Product Data Sheet
RXPS-002250, Rev B
November 2020

Roxar™ PDS (PIG Detection System)

Non-intrusive PIG Detection

The Roxar PIG is a non-intrusive, bi-directional unit that detects the high performance acoustic emissions generated by all types of PIGs as they move through the pipe. The detector has no moving parts or active emission sources.

Roxar PIG Detection System (PIG)

The Roxar PIG Detection System (PDS) is a valuable instrument for pipeline integrity applications.

The system allows you to:

- Enable control over the travel of the Pipeline Inspection Gauges (PIG) through the PIG loop
- Receive generated information if the PIG successfully passed problem areas
- Enable operators to gain knowledge of the large obstacles within the PIG loop

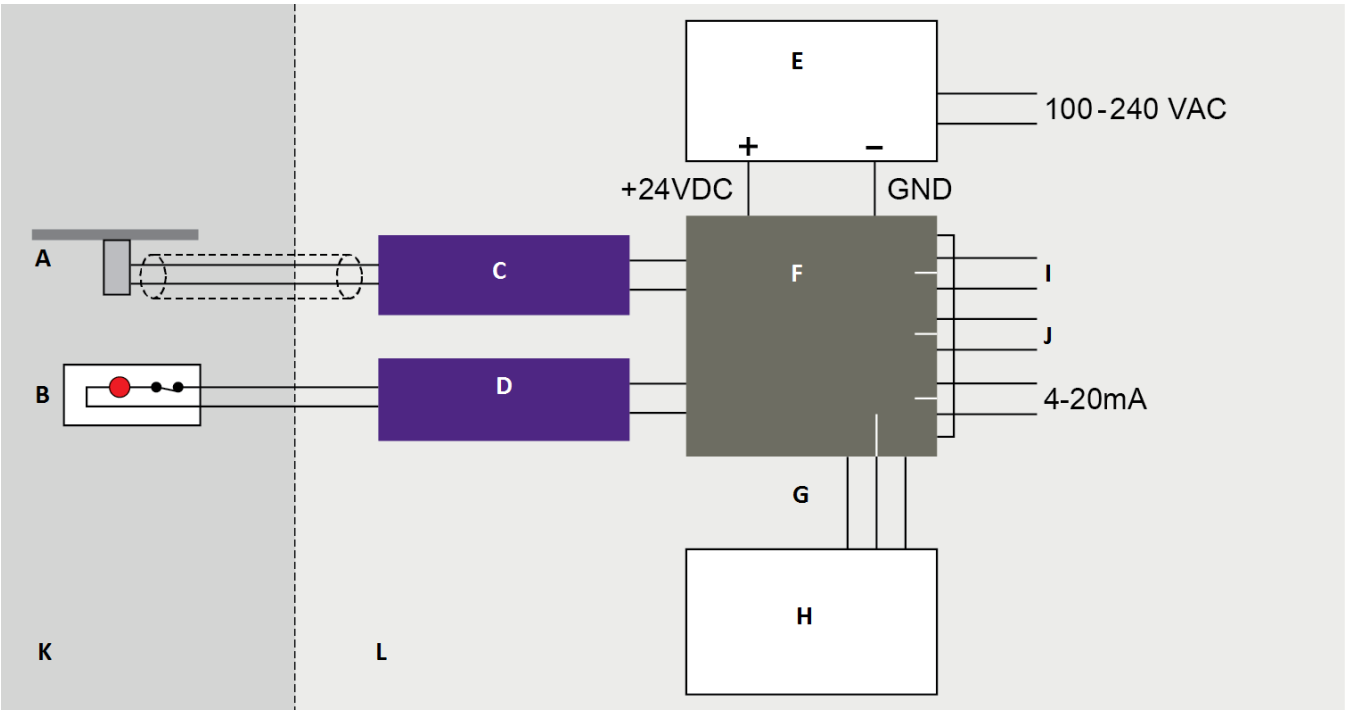
The Roxar PDS is an acoustic type device that includes the following benefits:

- Detects any type of PIG in both directions
- Generates accurate timings at which a PIG passes a given point
- Ability to detect sand noise without calibration.
- No mechanical moving parts resulting in low maintenance.
- Compact and low weight device.
- Non-intrusive design benefits include:
  - No wetted parts
  - No pipe pressure drop
  - Easy to install
  - No shutdown required for installation
  - Easy to retrofit for existing installations

