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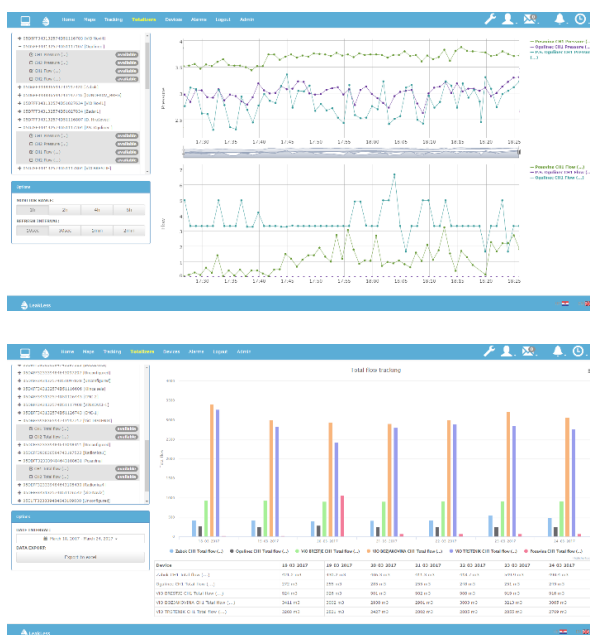


LeakLess

LeakLess PDL-AG

Advanced industrial GPRS data logger

Technical Data Sheet



Possible applications

- Monitoring of water distribution network as a whole
- Design and calibration of hydraulic models
- Optimization of water distribution processes
- Pressure and flow measurement
- Level monitoring and control
- Detection and localization of leakages and defects
- Remote monitoring of distant locations
- Support for smart water distribution management

Benefits at a glance

- Real-time monitoring via wireless data transfer link
- Long-term autonomy driven by low power consumption
- Remote re-configuration support via two-way communication channel
- Fully configurable directly on the device via large LCD with no need for PC
- Fast and easy deployment and configuration
- Cost effective solution
- Advanced PC independent human machine interface

Key LeakLess PDL-AG functionalities

- 2 multifunctional analog voltage/current input channels for pressure/flow/other signal measurement
- 2 multifunctional digital input channels for impulse flow/immersion/openness/other signal tracking
- GPRS support for real-time tracking and/or with arbitrary reporting period
- Fast logging support for transient detection
- Advanced human machine interface with graphic display for configuration and plotting
- Remote monitoring and device configuration via web and smartphone apps
- Rechargeable batteries through different LeakLess accessories or USB link
- Support for continuous power supply
- IP 67 device protection

Software support | Web and smartphone apps

- Interactive map supporting visualization of device locations
- Graph visualization with zooming, export and note adding support
- Fast inspection of daily cumulative values
- Real-time measurement tracking
- Statistics analysis of measured data
- Active warning system and history overview for alarms
- Support for uploading up to 3 additional files alongside each installed device (.png, .jpg, .pdf)
- Multiple locations side-by-side plotting support
- DMA zone management with algebraic manipulations between locations or channels
- Full account administration with assignable permission levels

Accessories | LeakLess Power Converter and LeakLess Battery Pack

- Support continuous supply of LeakLess PDL-AG device
- Support for recharging of batteries of LeakLess PDL-AG device
- IP 67 device protection
- Simple on pipe installation

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1. Design and components



The main components of the device are:

- ASA plastic enclosure
- LCD display
- Membrane keyboard with 7 buttons and 2 LED indicators
- Connectors for input channels – 2 analog and 2 digital
- Connector for USB linking or battery charging
- Connector for an external antenna

Weight:

- 590 g (\approx 1.301 lb)

Ingress protection:

