**ABB**

# ABB Ability™ Smart Sensor
## Condition monitoring for powertrain

# ABB Ability™ Smart Sensor
# for motors and general machinery

Changes in temperature and vibration can indicate potential problems in equipment. Yet monitoring rotating equipment is considered expensive and often overlooked, leaving problems unnoticed until a failure occurs. ABB now makes it easier and safer to know how your equipment is performing.

The ABB Ability™ Smart Sensor converts rotating equipment, such as motors and general machinery, into smart, wirelessly connected assets. It enables users to monitor the health of their equipment and to plan maintenance in advance. Unplanned downtime can be avoided, efficiency optimized and safety improved.

ABB Ability™ connects you to the power of industrial IoT. ABB offers a unique digital advantage by combining connectivity and data analytics with our expertise to make your operations efficient, predictable and safe.

**Increased safety** ●━━━━━●

**Increased productivity** ●━━━━━●

**Reduced maintenance** ●━━━━━●

**Eliminated unplanned stops** ●━━━━━●
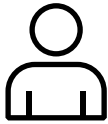
**Easy to use** ●━━━━━●

# Do you know how your assets feel?
## This is why you should



| **Traditional way** | Routine maintenance introduces safety hazards as employees are working around rotating equipment or trying to reach motors that are difficult or dangerous to access. | Not knowing the health of your assets leaves you at risk for untimely equipment failure, which can lead to process interruption, unplanned downtime, and lost revenue. | Maintenance is a routine schedule based on a combination of experience, training and "this is how we always do it". | The user has little visibility of when component failure may occur. |
|---|---|---|---|---|
| **With ABB Ability™ Smart Sensor** | **Increased safety**<br><br>The ability to monitor assets remotely allows maintenance and other relevant personnel to safely get a health check without touching equipment. | **Increased productivity**<br><br>Trending data helps to develop patterns for monitoring of performance and ability to predict replacement. | **Reduced maintenance**<br><br>Maintenance can now be planned according to actual needs rather than based on generic schedules. | **Eliminate unplanned stops**<br><br>Warnings on decreasing health status allow you to plan maintenance before there is a problem and the system is down. |

# Easy to use

**Wireless**
The ABB Ability™ Smart Sensor is designed for quick and easy installation and activation. The sensor is battery operated, no wiring, special tools or special software required.

**Easy installation**
The ABB Ability™ Smart Sensor is easily attached to assets without the need for wiring. Mounting and configuring the sensors takes only a few minutes. With the M6 (1/4"-28UNF) type mounting, the sensor can be mounted on any surface.
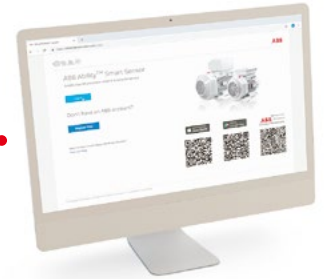
**Easy activation**
The sensor is easily activated using NFC* protocol.

**ABB Ability™ cloud access**
ABB Ability™ can combine data collected by the sensor with data from other connected equipment, such as variable-speed drives and pumps. This data can be accessed and analyzed remotely, providing deeper insight into the health of the entire process.

*NFC - Near Field Communication which is available in many smart phones such as iPhones

# Easy to use
## No matter where you are

Machinery is working even when you are not. Advanced conditional monitoring is now hand held through the Smart Sensor App. Designed with ease in mind, the app allows you to get up to date information on all assets at any time, no matter where you are. Simply download ABB Ability™ Smart Sensor App for any iOS or Android based device.

**Intuitive interface**
The simple, graphical interface is easy to use and understand.

**Traffic light system**
Asset health is displayed with a traffic light icon to quickly show users the state of that motor.

**Push notifications**
When conditions change, you want to be the first to know. ABB Ability™ allows you to get notifications based on your preferences.

**Event log**
All maintenance performed on assets can be scheduled and recorded in the app, providing an easy to access record of service for each asset.