Building Blocks behind the Roxar PIG detection system

The Roxar PIG detection system consists of several parts:

- A detector consisting of a transducer and housing clamped on to the pipe
- The basic safe area electronics consisting of a Calculation & Interface Unit (CIU) and a safety barrier
- Service software

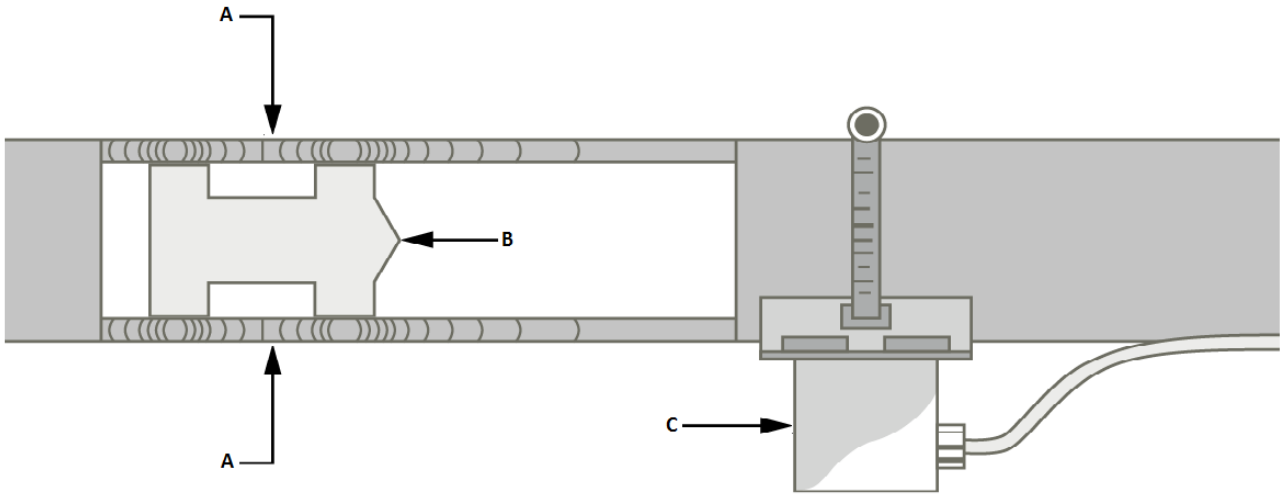


A. Flowline Detector
B. Field Reset Box
C. Safety Barrier
D. Safety Barrier (optional)
E. Power Supply (PSU) (optional)
F. Calculation & Interface Unit (CIU)
G. Service Bus RS232
H. PC with service software (optional)
I. Modbus RTU/RS485
J. Volt Free Contact
K. Hazardous Area
L. Safe Area or Ex-d Enclosure

Roxar PIG working principle

When a PIG travels through the pipe, the friction between the PIG and the pipe generates a characteristic noise. This noise contains information that can be interpreted to gain more knowledge on the situation inside the pipe. By designing the Roxar PIG around an acoustic emission transducer, this noise is detected and can be used to gather valuable information.