- Enclosure: IP67/IP68/ Connectors: IP68

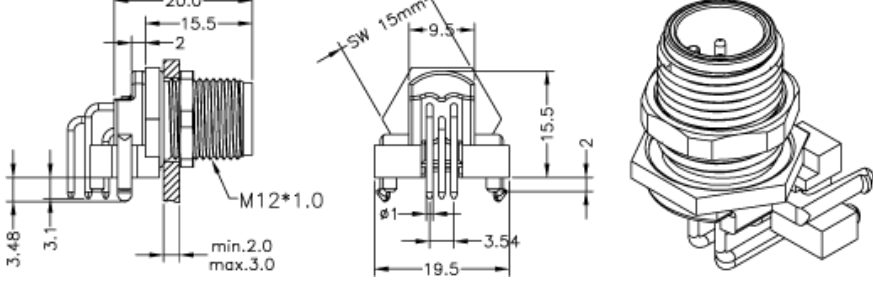
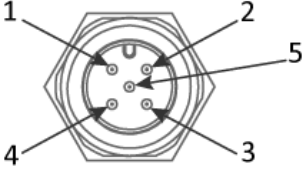
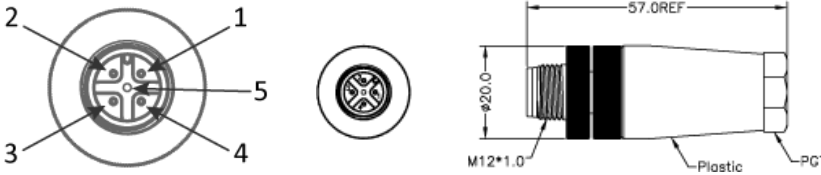
Connectors and caps:

- USB/Power supply connector – M12 male; 5 pins; right angle; front panel mount; connector cap with chain
- Analog input connector (2x) – M12 female; 4 pins; right angle; front panel mount; connector cap with chain
- Digital input connector (2x) – M12 female; 3 pins; right angle; front panel mount; connector cap with chain
- GSM/GPRS antenna connector

Availability via on-device interface:

General purpose features	Device identifier; Device ID (unique); Firmware version; Hardware version
Configurable general purpose features	Credentials (Username and Password)
Testable general purpose features	GPRS test; SMS test; MAIL test

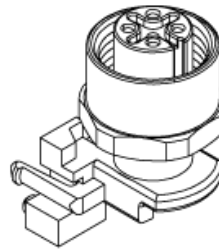
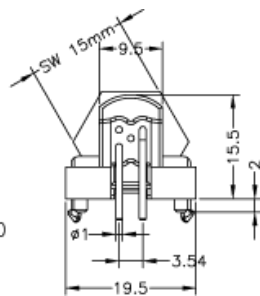
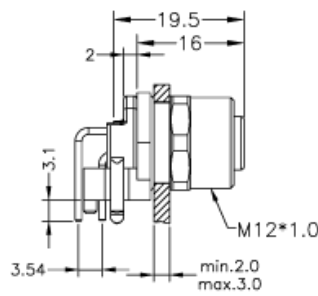
2. Connectors

Conn.					
USB/Power supply (M12 male; 5 pins)	Schematic				
	Electrical Characteristics	Rating voltage	60 V AC/DC	Connector size	M12
		Insulation resistance	>100 MΩ	Locking system	Screw locking
		Rating current	4 A	Ambient temperature	-25 °C ... 85 °C
		Contact resistance	≤5 mΩ	Ingress protection	IP67/IP68
	Contacts material: Brass with gold plated				
Pinout schematic	Device connector	Accompanied cable connector			
					
Electrical wiring			Connector	Cable	
	USB D+		PIN 1	Brown	
	USB POW		PIN 2	White	
	USB D-		PIN 3	Blue	
	GND		PIN 4	Black	
	VCC (10 ... 32 VDC)		PIN 5	Grey	

USB connection typical use	<ul style="list-style-type: none"> • PC connection for connecting the device with <i>LeakLess Configurator</i> application used for: <ul style="list-style-type: none"> ○ Real-time on-sight monitoring ○ Measurement history inspection of device internal memory ○ Parallel multiple channels visualization ○ Data storing for backup purposes • Power supply source connection for: <ul style="list-style-type: none"> ○ Battery recharging
Power supply connection typical use	<ul style="list-style-type: none"> • Power supply source connection for: <ul style="list-style-type: none"> ○ Battery recharging over the voltage input within the 10 ... 32 VDC range

