix with the modules you will receive based on your requirements.

Communication to Fieldwatch and power option	Hazardous area type		
	Non-hazardous area	Hazardous area (1) < 1640 feet (500 m)	Hazardous area (1) >1640 feet (500 m)
Wired communication (RS-485/RS-232/TCP-IP) and Wired power supply (110-260 VAC/18-32 VDC/ Fieldbus)	Sensing Pin Matrix Roxar FSM Log Data Unit Fieldwatch (data management software)	Sensing Pin Matrix Roxar FSM Log Data Unit Fieldwatch (data management software) Field Interface Unit inside non-Ex enclosure (Safe Zone)	Sensing Pin Matrix Roxar FSM Log Data Unit (Ex) Fieldwatch (data management software) Field Interface Unit inside Ex-d enclosure
Wireless Communication (Cellular/WLAN) and Wired Power Supply (110-260 VAC/18-32 VDC/Fieldbus)	Sensing Pin Matrix Roxar FSM Log Data Unit Fieldwatch (data management software) Cellular or WLAN modem inside Roxar FSM Log Data Unit	Sensing Pin Matrix Roxar FSM Log Data Unit (Ex) Fieldwatch (data management software) Field Interface Unit inside non-Ex enclosure (Safe Zone) Cellular or WLAN modem inside non-Ex enclosure (Safe Zone)	Sensing Pin Matrix FSM Log Data Unit (Ex) Fieldwatch (data management software) Field Interface Unit inside Ex-d enclosure Cellular or WLAN modem inside Ex-d enclosure
Wireless Communication (Cellular/WLAN) and solar power supply	Sensing Pin Matrix Roxar FSM Log Data Unit Fieldwatch (data management software) Cellular or WLAN modem inside Roxar FSM Log Data Unit Solar Power Kit	Sensing Pin Matrix Roxar FSM Log Data Unit (Ex) Fieldwatch (data management software) Field Interface Unit inside non-Ex enclosure (Safe Zone) Cellular or WLAN modem inside non-Ex enclosure (Safe Zone) Solar Power Kit (Safe Zone)	Sensing Pin Matrix Roxar FSM Log Data Unit (Ex) Fieldwatch (data management software) Field Interface Unit inside Ex-d enclosure Cellular or WLAN modem inside Ex-d enclosure Solar Power Kit (Safe Zone)

Enclosure dimensions and weight

Roxar FSM Log Data Unit	
Dimensions	24.3 x 23.5 x 8.3 in (618 x 598 x 210 mm)
Approximate weight	66 lbs (30 kgs)

IP 66 enclosure for safe area	
Dimensions	30 x 30 x 11.8 in (760 x 760 x 300 mm)
Weight	98 lbs (44.5 kgs)

Ex-d IP 66 enclosure for hazardous area	
Dimensions	14.9 x 14.9 x 10.6 in (380 x 380 x 270 mm)
Approximate weight	132 lbs (60 kgs)

Solar panel	
Dimensions	64.5 x 39.1 x 1.6/1.4 in (1640 x 992 x 40/35 mm)
Approximate weight	39 lbs (18 kgs)
	Note Batteries are not included.

Junction box	
Dimensions	23.6 x 23.6 x 11.8 in (600 x 600 x 300 mm)
Approximate weight	39 lbs (18 kgs)

Operating conditions

Pipeline's surface temperature and outer diameter

The Roxar FSM Log 48 sensing matrix shall be retrofitted over pipelines with a surface temperature that ranges from -40°F to 266°F (-40°C to 130°C) for uncovered and buried requirements. The pipeline's outer diameter shall range between 6 inches to 48 inches.

Ambient temperature for the Roxar FSM Log Data Unit

The ambient temperature shall be within the temperature range of -40°F to 140°F (-40°C to 60°C).