Figure 1: PIG through a Pipe



A. *PIG-Generated Noise in the Pipe Wall*
B. *Moving PIG*
C. *Detector*

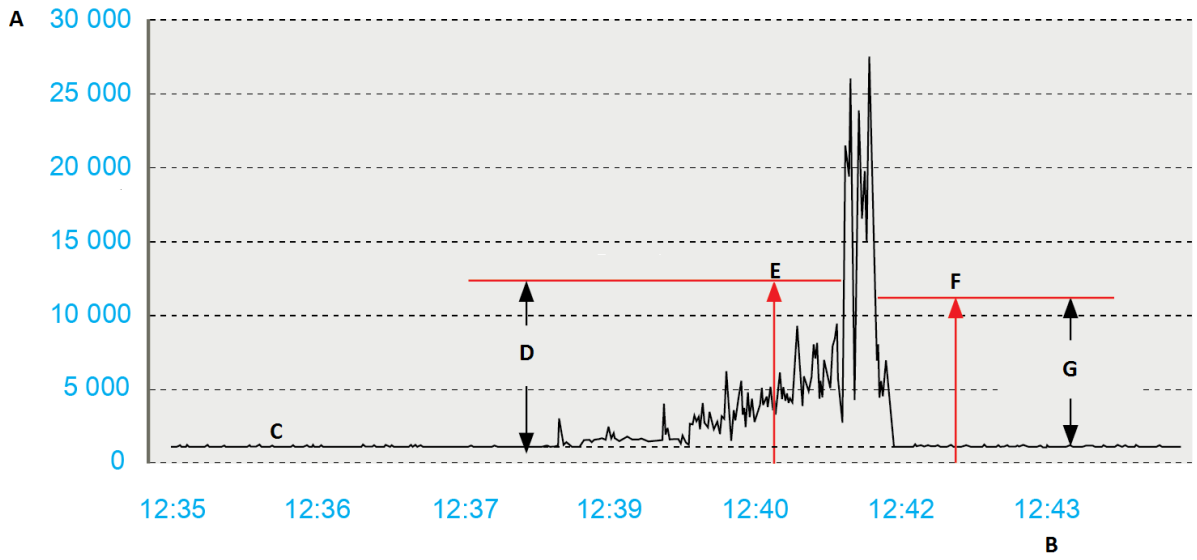
Pipeline Inspection Gauges (PIGs), in general, generate sufficient noise to allow detection at velocities at a minimum 0.05 m/s depending on the PIG material. Noise within the ultrasonic frequency band of the sensor will be largely dominated by that induced by the passing PIGs. Contributions from other external sources are negligible, which minimizes the risk for false readings.

The Calculation and Interface Unit (CIU) receives a digitized noise signal from the detector every second.

- When a PIG is approaching the detector, the noise generated by the PIG rises above the Average Noise Level (ANL) and when increasing above a defined limit, the CIU gives a “PIG Approach” signal.
- When the PIG has passed the detector, the noise level drops back to normal level. When the level drops off below a defined limit, the CIU generates a “PIG Passed” signal.

The defined limits can be set to suit the typical noise level for any type of PIG, as shown in the example Figure 2.

Figure 2: Noise Level of a PIG



A. *Raw Data Signal (1000nV)*
B. *Time*
C. *ANL*
D. *Approach Threshold*
E. *Li*
F. *Lo*
G. *Passed Threshold*

Technical specifications

Table 1: Roxar PDS Technical Specifications

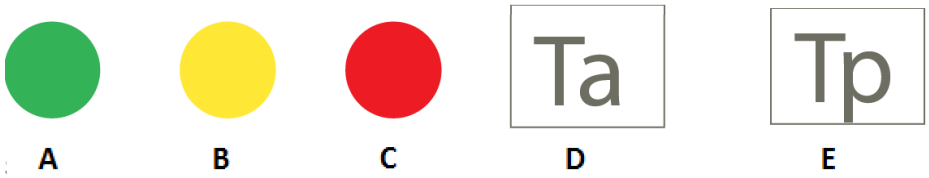
Value	Description
Ambient temperature	-40 °F (-40.0 °C) to 176 °F (80.0 °C)
Calculation Interface Unit (CIU) dimension and weight	29 mm X 99 mm X 113 mm (WxLxH) and 0.2 kg
CIU supply voltage	24 VDC
Data storage	Up to 90 days based on 10 second averaging intervals
Detector Approvals	ATEX, IECEx, CSA, Inmetro, and EAC
Detector Ingress protection	IP66-67
Detector / monitor dimensions and weight	88 mm (OD) x 100 mm and 3.0 kg
Electrical specifications Detector	24 VDC (powered through CIU)
Installation	Detector/monitor: Fixed on pipe exterior (OD from 2 in to 48 in) in Exia/Zone 0, 1, 2 CIU or Safety Barrier: DIN-rail mountable in safe area or optional in field enclosure
Pipe surface temperature	■ Standard Temperature: -40 °F (-40.0 °C) to 239 °F (115.0 °C) ■ High Temperature: -40 °F (-40.0 °C) to 554 °F (290.0 °C)
Repeatability	The sensors have repeatability better than 1%, meaning that the sensor signal will read the same values with less than 1% deviation for fixed noise reference signals generated by a calibrated noise generator. The reference signals range from zero to a maximum sensor reading of 2 mill (100nV).
Required PIG velocity	Minimum 0.05 m/s depending on PIG material (Steel PIG: minimum 0.05 m/s / Polymer PIG: > 0.5 m/s)
Safety barrier dimensions	12.6 mm x 105 mm x 90 mm (WxLxH)
System power consumption	1.2 to 2.5W (depends on which barrier is used)
Uncertainty	Up to +/- 2 seconds, depending on flow regimes and calibration level