Analog and digital inputs

Schematic



Electrical Characteristics

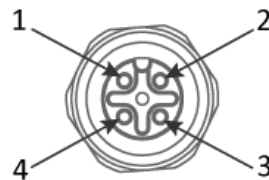
Rating voltage	250 V AC/DC	Connector size	M12
Insulation resistance	>100 MΩ	Locking system	Screw locking
Rating current	4 A	Ambient temperature	-25 °C ... 85 °C
Contact resistance	≤5 mΩ	Ingress protection	IP67/IP68

Contacts material: Phosphorus copper with gold plated

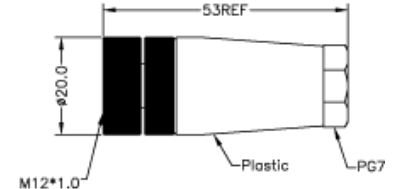
Analog input connector (2x)
(M12 female; 4 pins)

Pinout schematic

Device connector



Accompanied cable connector



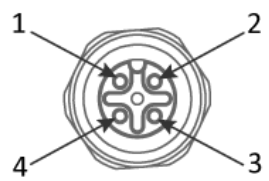
Electrical wiring

	Connector	Cable
GND	PIN 1	Brown
VCC 15 VDC	PIN 2	White
Voltage input (0 ... 10 V)	PIN 3	Blue
Current input (4 ... 20 mA)	PIN 4	Black

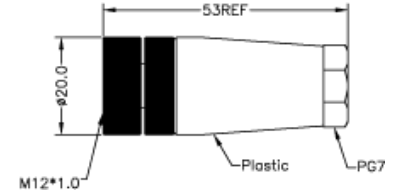
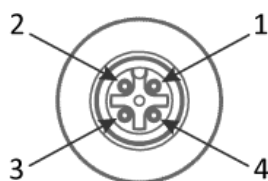
Digital input connector (2x)
(M12 female; 3 pins)

Pinout schematic

Device connector



Accompanied cable connector



Electrical wiring

	Connector	Cable
GND	PIN 1	Brown
Input	PIN 2	Green
–	PIN 3	–
Output	PIN 4	Black

Analog channels typical use

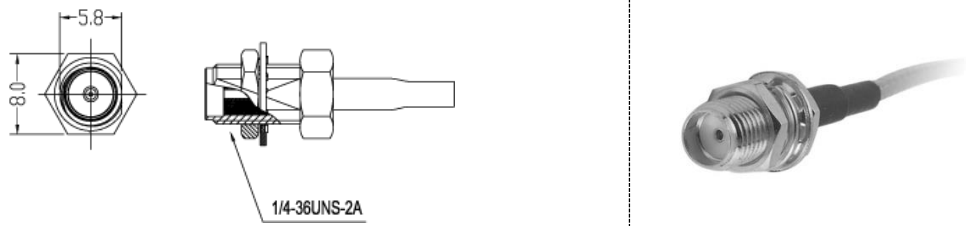
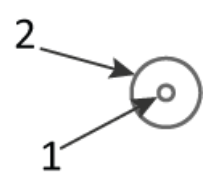
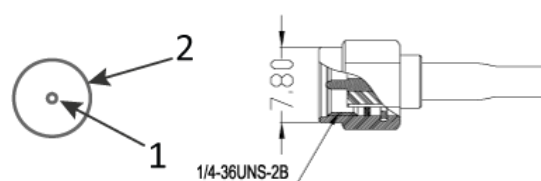

Pressure probe; Ultrasonic flow meter; Electromagnetic flow meter; Ultrasonic level meter;

Digital channels typical use

Impulse flow meter; Level switch monitor; Pump condition monitor; Error signal monitor; Alarm signal monitor; Status signal monitor; Cover opening