**Access in remote locations**
For locations with remote access, or out of mobile device range, sensor data can be automatically sent thru Bluetooth Low Energy to the ABB Ability™ platform using a Gateway.

**Bearing condition**
Ultrasonic acoustic sensors to accurately assess bearing condition

**Energy saving guide**
Estimation of output power to help guide any energy saving measures

# Safe to use
## Cyber security

ABB understands the importance of protecting your data, and we take this responsibility seriously. The ABB Ability™ Smart Sensor adheres to strict security measures to ensure that the health of your assets is all you need to worry about.

**Data ownership**
- You own all of your data.
- Your data cannot be accessed by anyone outside your company unless you have authorized them in the portal.
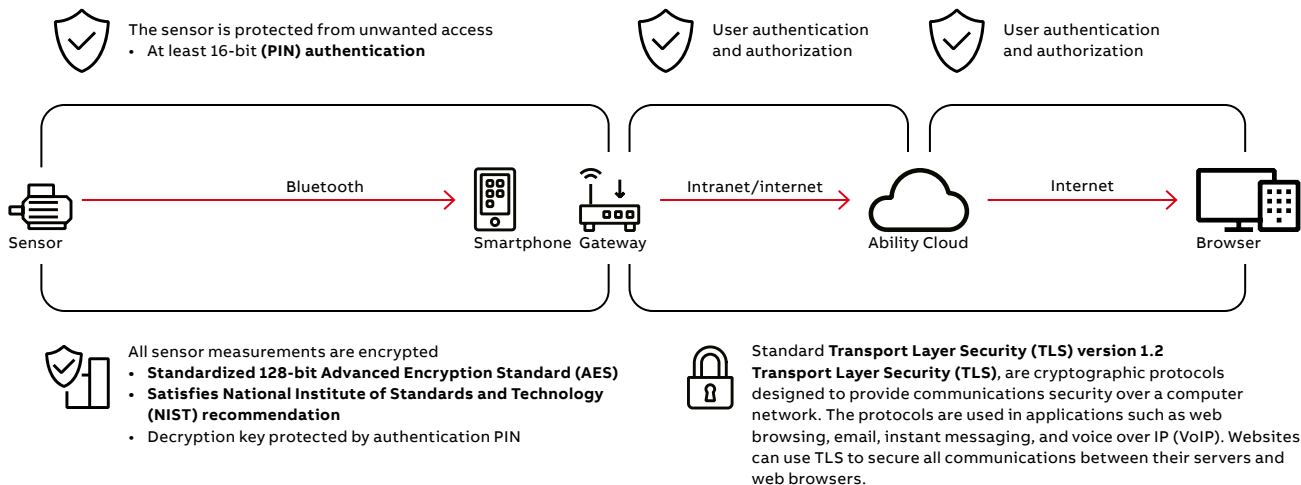
**The sensor is protected from unwanted access**
- 16-bit Personal Identification Number (PIN) authentication
- PIN is changeable during commissioning as well as during normal sensor usage (Default PIN is 0000)
- PIN throttling prevents brute-force attacks

**All sensor measurements are encrypted**
- By recommendation of National Institute of Standards and Technology (NIST)
- Decryption key is protected by authentication PIN

**Secure communication system overview**

The sensor is protected from unwanted access
- At least 16-bit **(PIN) authentication**

User authentication and authorization

User authentication and authorization

Sensor — Bluetooth → Smartphone  Gateway — Intranet/internet → Ability Cloud — Internet → Browser

All sensor measurements are encrypted
- **Standardized 128-bit Advanced Encryption Standard (AES)**
- **Satisfies National Institute of Standards and Technology (NIST) recommendation**
- Decryption key protected by authentication PIN

Standard **Transport Layer Security (TLS) version 1.2 Transport Layer Security (TLS)**, are cryptographic protocols designed to provide communications security over a computer network. The protocols are used in applications such as web browsing, email, instant messaging, and voice over IP (VoIP). Websites can use TLS to secure all communications between their servers and web browsers.