Roxar PIG detector

The Roxar PIG detector is mounted in a straight pipeline section, normally after the PIG launcher and before the PIG receiver. Excessive levels of unwanted noise may, in the worst case scenario, compromise the measurement principle. Care should be taken to avoid installation near valves, or close to the PIG receiver/launcher.

Installation considerations

Figure 3: Installation Use Guidelines



A. *Green – Safe use*
B. *Yellow – Safe use, but not recommended (risk for non-safety-critical sensor damage)*
C. *Red – Unsafe use (outside certified temperature envelope)*
D. *Ambient temperature: The temperature of air or other media in a designated area surround the equipment.*
E. *Surface temperature of the pipe on which the equipment is mounted.*

Standard Temperature (ST) version

For the ST version, the only installation requirement is that there is a space between the detector housing and the pipe installation to allow the heat to dissipate from the detector and the pipe. This space ensures the detector's temperature is kept as low as possible.

Figure 4: ST version chart

	T6	T5	T4		T3	T2
Ta max	Tp max 80 °C	Tp max 95 °C	Tp max 115 °C	Tp max 130 °C	Tp max 195 °C	Tp max 290 °C
40 °C	A	A	A	A	B	C
50 °C	A	A	A	B	C	C
60 °C	A	A	B	B	C	C
70 °C	C	B	B	B	C	C
80 °C	C	B	B	B	C	C

A. *Green – Safe Use*
B. *Yellow – Safe Use, But Not Recommended*
C. *Red – Unsafe Use*

High Temperature (HT) version

The HT version must always be mounted horizontally on the pipe.

The HT version also contains:

- An extended waveguide 'noise' at the front end to retract the sensor electronics away from the hot pipe surface
- Vent holes in the detector housing to provide more efficient heat evacuation

Figure 5: HT version chart

	T6	T5	T4	T3		T2	
Ta max	Tp max 80 °C	Tp max 95 °C	Tp max 130 °C	Tp max 170 °C	Tp max 195 °C	Tp max 240 °C	Tp max 290 °C
40 °C	A	A	A	A	A	A	A
50 °C	A	A	A	A	A	A	B
60 °C	A	A	A	A	B	B	B
70 °C	A	A	A	B	B	B	B
80 °C	C	A	B	B	B	B	C

A. Green – Safe Use
B. Yellow – Safe Use, But Not Recommended
C. Red – Unsafe Use

Model code numbering system

Roxar PIG detector acoustic – product model numbers

Product description

Code	Product description option
PDS01	Roxar PIG detector – Acoustic

Functional properties

Code	Functional Properties
ST	Standard temperature version (-40 °F (-40.0 °C) to 239 °F (115.0 °C))
HT	High temperature version (-40 °F (-40.0 °C) to 554 °F (290.0 °C))

Pipe size

Code	Pipe Size
002	Mounting fixtures from 2 in pipe size
012	Mounting fixtures from 2½ in to 12 in pipe size
024	Mounting fixtures from 12 in to 24 in pipe size
036	Mounting fixtures from 24 in to 36 in pipe size
048	Mounting fixtures from 36 in to 48 in pipe size

Main material (sensor housing)

Code	Sensor housing
A	Stainless steel

Detector approvals

All detector approvals are certified for Intrinsically Safe installations.

Code	Detector approvals
A2	ATEX
A3	IECEx
A4	CSA
A5	INMETRO
A6	EAC

Field cable gland

All field cable glands have the following certification: Hawke 501/453/Universal Ex de.