Antenna connection

GSM/GPRS antenna connector

Schematic				
Electrical Characteristics	Type	SMA female	RF Leakage	-60 dB min
	Nominal impedance	50 Ω	Insulation resistance	>5 GΩ
	Frequency range	0 to 12.4 GHz	Ambient temperature	-65 °C ... 165 °C
	Standing Wave Ratio	1.35 to 11 GHz	Ingress protection	IP67/IP68
	Contacts material: Gold plated heat treated beryllium copper			
Pinout schematic	Device connector	Accompanied cable connector		
				
Electrical wiring			Connector	Cable
	Antenna		PIN 1	-
	GND		PIN 2	-

3. Analog input interfaces

Analog inputs for measured variables: Voltage or current inputs

Total number of analog input channels: 2 (used in any combination of voltage and current input channels)

Analog inputs	Voltage inputs	Current inputs
Measured variable	DC voltage source	Current source*
Measured range	0 ... 10 VDC	4 ... 20 mA
Measuring accuracy	$\pm 1 \%$	$\pm 1 \%$
Connection	Three-wire system	Three-wire system
Response time	≤ 250 ms with open-circuit	≤ 250 ms with open-circuit
Available voltage supply	15 VDC	
Sensor power consumption	≤ 2 W	
Input resistance	>1 M Ω	
Characteristic curve	Voltage-linear	Current-linear
Digital accuracy	40 μ V	0.08 μ A
Calibration	Zero-point suppression	
Galvanic isolation	Yes	

*over an internally connected resistor

Related features availability via on-device interface:

Monitored features	Input measurements including: <ul style="list-style-type: none"> • plotting capabilities • alarming capabilities • remote monitoring capabilities • remote configuration capabilities
Configurable features	Per channel choice of: <ul style="list-style-type: none"> • Pressure input type: [0 – 10 V], [0 – 20 mA], [4 – 20 mA] • Pressure factor: 0 ... 10⁶ (supporting decimal numbering) • Zero-point suppression support: <ul style="list-style-type: none"> ○ Offset sign: - or + ○ Offset absolute value: 0 ... 999999 (supporting decimal numbering) ○ Auto zero • Pressure unit: [Bar], [Pa], [Psi] • Pressure wait time: 0 ... 10⁵ ms • Channel name (supporting input string)

4. Digital interfaces

Total number of digital channels: 2 (used in any combination of input and output channels)

Digital channels	Input	Output
Type	active or passive	low-side switch
Measured variable	{0,1} (ON/OFF)	
Frequency	≤ 1 kHz, 50% duty cycle	not applicable (as per operator's request)
Voltage range	active: '0' – [0 V ... 1 V]; '1' – [2 V ... 6 V] passive: 3,3 V DC (nc), 100 KΩ (pull-up)	max. 40 V DC (1,4 A)
Connection	Two-wire system	
Protection	overvoltage	overvoltage protected, overtemperature protected, short-circuit protected, overload protected

Related features availability via on-device interface:

Monitored features	Measurements
Configurable features	Per channel choice for <i>Digital input</i> : <ul style="list-style-type: none"> • Flow or Digital: [FLOW-ACT] or [DIGITAL-ACT] • Flow factor: 0 ... 10⁶ (supporting decimal numbering) • Total flow totalizer setting: 0 ... 10¹⁰ (supporting decimal numbering) • Flow unit: [l/s], [m³/s], [gal/s], [l/h], [m³/h], [gal/h] • Flow averaging time: 0 ... 999 s • Channel name (supporting input string) Per channel choice for <i>Digital output</i> : <ul style="list-style-type: none"> • Trigger output: ON/OFF • Channel name (supporting input string)

5. Remote communication link

Data transmission type: GSM/GPRS

- SIM card type: Micro SIM
- SIM card size: 12 x 15 mm

GSM modem: Quad band: 900MHz, 1800 MHz / 850MHz, 1900MHz

Secured MQTT (sMQTT) protocol used within the remote communication link.

