

EMD Utility pressure sensor datasheet

Preliminary edition 0.15 | 14 October 2026 | BLE interface version 3.x | Release specification

01 Overview

The EMD Utility pressure sensor provides pressure and water-temperature readings for connected monitoring. Its G3/4 parallel pressure fitting connects to the water system, while a five-pin M12 connector supplies external power. Bluetooth Low Energy (BLE) carries readings, calibration and configuration data to a compatible receiver.

The current sensor covers a nominal 0 to 16 bar range and includes a water-temperature probe in the protruding tube. Adjustable reporting, readings on request and stored calibration support straightforward integration into a monitoring system.



02 Features

- Pressure readings in pascals, with integrated water-temperature measurement.
- Adjustable reporting interval, or measurement on request.
- Stored zero and span calibration, with configurable temperature compensation.
- Documented BLE services for measurement, configuration and integration.
- CAN FD wired interface hardware.
- PC bridge software and EMD Utility Gateway integration.
- LE Secure Connections pairing with 128-bit link encryption.
- Signed device identity and fresh challenge verification for provisioned units.
- Signed firmware update support in configured firmware.
- Manufacturing records for firmware, configuration, identity and sign-off.

03 Application fit

Applications include equipment pressure monitoring, OEM instrumentation and pilot integration with a compatible BLE receiver. Follow the supplied installation guidance for media compatibility and mounting. The integrated probe in the protruding tube measures water temperature, reported alongside pressure and used for temperature compensation.

Contents

01 Overview	1
02 Features	1
03 Application fit	1
04 Device specifications	3
05 Pressure sensing performance	3
06 Measurement and calibration	3
07 Mechanical and electrical connection	4
08 Installation requirements	4
09 M12 connector pinout	5
10 Assembly drawing	6
11 Zero-pressure temperature characterisation	7
12 BLE service map	8
13 BLE message size and transfer setup	9
14 BLE reading format and behaviour	10
15 Calibration and commissioning	10
16 Firmware and service processes	10
17 PC and application bridge	11
18 EMD Utility Gateway	11
19 Secure connectivity and device identity	12
20 Supporting documentation	12

04 Device specifications

The table describes the measurement interface and evaluated pressure configuration. Encoding resolution defines the data format; select unit calibration to suit your measurement accuracy requirements.

Parameter	Specification	Conditions
Pressure type	Gauge pressure, Pa	Sealed-gauge reference
Nominal pressure range	1.6 MPa (16 bar)	Current sensor: 0 to 16 bar
Pressure accuracy	±0.1 bar (±10 kPa)	Complete sensor
Temperature output	Water temperature, 0.01 degrees C encoding	Integrated probe in the protruding tube; raw -32768 indicates temperature unavailable
Pressure encoding	Signed 32-bit integer, 1 Pa per count	Data encoding resolution; assess application accuracy through calibration and qualification
Report interval	0 to 3600 s; default 10 s	0 selects on-request reporting
Measurement request	BLE write to measure-now	Acquisition completes asynchronously
Calibration	Stored zero and positive span	Unit-specific; calibration status belongs to the supplied unit
Temperature correction	Polynomial, degree 2 to 5	Six stored coefficients; configurable enable
Concurrent receiver	One BLE connection and one stored bond	Stored pairing for consistent reconnection; supported receiver transfer
Identity	ECDSA P-256 challenge-response	Available with attestation-enabled firmware and a provisioned credential
Update interface	Encrypted BLE SMP; signed firmware	Use with compatible firmware and receiver

05 Pressure sensing performance

These values describe the pressure sensing element in the 16 bar configuration. FS = full scale; BFSL = best-fit straight line. Use the supplied assembly's operating ratings and calibration record for installation and measurement accuracy.

