PAQUiN SENSORS
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Ultrasonic Level Switch

- **Non-Contact Measurement:** Uses ultrasonic pulses for accurate, contactless level measurement
- **Versatile Output Options:** Available with PNP transistor with open collector or a two-state current switch (4 mA / 20 mA)
- **Wide Ranges:** Supports measurement distances from 0.1 m to 10 m, customizable by model
- **Status Indication:** LED illumination
- **Explosion-Proof Variants:** Designed for hazardous locations
- **Configurable Settings:** Allows for local setup with buttons, a magnetic pen, or remote configuration via Modbus RTU

About

The P421 Ultrasonic Level Sensor is a versatile and reliable measurement device designed for non-contact level sensing of liquids and some solid materials. Its all-plastic construction and various connection types make it highly adaptable to different installation environments, including hazardous locations with explosive gases. The sensor operates using ultrasonic pulses to measure distances accurately, compensating for temperature variations to maintain precision. With options for different measurement ranges, output types, and settings, the P421 can be customized to meet diverse industrial needs.

Applications

- ✓ Food & Beverage
- ✓ Chemical Refining
- ✓ Pharmaceuticals
- ✓ Water & Wastewater
- ✓ Clean Liquids
- ✓ Slurries
- ✓ Pastes
- ✓ Sludges
- ✓ Adhesives
- ✓ Resins

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Build Your Part Number

Series P421

Example: P421SM2P2SCT4PSE5

Series
P421

Hazard Performance - *select one*	
S	Standard Atmosphere (non-explosive)
E	Explosion Proof

Measuring Range - *select one*	
M1	0.10 ... 1.0 meters
M2	0.20 ... 2.0 meters
M3	0.20 ... 6.0 meters
M4	0.40 ... 10 meters

Process Connection - *select one; see diagrams on page 6 (includes 1 seal)*	
P1	G ¾"
P2	G 1"
P3	G 1 ½"
P4	G 2 ¼"

Output - *select one*	
P	PNP switching transistor with open collector
S	Two-state current switch 4 mA / 20 mA

Electrical Connection - *select one; refer to pages 5 & 6*	
G	DIN 43650A (IP65)
C	M12 x 1, 4-pole (IP67)
B	Cable gland with non-detachable cable (IP67)
H	Cable gland with non-detachable cable (IP67) and with female thread for installation of protective hose (hose over cable)

Switch Point Adjustment - *select one*	
T	By push buttons
M	By magnetic pen (pen included)

Cable Length – *must inform required cable length if B or H selected above*	
	Cable length in meters (Example: 15 = 15 meter)

Mating Electrical Connection Assembly – *optional; will be quoted as a separate line item*	
Part#	
PSE1	M12x1, 5 pole – straight with cable gland (field wireable)
PSE2	M12x1, 5 pole - straight with 1 meter PUR cable
PSE3	M12x1, 5 pole - straight with 3 meter PUR cable
PSE4	M12x1, 5 pole - straight with 1 meter PUR shielded cable
PSE5	M12x1, 5 pole - straight with 3 meter PUR shielded cable
PSE6	M12x1, 5 pole - 90° (field wireable)
PSE7	M12x1, 5 pole - 90° with 1 meter PUR shielded cable
PSE8	M12x1, 5 pole - 90° with 3 meter PUR shielded cable
PSE14	DIN 43650-A with cable gland (field wireable)
PSE15	DIN 43650-A with 1 meter PUR cable
PSE16	DIN 43650-A with 3 meter PUR cable
PSE17	DIN 43650-A with 1 meter PUR shielded cable
PSE18	DIN 43650-A with 3 meter PUR shielded cable
PSE19	DIN 43650-A with 1/2" NPT female & cable gland (field wireable)

Accessories – *optional; will be quoted as a separate line item*	
	Plastic fastening nuts G ¾", G 1", G 1 ½", G 2 ¼"
	Horn adapter G ¾", G 1", G 1 ½", G 2 ¼"
	Stainless teel nipples G 1", G 1 ½"
	Steel nipples G 1", G 1 ½"
	Protective hose (for option H)