Related features availability via on-device interface:

Configurable features	SIM pin; SIM number; Network APN GSM/GPRS connectivity parameterized employing: <ul style="list-style-type: none"> • GSM retry count: 0 .. 99 • GSM wait time: 0 .. 99 s
Testable features	Signal locate – feature for supporting optimal antenna mounting for best signal quality gain GPRS test; SMS test; MAIL test;

6. Monitoring features

Four operation modes supported:

- *Basic* – plain measurements (no data recording/no data transmission)
- *Continuous* – real-time GSM/GPRS monitoring (programmable recording period/real-time transmission)
- *Interval* – interval GSM/GPRS monitoring (programmable recording period/programmable transmission period)
- *Fast log* – fast recording (programmable recording period/no data transmission)

Operating modes	Sampling interval	Sampling interval resolution	Transmission interval	Transmission interval resolution
Basic	1 s	–	–	–
Interval GPRS*	1 s ... 9999 s	1 s	1 min ... 24 h	1 s
Continuous GPRS	1 s ... 9999 s	1 s	real-time**	–
Fast log	50 ms ... 999 ms	1 ms	–	–

* (reference daily transmission time support)

Configurable features	Monitoring configurable in terms of mode of operation and the accompanied: <ul style="list-style-type: none"> • Recording period – the adaptable intervals dependant on chosen mode of operation • Transmission period – the adaptable intervals dependant on chosen mode of operation
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** (communication channel delay only)

7. Alarms

Threshold and profile alarms independently configurable on each channel.

Alarm appearance delivering instantly, independent of pre-configured regular data delivery periods.

Configurable features	GPRS/SMS/MAIL choice – support for different modes of alarm reporting SMS alarm report number MAIL alarm report address Alarm detection thresholds configurable per channel as: <ul style="list-style-type: none"> Max value, Min value, Delta value (full remote configurability support)
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8. Memory capacity

Size: 2 GB, automatically allocable between channels respecting needs (no limits per channel)

- For the period of full CH meas. acquisition:

Measurement interval	Duration of full CH meas. acquisition	Memory capacity filled (%)
10 s	6 months	6%
	1 year	12%
	2 years	24%
	5 years	60%
1 min	6 months	1%
	1 year	2%
	2 years	4%
	5 years	10%
5 min	6 months	0.2%
	1 year	0.4%
	2 years	0.8%
	5 years	2%

Type: Solid state, non-volatile

Data storage: Rotating store, or store until full

Related features availability via on-device interface:

Configurable features	Logging into internal memory: ON/OFF Storage organization support including: <ul style="list-style-type: none"> Information about used internal memory: 0.0 – 100.0 % Flexibility of memory storage organization (conf. size and name of file)
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9. Clock

Type: Crystal controlled calendar clock with leap year adjustment

Synchronisation

- Automatic synchronization in during each connection (supported in *Continuous* and *Interval* modes)
- Manual synchronization supported by operators on-device request

Related features availability via on-device interface:

Configurable features	Date and Time direct on-device setting TIME sync – support for any-time clock synchronization to LeakLess server time
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10. Human machine interface

Advanced human machine interface consists of several components including display, set of buttons and LED indicators. The software support is developed providing various functionalities including:

- Full device configuration possibility
 - Identifier; TIME sync; SIM pin; SIM number; Network APN; Credentials (Username and Password); GSM retry count; GSM wait time; SMS alarm report number; MAIL report address; Date and Time;
- Full measurement configuration support
 - Pressure unit; Flow unit; Analog signal wait time; Flow averaging time; Recording period; Transmission period; GPRS choice; Logging choice; Memory storage organization (conf. size and name of file)
 - Per channel configuration: Analog input interval; Digital vs. cumulative input signal; Analog signal factor (pressure factor); Digital signal factor (flow factor); Total cumulative value (flow);
 - Zero-point adjustment including: Offset sign; Absolute offset; Auto-zero adjustment
- Full testing of functionalities and installation possibility
 - GPRS test; SMS test; MAIL test; Signal strength test
 - Direct measurements and plotting of analog (pressure) and digital signals ((total) flow, plane digital signal)
- Full LCD configuration
 - LCD brightness; LCD contrast; LCD illumination duration
- Full configuration of alarm rationale
 - Per channel configuration: Max value; Min value; Delta value;
- Device status:
 - Battery level; Temperature; Charging status
- Remotely monitored information include:
 - Channel states/measurements; Device identifier; Firmware and Hardware version; Battery level;
- Multilingual software support: English and Croatian

For more details, please confer the ***LeakLess PDL-AG Operation manual***.