Distance from the Sensing Pin Matrix to the Roxar FSM Log Data Unit

The distance between the sensing matrix and the Roxar FSM Log Data Unit shall not exceed 32 feet (10 meters).

Distance from the Roxar FSM Log Data Unit to the Field Interface Unit

The distance between the above-mentioned elements shall not exceed 1640 feet (500 meters).

Note

The Field Interface Unit is contained either in an IP 66 non-Ex enclosure (only for safe areas) or in an Ex-d enclosure (Zone 1 and 2 hazardous area).

Solar panel and controller ambient temperature

The ambient temperature for the solar panel controller shall be within the temperature range of -13°F to 104°F (-25°C to 40°C). The temperature range for the solar panel shall be from -40°F to 185°F (-40°C to 85°C).

Note

Batteries are not included.

Cellular modem ambient temperature and protocols

The ambient temperature for the modem shall be within the temperature range of -29°F to 165°F (-34°C to 74°C). The modem has global LTE and HSPA+ multi-carrier network support.

WLAN modem ambient temperature and protocols

The ambient temperature for the modem shall be within the temperature range of -13°F to 140°F (-25°C to 60°C). WLAN access point, client, WLAN 802.11 a, b, g, n, frequency 2.4 GHz and 5 GHz.

Roxar Fieldwatch hardware requirements

Roxar Fieldwatch hardware requirements	
Fieldwatch server	Minimum Intel Xeon E5 or similar processor 8-12 GB RAM 1 TB free disc space Microsoft Windows Server 2008 R2 SP1 or newer
Fieldwatch client	1 GHz processor 2 GB RAM 2 GB free disc space 1280 x 1024 resolution true color Microsoft Windows 7 or newer (32 and 64 bit)

Matrix cables for low temperature option

Type	Description
Matrix cables	33 ft (10 m) of cable with: <ul style="list-style-type: none"> ■ core temperature rating: up to 284 °F (140 °C) ■ jacket temperature rating: up to 194 °F (90 °C)
Current feed cables	33 ft (10 m) of cable with: <ul style="list-style-type: none"> ■ core temperature rating: up to 284 °F (140 °C) ■ jacket temperature rating: up to 194 °F (90 °C)
Jumper cables	16 in (40 cm) of cable with: <ul style="list-style-type: none"> ■ core temperature rating: up to 284 °F (140 °C) ■ jacket temperature rating: up to 194 °F (90 °C)
Temperature sensor assembly	A spliced set of cables composed of: <ul style="list-style-type: none"> ■ 20 in (50 cm) metal temperature sensor that can resist temperature up to 932 °F (500 °C)** ■ 7 ft (2 m) of cable with: <ul style="list-style-type: none"> — core temperature rating: up to 284 °F (140 °C) — jacket temperature rating: up to 194 °F (90 °C)

Model code numbering system

Model	Product description
Roxar FSM Log 48	Field Signature Method Non-intrusive Metal Loss Monitor and Logger

FSM Log 48 enclosure material

Code	FSM Log 48 enclosure material
A	Stainless steel

Matrix and logger approval

Code	Matrix and logger approval
A0	Not approved for hazardous area
A1	ATEX/IECEX

FSM power supply

Code	FSM power supply
1 ⁽¹⁾	110/260 VAC
2 ⁽¹⁾	18-32 VDC
3 ⁽²⁾	Roxar Fieldbus Power
4	Solar Kit-12 VDC

(1) Not available with Matrix and logger approval, option A1.

(2) Not available with Matrix and logger, option A0.

FSM Fieldbus cable size range

Code	FSM Fieldbus Cable Size Range
0 ⁽¹⁾	Not applicable
1 ⁽²⁾	5.5 -12 mm OD / 3.5 - 8.1 ID; For Roxar standard field cable
2 ⁽²⁾	12.5 - 20.5 mm/OD/ 8.4 - 14.3 mm ID; For Roxar heavy duty field cable

(1) Not available with Matrix and logger approval, option A1.