Code	Field cable gland
G0	No Gland (Client provided)
M2	Metric; Brass; Hawke
M3	Metric; Nickel-plated brass
M4	Metric; Stainless steel; Hawke
N2	NPT; Brass; Hawke
N3	NPT; Nickel-plated brass
N4	NPT; Stainless steel; Hawke
X9(1)	Other gland

(1) *Not Available withFactory option Z.*

Field cable size range

Code	Field cable size range
0(1)	Not applicable
1(2)	5,5mm - 12 mm OD / 3,5 - 8,1 ID
2(2)	9,5 mm - 16 mm OD / 6,5 - 11,4 mm ID (Selection for Roxar Heavy Duty BFOU Field Cable)
3(2)	12,5 mm- 20,5 mm OD / 8,4 - 14,3mm ID
4(2)	16,9 - 26 mm ID / 11,1 - 19,7 mm ID

(1) *Only available with Field Cable Gland option G0 (no gland).*
(2) *Not available with Field Cable Gland option G0 (no gland).*

Communication interface

Code	Communication interface
0B	Modbus RTU
0C	Analog 4-20 mA
0D	Voltage free contact

Customer supply voltage

Code	Customer supply voltage
1	24VDC
2	100-240 VAC, 50/60Hz (Power supply to be offered separately)

Barrier

Code	Barrier
00N	Client provided barrier; Roxar CIU
02A	Zener barrier (IS); Roxar CIU
02B	Galvanic isolator barrier (Non ISE); Roxar CIU

Field reset box

Code	Field Reset Box
0000	No Field Reset Box / Not applicable
FRB1	External Supplied Field Reset Box Ex ia for Roxar Pig Detector; Stainless steel / ATEX
FRB2	External Supplied Field Reset Box Ex de for Roxar Pig Detector; Stainless steel / ATEX IECEx Inmetro EAC

Installation location for electronics (CIU barrier)

Code	Installation location for electronics (CIU barrier)
Z0	Customer provided (CIU and barrier included as loose items)
Z1	Rail kit – loose items (Rail kit offered separately); (CIU and barrier included as loose items)
Z2	Rail kit – assembled (ETO ITEM offered separately); (CIU and barrier included on the rail kit)
Z3	External supplied Ex d/Ex de enclosure (ETO ITEM offered separately); (CIU and barrier included in the enclosure)
Z4(1)	External supplied Ex d/Ex de enclosure with reset function; (ETO ITEM offered separately); (CIU and barrier included in the enclosure)
Z5	Safe area cabinet; (ETO ITEM offered separately); (CIU and barrier included in the cabinet)

(1) *Not available with Field Reset Box options FRB1 or FRB2, or 0909.*

Tag plates

Code	Tag Plates
ZZ	No tag plates
TG	Standard tag plates
XX(1)	Project-specific tag plates

(1) *Not available with Factory option Z.*

Product specific options

Code	Product Specific Options
C0	No coating
C6	Roxar Standard Coating for stainless steel (ss); Sensor housing and mounting socket
C7(1)	Roxar Standard Coating for ss; Field reset box
C8(1)	Roxar Standard Coating for ss; Sensor housing, mounting socket, and field reset box
CX(2)	Project-specific coating

(1) *Not available with Field Reset Box option 0000.*
(2) *Not Available with factory Option Z.*

Factory options

Code	Factory Options
Z	Standard product
X	ETO product

PDS electronics enclosure assembly kit - product model numbers

Product description

Code	Product description
SAMPDSENC	SAM/PDS electronics enclosure assembly kit

Sensor type

Code	Sensor type
2	PDS - Pig Detection System
X(1)	Other

(1) *Not available with Factory option Z.*

Enclosure location

Code	Enclosure location
S(1)	Safe area
H(2)	Hazardous area (zone 1, 2)
X(3)	Other

(1) *Not available with Approvals options D2, D3.*
(2) *Not available with Approvals option NO.*
(3) *Not available with Factory option Z.*

Material

Code	Material
C	Sheet steel - painted RAL 7035
S	Stainless steel 316
A	Aluminum
X(1)	Other materials