Parameter	Specification
Pressure range	0 to 16 bar (0 to 1.6 MPa)
Nonlinearity	At most 0.25% FS, BFSL (40 mbar at 16 bar FS)
Repeatability	At most 0.05% FS (8 mbar)
Long-term drift	At most 0.2% FS/year (32 mbar/year)
Element overpressure reference	200% FS (32 bar); use assembly ratings for installation
Pressure diaphragm	316L stainless steel

06 Measurement and calibration

Pressure is reported directly in pascals. Stored zero and span settings support unit calibration, while configurable compensation uses water temperature to correct the reading. Use the supplied calibration record to select settings for your application's accuracy requirements.

07 Mechanical and electrical connection



Process end with offset tube and pressure openings

M12 electrical connector end

The photographs show the pressure sensor assembly, including the offset tube on the process end and the M12 electrical connection. They are product views; use the supplied installation drawing for dimensions and clearances.

Interface	Description
Power connection	Five-pin, A-coded M12 male connector; external power input
Supply voltage	Regulated 5.0 V DC nominal; 4.5–5.5 V DC operating range at the M12 connector
Peak supply current	17.5 mA, provisional
Idle supply current	30 µA, provisional
Wired interface hardware	CAN FD
Cable connector	Five-pin, A-coded M12 female cable connector with screw coupling
Pressure connection	Male G3/4-14 B parallel thread; matching G3/4 female fitting and specified seal
Process-end construction	Offset water-temperature probe with separate pressure openings
Overall length	126 mm, nominal
Body diameter	40 mm, nominal
Spanner flats	36 mm across flats, nominal
Assembly materials	Brass body; PVC cap; nitrile seals; stainless steel M12 connector

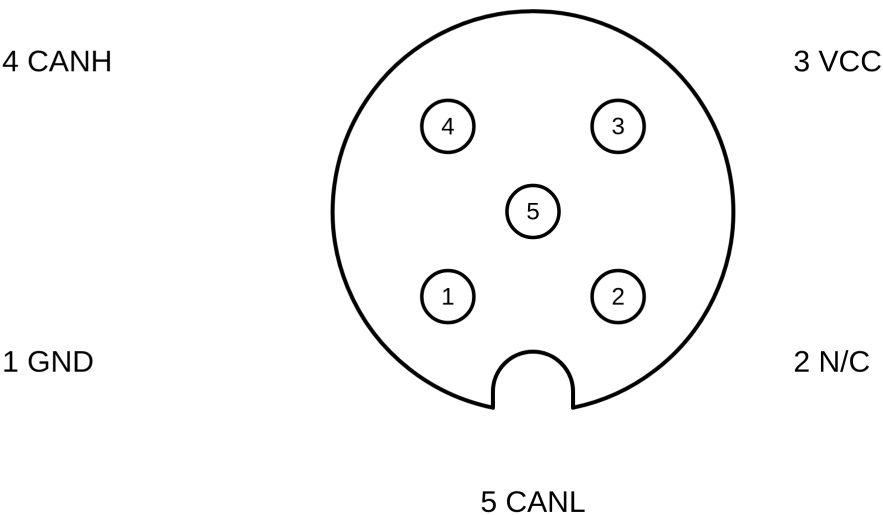
08 Installation requirements

Use a matching five-pin, A-coded M12 female cable connector.

Follow the supplied fitting and mounting instructions. Use the specified pipe fitting and seals, and keep pressure, supply voltage and temperature within the stated limits.

09 M12 connector pinout

The five-pin, A-coded M12 male connector provides power and the CAN interface. The diagram and table identify each contact by its number and function.



Sensor connector viewed from outside, looking at the contacts. Contact numbers identify the connections in the table below.