(2) Not available with Matrix and logger approval, option A0.

FSM Fieldbus cable gland

Code	FSM Fieldbus cable gland
G0 ⁽¹⁾	No gland
P4 ⁽²⁾	Metric; Brass; Hawke 501/453/Universal Ex de
P5 ⁽²⁾	Metric; Nickel-plated brass; Hawke 501/453/Universal Ex de
P6 ⁽²⁾	Metric; Stainless steel; Hawke 501/453/Universal Ex de
X9 ⁽²⁾⁽³⁾	Other gland

(1) Not available with Matrix and logger approval, option A1.

(2) Not available with Matrix and logger approval, option A0.

(3) Not available with Factory option Z.

FSM power cable size range

Code	Power cable size range
0 ⁽¹⁾	Not applicable
5 ⁽²⁾	3.2 - 8.0 mm OD
6 ⁽²⁾	6.5 - 11.9 mm OD
9 ⁽²⁾⁽³⁾	Other size

(1) Not available with Matrix and approval logger, option A0.

(2) Not available with Matrix and logger approval, option A1.

(3) Not available with Factory option Z.

FSM power cable gland

Code	Power Cable Gland
G0 ⁽¹⁾	No gland
P1 ⁽²⁾	Metric; Brass; Hawke 501/421/Universal Ex de
P2 ⁽²⁾	Metric; Nickel-plated brass; 501/421/Universal Ex de
P3 ⁽²⁾	Metric; Stainless steel; 501/421/Universal Ex de
X9 ⁽²⁾⁽³⁾	Other gland

(1) Not available for Matrix and logger approval, option A0.

(2) Not available for Matrix and logger approval, option A1.

(3) Not available with Factory option Z.

FSM communication protocol

Code	FSM communication protocol
10 ⁽¹⁾	Roxar Fieldbus
60 ⁽²⁾	RS-232; Include a converter 232 to 485
70 ⁽²⁾	RS-485; Include a converter from 232 to TCP IP
80 ⁽²⁾	TCP IP
81 ⁽²⁾	Roxar FSM over WLAN; Phoenix Contact 5100; Check data sheet for country approvals and licenses
82 ⁽²⁾	Roxar FSM over WLAN; Phoenix Contact 5101; US and Canada
83 ⁽²⁾	Roxar FSM over WLAN; Phoenix Contact 5102; Japan
84 ⁽²⁾	Roxar FSM over Cellular; 4G LTE ANZ/LATAM
85 ⁽²⁾	Roxar FSM over Cellular; 4G LTE North America
86 ⁽²⁾	Roxar FSM over Cellular; 4G LTE EMEA/APAC
87 ⁽²⁾	Roxar FSM over Cellular; 4G LTE 450 EMEA/APAC
88 ⁽²⁾	Roxar FSM over Cellular; Global HPSA+
89 ⁽²⁾	Roxar FSM over Cellular; CDMA EV-DO 450 EMEA
99 ⁽²⁾⁽³⁾	Other

(1) Not available with Matrix and logger approval, option A0.

(2) Not available with Matrix and logger approval, option A1.

(3) Not available with Factory option Z.

FSM communication cable size range

Code	FSM communication cable size range
0 ⁽¹⁾	Not applicable
5 ⁽²⁾	3.2-8.0 mm OD
6 ⁽²⁾	6.5-11.9 mm OD

(1) Not available with Matrix and logger approval, option A0.

(2) Not available with Matrix and logger approval, option A1.

FSM communication cable gland

Code	FSM communication cable gland
G0 ⁽¹⁾	No gland
M2 ⁽²⁾⁽³⁾⁽⁴⁾	Metric 20; Brass
M3 ⁽²⁾⁽⁴⁾⁽⁵⁾	Metric 20; Nickel-plated brass
M4 ⁽²⁾⁽³⁾⁽⁵⁾	Metric 20; Stainless steel
X9 ⁽²⁾⁽⁶⁾	Other gland

- (1) Not available with matrix and logger approval, option A0.
 (2) Not available with matrix and logger approval, option A1.
 (3) Not available with FSM power gland, option P2.
 (4) Not available with FSM power gland, option P3.
 (5) Not available with FSM power gland, option P1.
 (6) Not available with Factory option Z.