Buttons

- Used for multiple functionalities including
 - menu navigation – combining choice/back keys with 4 arrow keys
 - inputting sequences of integer and decimal numbers, alpha-numeric seq., data and time, etc.
- Physical size: 8 mm diameter

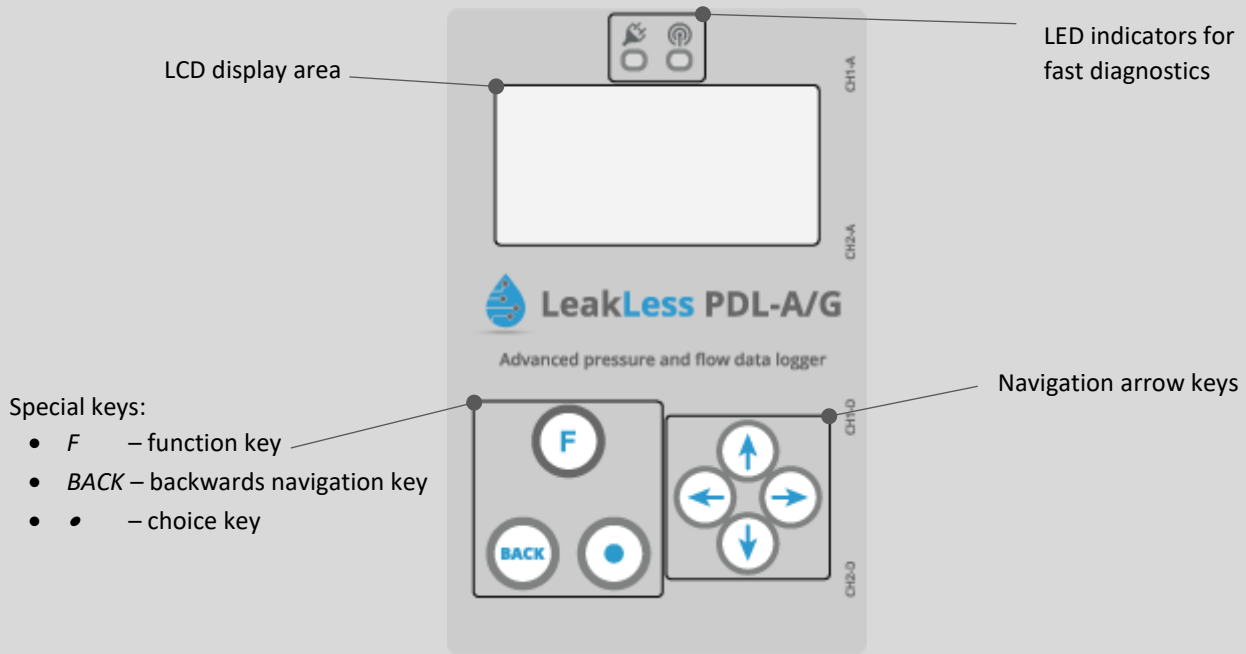
Display

- Size: 132 x 65 pixels
- Interface 6800 8-bit Parallel, 8080 8-bit Parallel, 4-Wire Serial SPI
- IC or Equivalent NT7532, NT7538, SPLC501, SPLC502, ST7565
- Appearance: Black on White
- Diagonal Size: 2.5"
- Outline Dimension: 69.0 x 41.5 x 5.2 mm (w x h x t)
- Visual Area: 66.00 x 32.5 mm
- Active Area: 56.73 x 27.92 mm (w x h)
- Dot (Pixel) Size: 0.40 x 0.40 mm
- Dot (Pixel) Pitch: 0.43 x 0.43 mm
- Display Type: STN-LCD Grey
- Sunlight Readable: Yes

Related features availability via on-device interface:

Configurable features	User interface adaptability in terms of: <ul style="list-style-type: none"> • LCD brightness: 0 ... 100 % • LCD contrast: 0 ... 100 % • LCD illumination duration: 0 ... 999 s
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11. Membrane keyboard



Indicator LEDs

LED type	Fast blinking	Solid lightning
Power supply LED	–	Active power supply
GPRS activity LED	Acquiring network	Active connection

12. Power supply | Power consumption | Batteries

Power supply range: 7-38 V DC

Accessory power supply range: 115-230 VAC +10% to –15%, 50-60 Hz (with LeakLess Power Converter)

Internally powered by rechargeable Lithium-ion batteries

- Capacity: 4 x 3500 mAh = 14000 mAh

Device activity	Current consumption (typical)	Activity length (typical)
Sleep mode	0,1 mA	always active
Data acquisition	30 mA (typical with 200 mW probe)	500 ms
Communication link activation	150 mA	30 s
Data sending over GPRS	120 mA	30 ms (per measurement)

Power consumption per activity and battery autonomy	# of meas. (per day)	# of sending (per day)	Sleep mode consumption (mAh/day)	Meas. consumption (mAh/day)	Comm. link activ. and data sending (mAh/day)	Total consumption (mAh/day)	Total autonomy (years)*
	96 (15 min)	0	2,40	0,40	0,00	2,80	13,70
	96 (15 min)	1 (24h)	2,40	0,40	1,11	3,91	9,82
	96 (15 min)	4 (6h)	2,40	0,40	4,11	6,91	5,55
	96 (15 min)	24 (1h)	2,40	0,40	24,11	26,91	1,43
	288 (5 min)	0	2,40	1,20	0,32	3,92	9,78
	288 (5 min)	1 (24h)	2,40	1,20	1,32	4,92	7,80
	288 (5 min)	4 (6h)	2,40	1,20	4,32	7,92	4,84
	288 (5 min)	24 (1h)	2,40	1,20	24,32	27,92	1,37
	1440 (1 min)	0	2,40	6,00	1,60	10,00	3,84
	1440 (1 min)	1 (24h)	2,40	6,00	2,60	11,00	3,49
	1440 (1 min)	4 (6h)	2,40	6,00	5,60	14,00	2,74
	1440 (1 min)	24 (1h)	2,40	6,00	25,60	34,00	1,13
	2880 (30 sec)	0	2,40	12,00	3,20	17,60	2,18
	2880 (30 sec)	1 (24h)	2,40	12,00	4,20	18,60	2,06
	2880 (30 sec)	4 (6h)	2,40	12,00	7,20	21,60	1,78
	2880 (30 sec)	24 (1h)	2,40	12,00	27,20	41,60	0,92
	5760 (15 sec)	0	2,40	24,00	6,40	32,80	1,17
	5760 (15 sec)	1 (24h)	2,40	24,00	7,40	33,80	1,13
	5760 (15 sec)	4 (6h)	2,40	24,00	10,40	36,80	1,04
	5760 (15 sec)	24 (1h)	2,40	24,00	30,40	56,80	0,68

*The autonomy is based on typical power consumption appearances and do not exactly follow the given calculation

Related features availability via on-device interface:

Monitored features	<ul style="list-style-type: none"> Battery level: 0 – 100 % Charging status: YES/NO
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13. Permitted ambient conditions

Enclosure material and rating: ASA plastic; ingress protection IP67 (1 m w.g. for 30 minutes)

- Operating temperature: -20 °C ... +80 °C (-58 ... +212 °F)
 - LCD fully operative within -0 °C ... +50 °C (-58 ... +212 °F)

Mechanical load: Version: 1 G, 1-800 Hz sinusoidal in all directions.

14. Mounting

The enclosure design enables device mounting with ease, relying on two types of adapters:

- Pole mount bracket – used for direct on-pipe fixing
- Suspension bracket – used for on-wall fixing

Mounting accessories

Pole mount bracket	Schematic	
Suspension bracket	Schematic	

15. Additional information

For more details, please confer the ***LeakLess PDL-AG Operation manual***.



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