# Safe to use
## Hazardous duty certificates

**Third-party hazardous location certified (intrinsically safe)**
When it comes to applications in hazardous environments, there's no reason for customers to assume any risk  by using a product which is self certified. That's why both the ABB Ability™ Standard and High Performance Smart Sensors are third party NEC certified for worry-free use in hazardous environments. All required product markings and documentation are included with each sensor at no additional charge. When it comes to hazardous environments, you can trust ABB Ability™ Smart Sensors.

| | |
|---|---:|
| | Ex ia I Ma -40° C ≤ Tamb ≤ +85° C (Mining) |
| EX. ATEX, IECEx | Ex ia IIC T4 Ga -40° C ≤ Tamb ≤ +85° C (Gas) |
| | Ex ia IIIC T157 Da -40° C ≤ Tamb ≤ +85° C (Dust) |
| | CI I, Zn 0, AEx ia I Ma |
| | CI I, Zn 0, AEx ia IIC T4 Ga |
| NEC | Zn 20, AEx ia IIIC T157oC Da |
| | CI I, Div I Gr A, B, C and D T4 |
| | CI II, Div I Gr E, F and G T4 |
| | CI III, Div I -40oC ≤ Tamb ≤ +85oC |
| | EN 300 328 v.2.1.1 |
| Radio | EN 301 330 v.2.1.1 |
| | FCC/IC |

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# ABB Ability™ portal



ABB Ability™ Smart Sensors include access to the ABB Ability™ digital platform. This portal allows you to monitor asset function and analyze data trends, leading to better uptime  and ensuring that critical operations run smoothly and consistently.

The sensor uses Bluetooth Low Energy to wirelessly communicate information about the assets operational health via your smartphone or Bluetooth-gateway to a secure server. Data from the sensor can be displayed graphically on a smart phone, tablet or the ABB Ability™ web portal.
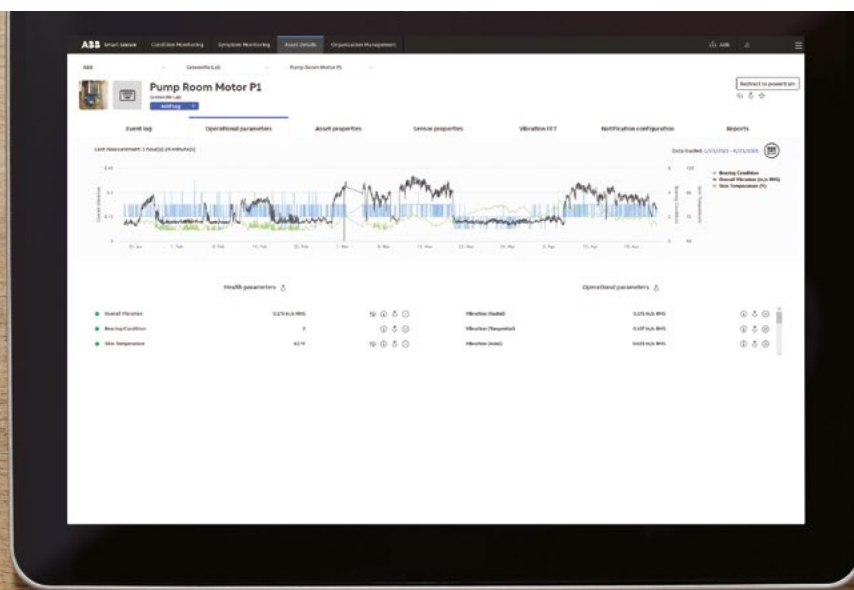
**Trending data**
Allows users the ability to zoom in and pinpoint certain events. Users can customize preferences and plot data relevant to them. This data is available to download to Microsoft Excel.