Communication enclosure approval

Code	Communication enclosure approval
NN ⁽¹⁾	Not applicable
EA ⁽¹⁾	Non Ex-IP 66
EB ⁽²⁾	Ex-d IIB
EC ⁽²⁾	Ex-d IIC
ED ⁽²⁾	Only components for Ex-d enclosure
XX ⁽²⁾⁽³⁾	Others

- (1) Not available with Matrix and logger approval, option A1.
 (2) Not available with Matrix and logger approval, option A0.
 (3) Not available with Factory option Z.

Enclosure material

Code	Enclosure material
N ⁽¹⁾	Not applicable
A ⁽²⁾⁽³⁾	Stainless steel
B ⁽²⁾⁽³⁾	Aluminum
C ⁽⁴⁾	Sheet steel

- (1) Not available with Communication enclosure approval, options EA, EB and EC.
 (2) Not available with Matrix and logger approval, option A0.
 (3) Not available with Communication enclosure approval, option ED.
 (4) Available only with Communication enclosure approval, option EA.

Enclosure power supply

Code	Enclosure power supply
0 ⁽¹⁾⁽²⁾	Not applicable
1	Wired - 100/260 VAC-24VDC (all)
2	Wired - 10-36 VDC (all)
3	Solar Kit -24 VDC (all)

(1) Not available with Communication enclosure approval, options EA, EB and EC.

(2) Not available with Communication enclosure approval, option ED.

Enclosure power cable size range

Code	Enclosure power cable size range
0 ⁽¹⁾	Not applicable
5 ⁽²⁾	3.2 - 8.0 mm OD
6 ⁽²⁾	6.5 - 11.9 mm OD

(1) Not available with Communication enclosure approval, options EA, EB and EC.

(2) Not available with Communication enclosure approval, option ED.

Enclosure power cable gland

Code	Enclosure power cable gland
G0 ⁽¹⁾	No gland
M2 ⁽²⁾⁽³⁾⁽⁴⁾	Metric 20; Brass
M3 ⁽²⁾⁽⁵⁾⁽⁴⁾	Metric 20; Nickel-plated brass
M4 ⁽²⁾⁽⁵⁾⁽³⁾	Metric 20; Stainless steel
X9 ⁽²⁾⁽⁶⁾	Other gland

(1) Not available with Communication enclosure approval, options EA, EB, and EC.

(2) Not available with Communication enclosure approval, option ED.

(3) Not available with FSM Fieldbus cable gland, option P5.

(4) Not available with FSM Fieldbus cable gland, option P6.

(5) Not available with FSM Fieldbus cable gland, option P4.

(6) Not available with Factory option Z.

Enclosure communication protocol

Code	Enclosure communication protocol
00 ⁽¹⁾⁽²⁾	Not applicable
60	RS-232; Include a converter RS-232 to RS-485
70	RS-485; Include a converter RS-232 to TCP-IP
80	TCP-IP
81	Roxar FSM over WLAN; Phoenix Contact 5100; Check data sheet for country approvals and licenses
82	Roxar FSM over WLAN; Phoenix Contact 5101; US and Canada
83	Roxar FSM over WLAN; Phoenix Contact 5102; Japan
84	Roxar FSM over Cellular; 4G LTE ANZ/LATAM
85	Roxar FSM over Cellular; 4G LTE North America;
86	Roxar FSM over Cellular; 4G LTE EMEA/APAC
87	Roxar FSM over Cellular; 4G LTE 450 EMEA/APAC
88	Roxar FSM over Cellular; Global HPSA+
89	Roxar FSM over Cellular; CDMA EV-DO 450 EMEA
99 ⁽³⁾⁽⁴⁾	Other

- (1) Not available with Communication Enclosure Approval, options EA, EB and EC.
- (2) Not available with Communication Enclosure Approval, option ED.
- (3) Not available with Matrix and logger approval, option A0.
- (4) Not available with Factory option Z.