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Technical Parameters

Technical Parameters			
Electrical	Supply Voltage	Standard Atmosphere: 18 ... 36 VDC Explosion Proof: 18 ... 30 VDC	
	Current Supply	Standard Atmosphere: Maximum 12 mA Explosion-Proof: disconnected 4 mA / connected 20 mA	
	Current Output	PNP Transistor with an open collector	
	Voltage Output	Two-state current switch 4 mA / 20 mA	
	Maximal Current Output Load Resistance	U = 24 VDC	R_{max} = 270 Ω
		U = 22 VDC	R_{max} = 180 Ω
		U = 20 VDC	R_{max} = 90 Ω
	Minimal Voltage Output Load Resistance	R_{min} > 1 kΩ	
	Delay Between Supply Power Rise Time and First Measurement	Variants with Measuring Range M1, M2, M3 (0.10 ... 6.0 meters)	5 seconds
		Variants with Measuring Range M4 (0.40 ... 10 meters)	9 seconds
	Max. Internal Values [2] (Explosion Proof)	U_i = 30 VDC I_i = 132 mA P_i = 0.99 W C_i = 370 nF L_i = 0.9 mH	
	Failure Indication	Echo failure – basic mode Echo failure – inverse mode Level in dead zone [4] – basic mode Level in dead zone [4] – inverse mode	3.75 mA / 0 V 22 mA / 10.5 V 22 mA / 10.5 V 3.75 mA / 0 V
Measuring	Measuring Range Minimum [1]	0.10 meters	
	Measuring Range Maximum [1]	10 meters	
	Resolution	< 1 mm	
	Accuracy (within total range) (M4?)	Variants with Measuring Range M1	0.1 – 0.2 meters: 0.3% 0.2 – 1.0 meters: 0.2%
		Variants with Measuring Range M2 or M3	0.2 – 6.0 meters: 0.15%
	Temperature Error	Maximum 0.04% / K	
	Beam Width (-3 dB)	Variants with Measuring Range M1, M2, and M4 (0.10 ... 6.0 meters)	10°
		Variants with Measuring Range M3 (0.20 ... 6.0 meters)	14°
	Measuring Period	Variants with Measuring Range M1, M2 (0.10 ... 2.0 meters)	0.6 seconds
		Variants with Measuring Range M3 (0.20 ... 6.0 meters)	1.0 seconds
		Variants with Measuring Range M4 (0.40 ... 10 meters)	1.8 seconds
	Averaging	4 measurements [3]	
Environmental	Safety	Explosion Proof Hazard Performance (E)	EN 60079-0:2007 EN 60079-11:2007 EN 60079-26:2007 09 ATEX 0119X
		Explosion Proof with M1, M2, M3 Range, any Output (and M4 Range only with 2-State Output) Intrinsically safe explosion-proof performance for use in hazardous areas (explosive gas atmospheres) **Ex II 1/2G Ex ia IIB T5 Ga/Gb** with intrinsically safe supply units 1), whole level sensor zone 1, front head part 0.	
		Low Safety Voltage	33 2000-4-41
		Electromagnetic Compatibility	EN 55011/B, EN 61326-1 and EN 61000-4-2 to 6
	Water Protection Class	Variants with Setting Using Buttons	IP67
		Variants with Connector ISO	IP67
		Variants with Connector M12 and Magnetic Pen Setting	IP67 [5]
		Variants with Standard Cable Gland and Magnetic Pen Setting	IP68
		Variants with Cable Gland for Protective Hose and Magnetic Pen Setting	IP68
	Ambient Temperature Range	Variants with M1, M2, or M3 (0.10 ... 6.0 meters)	-22°F ... 158°F (-30°C ... +70°C)
		Variants with M4 (0.40 ... 10 meters)	-22°F ... 140°F (-30°C ... +60°C)
	Short Time Temperature Stress Resistance	+194°F / 1 hour (+90°C / 1 hour)	
	Maximum Operation Overpressure (On Transmission Surface)	0.1 MPa	

1) In case the level of bulk-solid materials is measured, the measurement range is reduced.
2) Allowed pressure range in zone 0: 80 ... 110 kPa.
3) From the last six measurements are taken out extreme values MAX and MIN, then the remaining four measurement was performed arithmetic average.
4) Dead zone = blind zone = blocking zone.
5) Protection class IP68 can be achieved when a special connector is used.

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Technical Parameters Con.

Technical Parameters

Materials	Recommended Cable	PVC 2 x 0.75 mm² (3 x 0.5 mm²)	
	Process Connection	Variants with Measuring Range M1 (0.10 ... 1.0 meters)	Pipe thread G ¾"
		Variants with Measuring Range M2 (0.20 ... 2.0 meters)	Pipe thread G 1"
		Variants with Measuring Range M3 (0.20 ... 6.0 meters)	Pipe thread G 1 ½"
		Variants with Measuring Range M4 (0.40 ... 10 meters)	Pipe thread G 2 ¼"
	Weight	Variants with Measuring Range M1 (0.10 ... 1.0 meters)	0.20 kg
		Variants with Measuring Range M2 (0.20 ... 2.0 meters)	0.20 kg
		Variants with Measuring Range M3 (0.20 ... 6.0 meters)	0.25 kg
		Variants with Measuring Range M4 (0.40 ... 10 meters)	0.65 kg
	Housing	Plastic PP	
	Electro-acoustic Transducer	Plastic PVDF	
	Cable Gland	Plastic PA	