Advanced algorithms are loaded into ABB Ability™ to help direct proper maintenance and decrease unexpected down time.



https://smartsensor.abb.com/Login
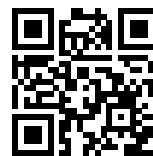
# Part information

**Standard performance Smart Sensors**

| Part number | Description | Application |
|---|---|---|
| EM5001A07SP | Standard performance Smart Sensor with aluminum bracket mounting kit. Does not include subscription | Finned/rib cooled motor |
| EM5001A08SP | Standard performance Smart Sensor with flat mount mounting kit. Does not include subscription | Finless/round steel motor/ General machinery |
| 3AXD50000823741 | Standard performance Smart Sensor without mounting hardware and subscription | - |

**High performance Smart Sensors**

| Part number | Description | Application |
|---|---|---|
| 3AFP9242910 | High performance Smart Sensor with aluminum bracket mounting kit. Does not include subscription | Finned/rib cooled motor |
| 3AFP9254388 | High performance Smart Sensor with flat mount mounting kit. Does not include subscription | Finless/round steel motor/ General machinery |
| 3AXD50000823765 | High performance Smart Sensor without mounting tool and subscription | - |

**Mounting hardware - Standard and high performance motor smart sensors**

| Part number | Description | Application |
|---|---|---|
| 3AFP9253863 | Aluminum bracket mounting hardware for finned/ rib cooled motor | Finned/rib cooled motor |
| 3AXD50000912643 | Flat mounting hardware for rolled steel motor/ general machinery | Finless/round steel motor/ General machinery |

**Subscription - Standard and high performance Smart sensors**

| Part number | Description | Application |
|---|---|---|
| 3AXD50000854493 | 3 year subscription | - |
| 3AFP9191436 | 2 year subscription | - |
| 3AFP9127707 | 1 year subscription | - |

**Subscription - High performance smart sensors**

| Part number | Description | Application |
|---|---|---|
| 3AFP9253864 | 5 year subscription | - |

**Smart Sensor Gateway**

| Part number | Description | Application |
|---|---|---|
| EM5001GW | Smart Sensor Gateway (common for all smart sensors) | - |
| 3AFP9247912 | Smart Sensor Gateway for hazardous area | - |

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## Technical data
Standard performance Smart Sensors

| Specifications | Standard performance sensor |
|---|---|
| **Temperature measurement (machine skin temperature)** | |
| Measurement range | -40° C to +85° C |
| Resolution | 0.1° C |
| Accuracy | +/-0.5° C |
| **Vibration measurement** | |
| Acceleration, low frequency (x, y, z direction) | |
|    Amplitude range | 0.03 - 157 m/s2 (16g) |
|    Frequency bandwidth | 0.1 Hz – 1.5 kHz |
| Acceleration, high frequency (z direction) | |
|    Amplitude range | N/A |
|    Frequency bandwidth | N/A |
| **Magnetic field measurement** | |
| Magnetic field (x, y, z direction) | |
|    Amplitude range | 1 – 1600 µT |
|    Frequency bandwidth | 0.1 – 250 Hz |
| **Ultrasonic sound measurement** | |
| Microphone | |
|    Amplitude range | 0.6 mN/m2 – 20 N/m2 |
|    Frequency bandwidth | 100 Hz – 80 kHz |
| **Wireless communication** | |
| Communication standards | Bluetooth® 5.0, Bluetooth® Low Energy |
| Radio standard | IEEE 802.15.4 |
| Frequency | 2.4 GHz, license free ISM band |
| Range (nominal) | >200 m @ line of sight |
| **Security** | |
| Encryption | 128-bit AES encryption |
| Authentication | IEC 62351 (role-based access control) |
| **Power** | |
| Battery type (not replaceable) | AA-type |
| Battery design life | Up to 5 years operation under standard conditions |
| **Environmental** | |
| Temperature | Operation: -40° C to +85° C |
| | Storage: <30° C |
| IP class | IP66/67 (dust-tight and resistant to powerful water jetting and submersion) |
| Chemical tolerance | See chemical tolerance sheet for PBT (Polybutylene terephthalate) |
| **Certifications** | |
| Hazardous areas | Ex ia I Ma -40 oC ≤ Tamb ≤ +85 °C (Mining) |
| | Ex ia IIC T4 Ga -40 oC ≤ Tamb ≤ +85 oC (Gas) |
| | Ex ia IIIC T157 Da -40 oC ≤ Tamb ≤ +85 oC (Dust) |
| | Cl I, Div 1, Gr A, B, C and D T4 |
| | Cl II, Div 1, Gr E, F and G T4 |
| | Cl III, Div 1 |
| Radio | EN 300 328 v.2.1.1 |
| | EN 301 330 v.2.1.1 |
| | FCC/IC |
| **EMC** | |
| Immunity | EN/IEC 61000-6-2 |
| Emission | EN/IEC 61000-6-3 |
| **Physical** | |
| Dimensions (W x D x H) | 75 mm x 58 mm x 33 mm |
| Weight | 130 g |
| Case material | Stainless steel/reinforced PBT |
| Mounting | On equipment housing or frame. Please consult installation manuals. M6 or UNF ¼" / 28 screw |