Enclosure communication cable gland

Code	Enclosure communication cable gland
G0 ⁽¹⁾	No gland
M2 ⁽²⁾⁽³⁾⁽⁴⁾	Metric 20; Brass
M3 ⁽²⁾⁽⁴⁾⁽⁵⁾	Metric 20; Nickel-plated brass
M4 ⁽²⁾⁽³⁾⁽⁵⁾	Metric 20; Stainless steel
X9 ⁽²⁾⁽⁶⁾	Other gland

- (1) Not available with Communication enclosure approval, option EA, EB and EC.
- (2) Not available with Communication enclosure approval, options EA, EB and EC.
- (3) Not available with FSM Fieldbus cable gland, option P5.
- (4) Not available with FSM Fieldbus cable gland, option P6.
- (5) Not available with FSM Fieldbus cable gland, option P4.
- (6) Not available with Factory option Z.

Enclosure communication cable size range

Code	Enclosure communication cable size range
0 ⁽¹⁾	Not applicable
5 ⁽²⁾	3.2 - 8.0 mm OD
6 ⁽²⁾	6.5 - 11.9 mm OD

(1) Not available with Communication enclosure approval, options EA, EB and EC.

(2) Not available with Communication enclosure approval, option ED.

FSM blind and drain plug material

Code	FSM blind and drain plug material
P	Nylon (TBV)
B	Brass
N	Nickel plated brass
S	Stainless steel

Matrix installation type

Code	Matrix installation type
TS	Topside installation
BD	Buried installation

Matrix type

Code	Matrix type
T1	Carbon steel pipe - Installation temperature 0 °C (32 °F) to 100 °C (212 °F)
T2	Carbon steel pipe - Installation temperature -40 °C (-40 °F) to 0°C/100 °C (212 °F) to 135 °C (275 °F)
T3	Stainless steel -40 °C (-40 °F) to 135 °C (275 °F)

Matrix size

Code	Matrix type
001	48 pin - Type 1; 50 mm pin distance; To determine OD and schedule combination
002	48 pin - Type 2; 80 mm pin distance; 80 mm pin distance; To determine OD and schedule combination
003	48 pin - Type 3; 160 mm pin distance; To determine OD and schedule combination
999 ⁽¹⁾	Other

(1) Not available in Factory option Z.

FSMLog model code reference plate

Code	Reference plate
P1	Client provided material and manufacturing

Tag plates

Code	Tag plates
ZZ	No tag plates
TG	Standard tag plates for instruments
XX ⁽¹⁾	Project specific tag plates

(1) Not available with Factory option Z.

Factory options

Code	Factory options
Z	Standard product
X	ETO product

Future use

Code	For future use
XXX ⁽¹⁾	N/A

(1) Not available with Factory option Z.

Emerson Automation Solutions

Roxar
Gamle Forusveien 17
4031 Stavanger
Norway
Europe: + 47 51 81 8800
Russian CIS countries: + 7 495 504 3405

www.Emerson.com/Roxar
info.roxar@emerson.com

Emerson Automation Solutions

North America: + 1 281 879 2328
Latin America:
Mexico: +52 55 5809 5010
Argentina: + 54 11 4809 2700
Brazil: + 55 15 3413 8000
Chile: + 56 2 2928 4800
Peru + 51 15190130

Emerson Automation Solutions

Asia Pacific: + 60 3 5624 2888
Australia: + 61 8 9208 1600
Middle East: + 971 4811 8100

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