Pin	Function	Connection
1	GND	Supply return
2	N/C	Not connected; leave unused
3	VCC	Positive power supply
4	CANH	CAN high signal
5	CANL	CAN low signal

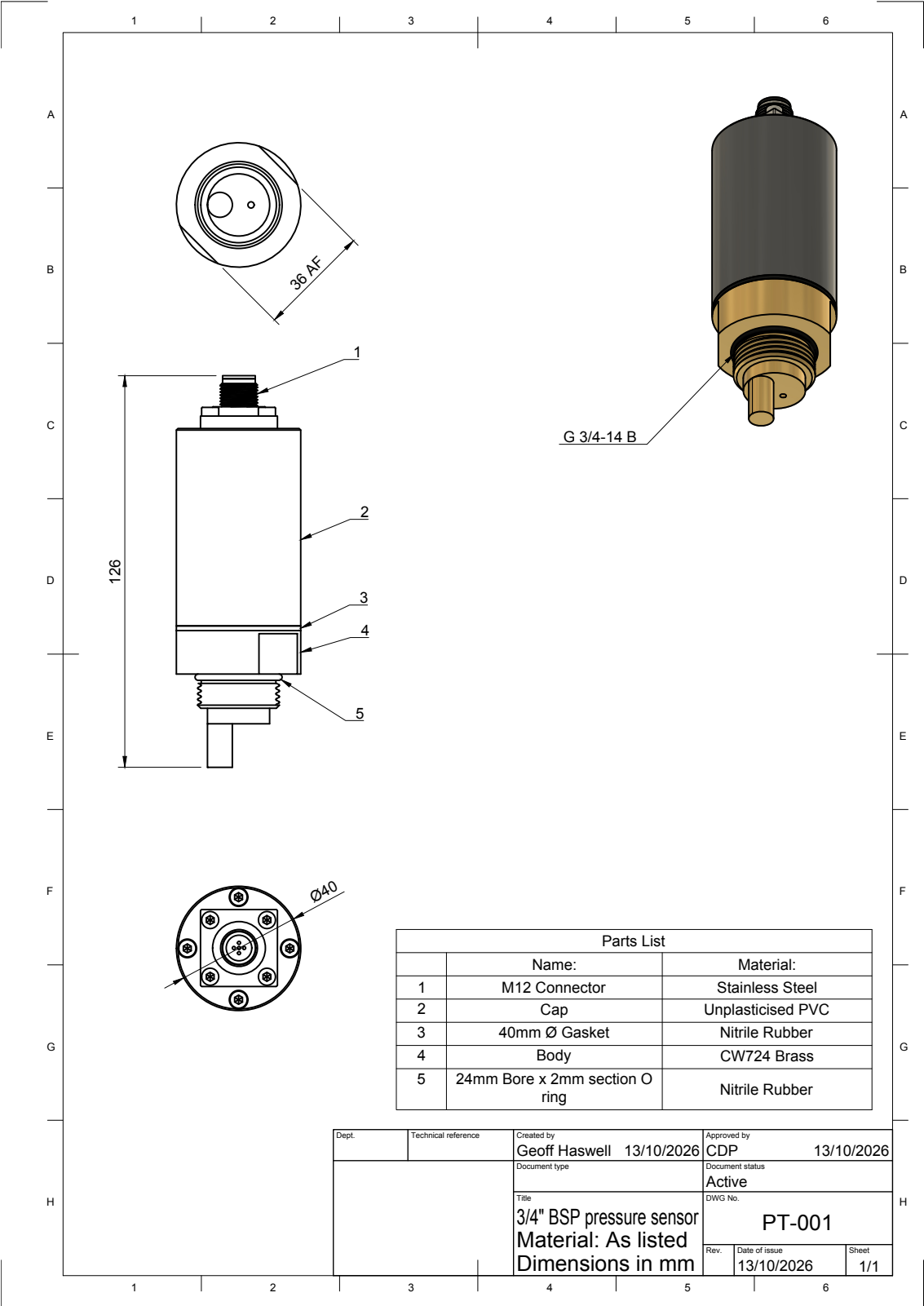
Connect a regulated 5.0 V DC supply to VCC (pin 3) and GND (pin 1). The supply range is 4.5–5.5 V DC at the sensor connector, including cable loss and power-supply tolerance. Use the contact numbers when preparing a cable or checking its connections.