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## Technical data
High performance Smart Sensors

| Specifications | High performance sensor |
|---|---|
| **Temperature measurement (machine skin temperature)** | |
| Measurement range | -40° C to +85° C |
| Resolution | 0.1° C |
| Accuracy | +/-0.5° C |
| **Vibration measurement** | |
| Acceleration, low frequency (x, y, z direction) | |
|    Amplitude range | 0.03 - 157 m/s2 (16g) |
|    Frequency bandwidth | 0.1 Hz – 1.5 kHz |
| Acceleration, high frequency (z direction) | |
|    Amplitude range | 0.1 - 450 m/s2 (50g) |
|    Frequency bandwidth | 100 Hz - 20 kHz |
| **Magnetic field measurement** | |
| Magnetic field (x, y, z direction) | |
|    Amplitude range | 1 – 1600 µT |
|    Frequency bandwidth | 0.1 – 250 Hz |
| **Ultrasonic sound measurement** | |
| Microphone | |
|    Amplitude range | 0.6 mN/m2 – 20 N/m2 |
|    Frequency bandwidth | 100 Hz – 80 kHz |
| **Wireless communication** | |
| Communication standards | Bluetooth 5.0, Bluetooth Low Energy |
| Radio standard | IEEE 802.15.4 |
| Frequency | 2.4 GHz, license free ISM band |
| Range (nominal) | >200 m @ line of sight |
| **Security** | |
| Encryption | 128-bit AES encryption |
| Authentication | IEC 62351 (role-based access control) |
| **Power** | |
| Battery type (not replaceable) | C-type |
| Battery design life | Up to 15 years operation under standard conditions |
| **Environmental** | |
| Temperature | Operation: -40° C to +85° C |
| | Storage: <30° C |
| IP class | IP66/67 (dust-tight and resistant to powerful water jetting and submersion) |
| Chemical tolerance | See chemical tolerance sheet for PBT (Polybutylene terephthalate) |
| **Certifications** | |
| Hazardous areas | Ex ia I Ma -40 oC ≤ Tamb ≤ +85 °C (Mining) |
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| | Cl I, Div 1, Gr A, B, C and D T4 |
| | Cl II, Div 1, Gr E, F and G T4 |
| | Cl III, Div 1 |
| Radio | EN 300 328 v.2.1.1 |
| | EN 301 330 v.2.1.1 |
| | FCC/IC |
| **EMC** | |
| Immunity | EN/IEC 61000-6-2 |
| Emission | EN/IEC 61000-6-3 |
| **Physical** | |
| Dimensions (W x D x H) | 82 mm x 69 mm x 45 mm |
| Weight | 185 g |
| Case material | Stainless steel/reinforced PBT |
| Mounting | On equipment housing or frame. Please consult installation manuals. M6 or UNF ¼" / 28 screw |