Status Indication

LED Indicator	Color	Function
"RUN"	Green	**Short flashing** (repeated depending on the measurement interval approx. 1 ... 2 s) - correct function, receipt of signal (echo) reflected from the measured surface **Fast flashing** – the measured surface is in the dead zone of the level sensor or the ultrasound transducer is dirty **Off** – the level sensor is not capable of receiving the echo. Incorrect installation or malfunction
"STATE"	Orange	<u>Output status indication</u> • Off – sensor output is disconnected (OFF) • On – sensor output is connected (ON) <u>Indication setting</u> • Slow flashing – setting indication for the disconnected status • Fast flashing – setting indication for the connected status • 3 short flashes – setting confirmation

Settings

<u>Device type with setting using buttons</u>

The measuring range is setup by means of two buttons "DOWN" and "UP". The "DOWN" button is used to enter to the setting mode (setting the 4 mA or 0 V limit) and to decrease the output current or voltage.
The "UP" button as an opposite function (setting the 20 mA or 10 V limit and increasing the output current or voltage). Values are confirmed by simultaneous pressing of both buttons for about 1 sec. The setting
process is indicated by yellow "STATE" LED indicator.

For detailed information, please read the instruction manual.

Key parts of the measuring device (version "T" with buttons)

<u>Device type with setting using a magnetic pen</u>

The measuring range is setup by touching of the magnetic pen to sensitive spots "EMPTY" and "FULL" . The "EMPTY" spot is used to enter to the setting mode (setting the 4 mA or 0 V limit) and to decrease the output current or voltage. The "FULL" spot as an opposite function (setting the 20 mA or 10 V limit and increasing the output current or voltage). Values are confirmed by touching of the magnetic pen to the sensitive spot for about 3 sec. The setting process is indicated by yellow "STATE" LED indicator.

For detailed information, please read the instruction manual.

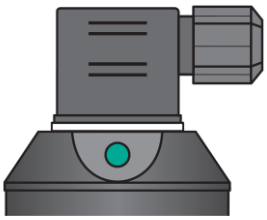
Key parts of the measuring device (version "M" with magnetic pen setting)

Electrical Connections

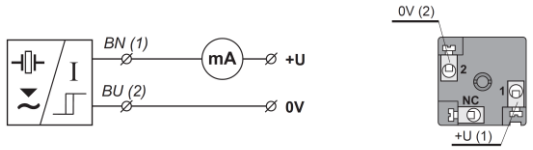
Electrical Connections

DIN43650A

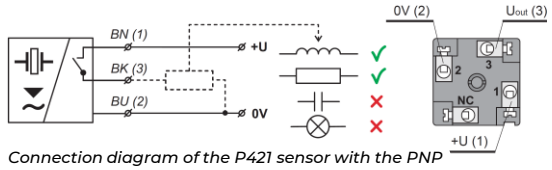
The P421 with a Connector ISO is connected to processing (display) units by means of a cable with an outer diameter of 6 to 8 mm (recommended wire cross-section 0.5 to 0.75 mm2), via a detachable ISO connector with inner screw terminals, which is part of the delivery. The connection diagram and the inner view of the connector are shown in Figures on the right. Non-detachable connector IP67 with PVC cable 5 m long can be supplied as an extra option.



View of the connector ISO



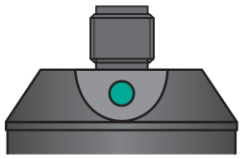
Connection diagram of the P421 sensor with two-state current switch 4 mA / 20mA output



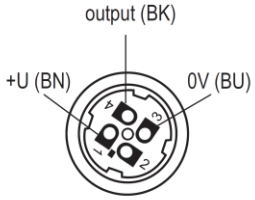
Connection diagram of the P421 sensor with the PNP switching transistor with an open collector output

M12x1, 4-pole

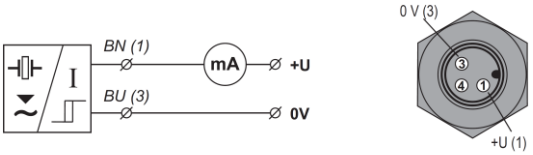
The P421 with a Connector M12 is connected to processing (display) units by means of a cable with an outer diameter of 4 to 6 mm (recommended wire cross-section 0.5 to 0.75 mm2), via a connector socket with a molded cable (2 or 5 m long) or via a detachable connector socket without a cable (see accessories), the connector is not basic part of the sensor. In this case connect the cable to the inner socket pins under figures on the right.