A suitable field-wireable example is **Phoenix Contact 1662968, SACC-M12FS-5CON-PG 7-M**: a straight, five-pin A-coded M12 female connector with M12 x 1 screw coupling and screw terminals. It accepts a cable outside diameter of **4–6 mm**. Wire it according to the pinout above.

Supplier	Order number
Mouser	651-1662968
DigiKey	277-4168-ND

10 Assembly drawing

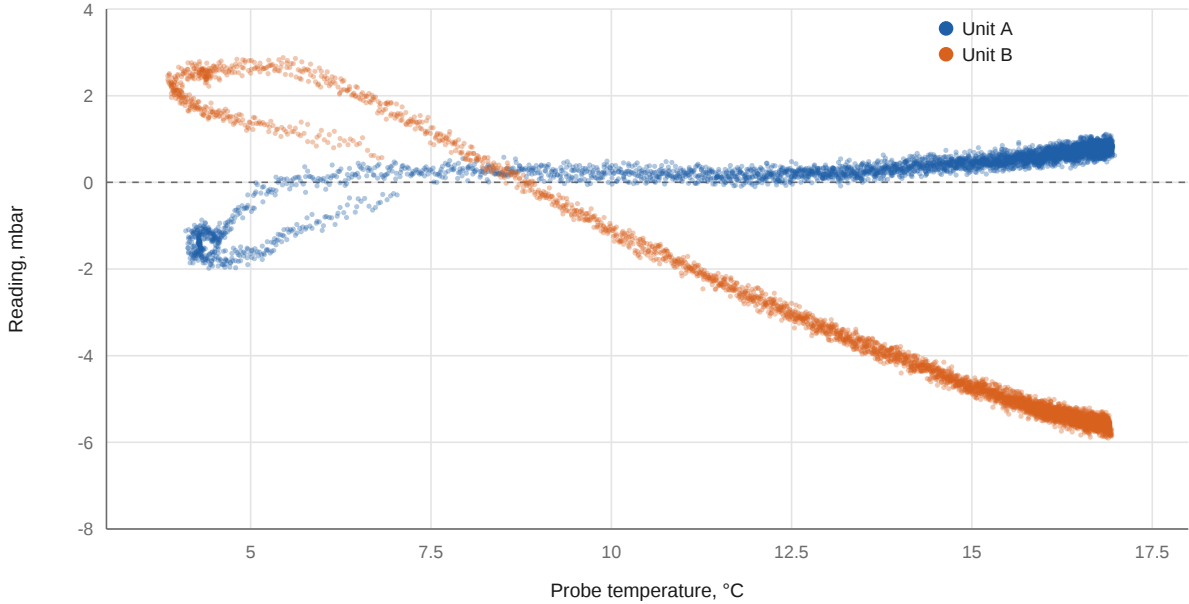
Drawing PT-001, 13 October 2026. Dimensions in millimetres.