(1) *Not available with Factory option Z.*

Enclosure approvals

Code	Enclosure approvals
NO(1)	Not applicable; Non Ex IP 66
A1(2)	ATEX IIC; SS:TÜV 12ATEX102320X
A2	ATEX IIB; SS:TÜV 12ATEX101309X
I1(2)	IECEX IIC; SS:TUN 12.0018X
I2	IECEX IIB; SS:TUN 12.0014X
A3	ATEX IIC; AL
A4	ATEX IIB; AL
I3	IECEX IIC; AL
I4	IECEX IIB; AL
X9(3)	Other

(1) *Not available with Material, option S.*
(2) *Not available with Material, option C.*
(3) *Not available with Factory option Z.*

Mounting

Code	Mounting
W	Wall mounted (mounting accessories included)
X(1)	Other

(1) *Not available with Factory option Z.*

CIU option

Code	CIU option
Material Code C (Sheet steel - painted RAL 7035)	
01	1 CIU
02	2 CIU
03	3 CIU
04	4 CIU
X(1)	Other

(1) *Not available with Factory option Z.*

Code	CIU option
Material Code S (Stainless Steel 316)	
01	1 CIU
02	2 CIU
03	3 CIU
04	4 CIU
X(1)	Other

(1) *Not available with Factory option Z.*

Barrier

Code	Barrier
A	Zener barrier
B	Galvanic barrier

Customer supply voltage

Code	Customer supply voltage
Material Code C (Sheet steel - painted RAL 7035)	
1	240 VAC
2	24 VDC
X(1)	Other power supply

(1) *Not available with Factory option Z.*

Code	Customer supply voltage
Material Code S (Stainless Steel 316)	
1	240 VAC
2	24 VDC
X(1)	Other power supply

(1) *Not available with Factory option Z.*

Communication output

Code	Communication output
0B	RS485
0C	Analog 4-20 mA
0D	Voltage free contact
0E	TCP/IP
9X(1)	Other communication

(1) *Not available with Factory option Z.*

Communication and sensor cable glands

Code	Power cable size range
G0(1)	No gland (client provided)
M2(2)	Metric brass; Hawke Ex de
M3(2)	Metric nickel-plated brass; Hawke Ex de
M4(2)	Metric stainless steel; Hawke Ex de
N2(2)	NPT brass; Hawke Ex de
N3(2)	NPT brass nickel-plated; Hawke Ex de
N4(2)	NPT stainless steel; Hawke Ex de
X9(2)(3)	Other

(1) *Available only with Communication and Sensor Cable Range, option 0.*
(2) *Not available with Communication and Cable Size Range, option 0.*
(3) *Not available with Factory option Z.*

Communication and sensor cable size range

Code	Communication and sensor cable size range
0	Not applicable
1	5,5 -12mm OD / 3,5-8,1 ID
2	9,5 - 16 mm OD / 6,5 - 11,4 mm ID
3	12,5 - 20,5 mm OD / 8,4 - 14,3 mm ID
4	16,9 - 26 mm OD / 11,1 - 19,7 mm ID

Power cable gland

Code	Power cable size range
G0(1)	No gland (client provided)
M2(2)	Metric brass; Hawke Ex de
M3(2)	Metric nickel-plated brass; Hawke Ex de
M4(2)	Metric stainless steel; Hawke Ex de
N2(2)	NPT brass; Hawke Ex de
N3(2)	NPT brass nickel-plated; Hawke Ex de
N4(2)	NPT stainless steel; Hawke Ex de
X9(2)(3)	Other

(1) *Available only with Power Cable Size Range, option 0.*
(2) *Not available with Power Cable Size Range, option 0.*
(3) *Not available with Factory option Z.*

Power cable size range

Code	Power cable size range
0	Not applicable
1	5,5 -12mm OD / 3,5-8,1 ID
2	9,5 - 16 mm OD / 6,5 - 11,4 mm ID
3	12,5 - 20,5 mm OD / 8,4 - 14,3 mm ID
4	16,9 - 26 mm OD / 11,1 - 19,7 mm ID

Tag plates

Code	Tag Plates
ZZ	No tag plates
TG	Standard tag plate; Trapholite, size 70 mm x 20 mm - customer information required
XX(1)	Project-specific tag plates

(1) *Not available with factory option Z.*

Electronics option

Code	Electronics option
Z	Standard

Factory option

Code	Factory Options
Z	Standard product
X	ETO product

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