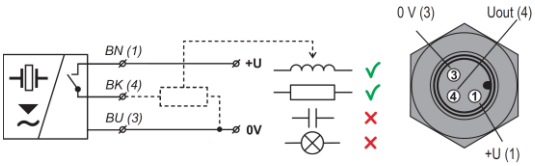
View of the connector M12



Inside view of the connector socket



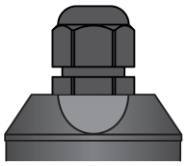
Connection diagram of the P421 sensor with two-state current switch 4 mA / 20mA output



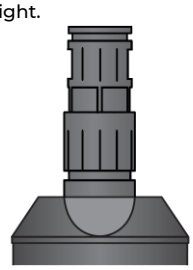
Connection diagram of the P421 sensor with the PNP switching transistor with an open collector output

Standard gland or gland with protective hose connection

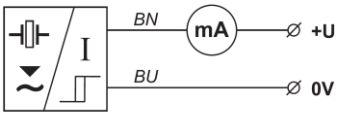
The P421 with a standard cable gland or a cable gland for protective hose are connected to processing (display) units by means of a fixed PVC cable 5 m long. standard cable gland (B) or plastic bushings with a thread for protective hoses (H) can be used as a cable gland. Connection diagrams are shown in Figures on the right.



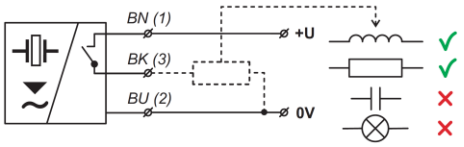
View of the standard cable gland



View of the cable gland for protective hose



Connection diagram of the P421 sensor with two-state current switch 4 mA / 20mA output



Connection diagram of the P421 sensor with the PNP switching transistor with an open collector output

Legend
BK = Black
BN = Brown
BU = Blue

⚠ Wiring operations shall only be carried out without voltage!

⚠ It is also necessary to design and take measures to reduce the effects of static electricity to a safe level in the wiring.

Installation in explosive atmospheres needs to be carried out in compliance with EN 60079-14 (Electrical installations for explosive gaseous atmospheres – Part 14: Electrical installations in dangerous areas other than mining) and possibly also in compliance with other standards relating to the area concerned.

ⓘ The supply source should be preferably designed as a stabilized source of safe voltage 18 V to 36 V DC (max. 30 V DC for Explosion Proof Variant), which is part of the downstream processing or display system.

In case of strong ambient electromagnetic disturbance, parallel run of the input cable with the power line or its length exceeding 30 m, we recommend using a shielded cable.

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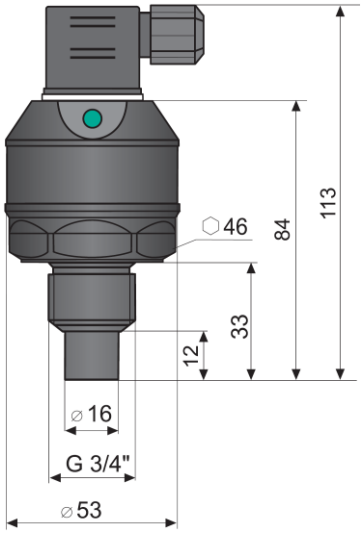
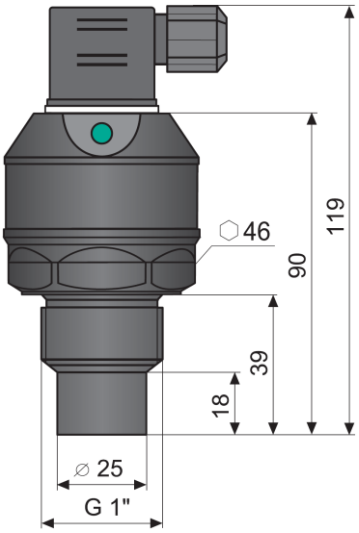
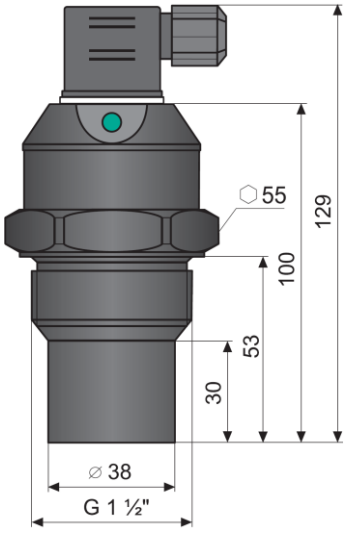
Dimensions, Electrical Connections & Process Ports