11 Zero-pressure temperature characterisation

Compensated reading against temperature, shared coefficients

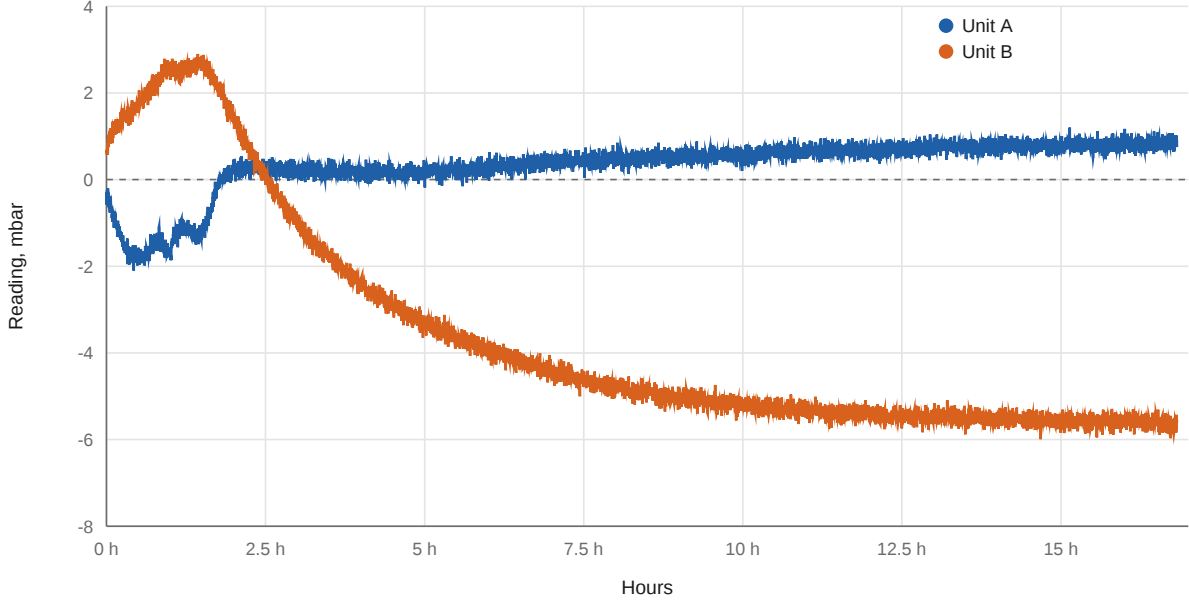
Two evaluation units; zero gauge pressure; temperature compensation enabled.



Reported readings from two evaluation units during a seventeen-hour temperature cycle, approximately 4 to 17 degrees C. Pressure ports were vented to zero gauge pressure. The plots characterise the zero-pressure response of these units under the stated test conditions.

Compensated reading over the seventeen-hour cycle

Two evaluation units; zero gauge pressure; temperature compensation enabled.



The same cycle viewed over time. Both plots show measured pressure readings with temperature compensation enabled on two evaluation units running firmware 2.0.52. The cycle captures the units' thermal response during changing temperature. Characterise additional pressure points when selecting calibration for a full-range accuracy requirement.

12 BLE service map

Custom UUIDs use 744e5d94-34b3-c5be-5ef7-fd5e9035SSCC. The table gives the final four hexadecimal digits, SSCC. For example the reading UUID is 744e5d94-34b3-c5be-5ef7-fd5e90350101. R = read, W = write, N = notify. Multibyte values are little-endian.

Service	Characteristic	Access	Bytes	Data or operation
0100 Measurement	0101 Reading	R, N	8	int32 pressure Pa; int16 reserved; int16 water temperature x100; -32768 = unavailable
0100	0102 Interval	R, W	2	uint16 seconds, 0..3600; 0 = on request
0100	0103 Measure now	W	1	Any one byte queues a reading
0200 Calibration	0201 Zero	R, W	4	int32 ADC zero counts
0200	0202 Compensation enable	R, W	1	0 or 1
0200	0203 Polynomial degree	R, W	1	2..5
0200	0204 Coefficients	R, W	48	Six IEEE 754 float64 values, c0..c5
0500 Pressure	0501 Span	R, W	4	Positive int32 ADC counts/bar
0500	0502 Raw counts	R	4	int32; available after the first acquisition
0500	0503 Zero now	W	1	Any one byte queues compensated zero calibration
0500	0504 Span from reference	W	4	Positive int32 reference pressure, Pa
0600 Attestation	0601 Credential	R	72 / 136	Provisioning form / signed credential
0600	0602 Challenge	W	32	Fresh challenge nonce
0600	0603 Response	R, N	64	Raw ECDSA signature, r concatenated with s
0700 Provisioning	0701 Install credential	W	136	One-time credential installation; service available until installation completes

Application services and notification subscriptions use an encrypted link. Attestation and provisioning are available in the corresponding firmware configuration. Service 0700 supports units awaiting credential installation.

Other service	UUID	Purpose and access
Device Information	180A	Unencrypted model, manufacturer and firmware strings
SMP	8d53dc1d-1db7-4cd3-868b-8a527460aa84	Encrypted firmware update transport
Diagnostics	54220000-f6a5-4007-a371-722f4ebd8436	Encrypted diagnostic transport; receiver integration required
Key recovery	744e5d94-34b3-c5be-5ef7-fd5e9035a480	a481: unencrypted one-byte 0x00 bond clear; default 600 s boot window

13 BLE message size and transfer setup

After connecting and establishing encryption, request a larger ATT MTU from the client and check the value negotiated. The sensor supports an ATT MTU up to 252. An MTU of at least 139 lets every calibration and identity write fit in one ordinary Write Request. The negotiated value also depends on the receiver.

Enable notifications on 0101 for fresh measurements. For identity checks, enable notifications on 0603 before writing a fresh 32-byte challenge to 0602; signature notifications require MTU 67 or greater. With a smaller MTU, retrieve the response by reading 0603, using a long read if needed. Signing is asynchronous: wait for the response to become available and complete one challenge before sending the next.

Operation	Value bytes	Minimum MTU for one packet	Smaller-MTU transfer
0204 coefficient write	48	51	Prepare/Execute long write
0204 coefficient read	48	49	Read/Read Blob
0602 challenge write	32	35	Prepare/Execute long write
0603 signature notification	64	67	Read 0603 instead
0603 signature read	64	65	Read/Read Blob
0601 unprovisioned form read	72	73	Read/Read Blob
0601 installed credential read	136	137	Read/Read Blob
0701 credential installation	136	139	Prepare/Execute long write; MTU at least 39

A long read collects the complete value with Read/Read Blob; each response carries up to MTU minus 1 data bytes. Check that the final value has the expected length before decoding or verifying it.

A long write uses contiguous Prepare Write fragments starting at offset 0, followed by Execute Write. The sensor queues up to four fragments, each carrying up to MTU minus 5 data bytes. For a 136-byte credential at MTU 65, send 60, 60 and 16 bytes, then execute. At MTU 39, use four 34-byte fragments. The default MTU 23 supports long coefficient and challenge writes, but not a complete credential installation within this queue.

Send each value as one logical operation. Separate ordinary writes are not reassembled by these characteristics. Complete one long write before starting another. Use Write Requests and check their ATT result; read calibration settings back after writing. After credential installation, rediscover services to obtain the updated service map.

14 BLE reading format and behaviour

Byte offset	Type	Meaning	Conversion
0..3	int32	Gauge pressure	Pa; divide by 100000 for bar
4..5	int16	Reserved	Reserved zero
6..7	int16	Water temperature	-32768 = unavailable; otherwise divide by 100 for degrees C

Example decoding: A0 86 01 00 00 00 C4 09 represents 100000 Pa, reserved 0 and 25.00 degrees C.

Reading 0101 provides the latest cached reading and starts a refresh. Subscribe to 0101 for new measurements. A write acknowledgement confirms request acceptance; check a fresh notification and read back the stored zero or span to verify acquisition or calibration completion.

Temperature status is carried in the existing temperature field. Raw **-32768** (0x8000, little-endian bytes 00 80) means the water-temperature reading is unavailable or a temperature fault has been detected. Check this value before dividing by 100 and display **Water temperature unavailable**, rather than a numerical temperature. A valid 0.00 degrees C reading is zero.

Example fault reading: A0 86 01 00 00 00 00 80 represents 100000 Pa, reserved 0 and water temperature unavailable. The complete payload remains eight bytes, with no additional characteristic or message-size requirement.

Before the first successful temperature measurement, the temperature field reports unavailable. The next successful measurement restores the measured value automatically. Pressure readings continue using stored zero/span, with temperature compensation bypassed while temperature is unavailable. The reserved field remains zero. Use a fresh 0101 notification to check recovery; track notification age separately to identify stale readings.