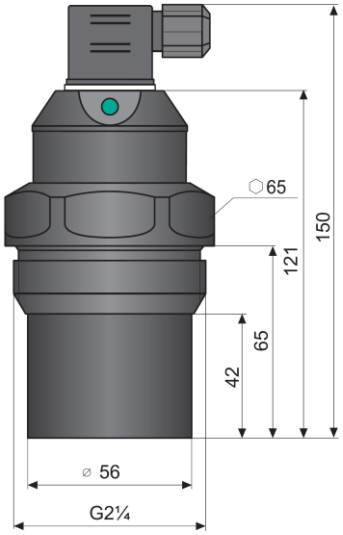
Measuring Range M1
(0.10 ... 1.0 meters)



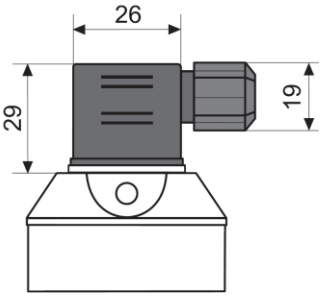
Measuring Range M1
(0.20 ... 2.0 meters)



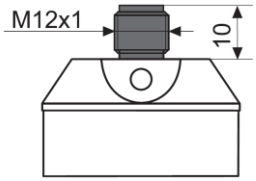
Measuring Range M1
(0.20 ... 6.0 meters)



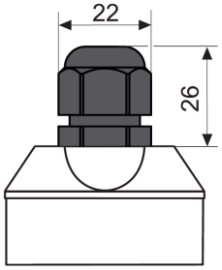
Measuring Range M1
(0.40 ... 10 meters)



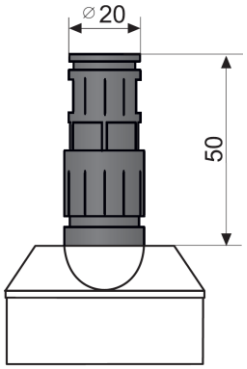
DIN 43650A



M12



Standard Cable Gland



Cable gland for protective hose

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Safety & Applications

Safety, Protections, Compatibility and Explosion Proof

Level sensor P421 is equipped with protection against electric shock on the electrode, reverse polarity, output current overload, short circuit and against current overload on output.

Protection against dangerous contact is provided by low safety voltage according to 33 2000-4-41. Electromagnetic compatibility is provided by conformity with standards EN 55011/B, EN 61326-1 and EN 61000-4-2 to 6.

Explosion proof is provided by conformity with standards EN 60079-0:2007, EN 60079-11:2007, EN 60079-26:2007.

Explosion proof is verified 09 ATEX 0119X.

A declaration of conformity was issued for this device in the wording of Act No. 90/2016 Coll., as amended. Supplied electrical equipment matches the requirements of valid European directives for safety and electromagnetic compatibility.

Special conditions for safe use of explosion proof variants

The device is designed for connection to our isolating repeater. When the other approved supply unit is used, whose output parameter satisfy above mentioned output parameters, it is necessary to have a galvanic separation or, if supply unit without galvanic separation is used (Zener barriers), it is necessary provide potential equalization between sensor and point of barrier earthing.

For application in zone 0 the present explosive atmospheres - mixture of air with flammable gases, vapor or mists must comply:

-4°F < Ta < +140°F (-20°C < Ta < +60°C)

11.6 PSI < p < 15.95 PSI (0.8 bar < p < 1.1 bar)

The device must be installed in such a way, to prevent mechanical damage of sensor face.

Maximum input parameters:

Ui = 30 V; Ii= 132 mA; Pi = 0.99 W; Ci = 370 nF; Li = 0.9 mH

Packing, Shipping, and Storage

The P421 device is supplied packaged in a cardboard box that protects it against mechanical damage.

When handling and during transport, it is necessary to prevent impacts and falls.

The P421 electrical device must be stored in dry enclosed areas with humidity up to 85%, free of aggressive vapors at temperatures between -4°F and 140°F (-20°C and 60°C) and must be protected against the effects of weather.

Additional Images

Paquin Sensors' product portfolio is designed to provide options to fit the most diverse range of specifications.

We collaborate with our customers to match the best product technologies with your unique application requirements.

Please contact us or call +1 (800) 831-8217 anytime to discuss your needs!