15 Calibration and commissioning

1. Identify the supplied assembly, sensing element, firmware and calibration status.
2. Connect a compatible BLE central, establish encryption and read Device Information.
3. At known zero gauge pressure and stable temperature, request zero-now at 0503. Confirm 0201 and a subsequent reading.
4. Apply a known positive gauge-pressure reference and write its pressure in Pa to 0504. Confirm 0501 and subsequent readings against the reference.
5. Set the reporting interval, verify notifications and retain the calibration record.

Run zero and span calibration with a valid temperature reading and re-zero after changing the compensation curve. To establish an application accuracy bound, check multiple pressures in increasing and decreasing sequences.

16 Firmware and service processes

Configured firmware verifies signed images and uses encrypted BLE SMP updates. Trial-update health checks support return to the previous image when needed. Select a compatible release and receiver for the supplied unit. After a full erase, restore calibration, pairing and provisioned identity as part of recommissioning.

17 PC and application bridge

EMD Utility bridging software connects the sensor over BLE to a Linux PC or application host using a Nordic nRF54LM20 DK connected by USB. Device discovery, paired connections and measurement streaming support monitoring, data collection and application development. The source code will be made freely available on GitHub.

Item	Integration support
BLE adapter	Nordic nRF54LM20 DK with compatible USB BLE controller firmware
Application host	Linux PC or application host using BlueZ
Sensor connection	Encrypted BLE; discovery, pairing and reconnection
Measurement access	Pressure in Pa and water temperature in degrees C
Application output	Machine-readable JSON notifications and CSV pressure logging
Source availability	Source code will be made freely available on GitHub

18 EMD Utility Gateway

EMD Utility Gateway collects pressure and water-temperature readings from sensors over BLE and forwards them to connected applications and cloud services. Automatic discovery and reconnection support ongoing monitoring. The gateway software supports multiple sensors, device identity verification, diagnostics and compatible firmware updates.



EMD Utility Gateway. Product illustration.

Function	Gateway support
Sensor data	Pressure and water-temperature readings over encrypted BLE
Connection management	Automatic discovery and reconnection; multiple sensors
Application delivery	Cellular cloud reporting; serial output in configured deployments
Reading records	Sensor identity and gateway reception timestamp
Device services	Identity verification, diagnostics and compatible firmware updates

19 Secure connectivity and device identity

Bluetooth LE Secure Connections pairing and 128-bit link encryption protect measurement and configuration communication. A stored receiver bond supports consistent reconnection. Provisioned units also support signed device credentials and a fresh cryptographic challenge-response, allowing compatible receivers to verify sensor identity.

Feature	Implemented mechanism	Use and integration
Wireless connection	LE Secure Connections; 128-bit link encryption	Encrypted measurement and configuration access
Receiver pairing	Just Works association; one stored receiver bond	Commission the selected receiver using the transfer procedure
Device identity	P-256 key; signed credential; fresh challenge-response	Compatible verifiers check credential trust and possession of the device key
Credential provisioning	One-time installation bound to device identity	Establishes the provisioned identity for subsequent verification
Device-held key	Per-device key used for challenge-response	Supports proof of device identity to the verifier
Firmware integrity	ECDSA P-256 signed firmware	Use a compatible signed release
Debug protection	Restricted debug access in production configuration	Select production protection or evaluation access for the supplied unit
Manufacturing traceability	Firmware, calibration and identity records	Supports unit configuration and service history

Use the receiver application's access policy to manage operator and gateway permissions alongside encrypted communication and device verification. One stored receiver bond provides a consistent connection setup. Use the receiver transfer procedure when commissioning a different receiver.

20 Supporting documentation

The pressure user manual provides installation, calibration, BLE integration, security and troubleshooting guidance. The product overview summarises applications and capabilities.

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