

From	Geir Svoen
Business area	Energy Industries
Phone direct	+4722872858
Fax direct	
E-mail	geir.svoen@no.abb.com
Cc	
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## **FCC "Limited Module Approval" letter**

"ABB Ability™ Smart Sensor xyzw" is a new family of wireless condition monitoring sensors from ABB. It consists externally of a rugged plastic enclosure, internally basically of a processor and communication module, a sensor module and a battery for powering the sensor over its lifetime. It is not possible to open the sensor to exchange the battery etc.

Over time, various variants will be launched with different internal transducers and different batteries & sizes. The sensor will be equipped with two variants of the "Processor and communication module":

PM001 Processor module, Bluetooth  
PM002 Processor module, WirelessHART

The modules are identical, except that PM002 is equipped with a transceiver chip that supports WirelessHART, while the Bluetooth is used for local communication and configuration only.

Initially two versions of the Smart Sensor will be released, one equipped with PM001, the other with PM002, targeting different solutions for system integration.

The PM001 and PM002 complies with all requirements stated in FCC part 15.212 (a) except (i) concerning separate shielding of transmitter, thereby application for LMA as described under FCC part 15.212 (b). Test reports show that all applicable part 15 requirements are fulfilled:

Compliance to FCC part 15.212 rules, as listed in KDB 996369 D01 clause III a):

- 1. The radio elements must have the radio frequency circuitry shielded:**  
No comply, There is no shield mounted on the PM001/PM002 radio circuitry.  
Thorough design with multilayer PCB, and careful tracing of transmitter power and radio signals ensure that FCC requirements anyway are fulfilled.  
This is verified with tests and reports done by NEMKO Norway.
- 2. The module must have buffered modulation/data inputs:**  
Comply, the PM001/PM002 are using standard circuits and firmware provided by Nordic Semiconductor (nRF52840) for Bluetooth and Analog for WirelessHART (LTC5800WHM for WirelessHART) which ensure that messages is transmitted according to constraints given by the protocol specification and FCC rules.
- 3. The module must contain power supply regulation on the module:**  
Comply. PM001 / PM002 has integral DC/DC converter powered by an internal Lithium Thionyl chloride battery (3.6V).

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4. **The module must contain a permanently attached antenna:**  
Comply. The antenna's are soldered to the PM001/ PM002 PBA and is not possible change or access.
5. **The module must demonstrate compliance in a stand-alone configuration:**  
Comply. Demonstrated by tests performed by NEMKO AS, Norway.
6. **The module must be labeled with its permanently affixed FCC ID label:**  
Comply. FCC ID is laserwritten to the surface of the PM001 / PM002 PBA surface
7. **The module must comply with all specific rules applicable to the transmitter:**  
Comply: Demonstrated by tests performed by NEMKO AS, Norway.
  
8. **The module must comply with RF exposure requirements**  
Comply: Design with max transmit power less than 10mW and omnidirectional antennas secure that RF exposure requirements are fulfilled. This is verified by tests executed and reported by NEMKO AS Norway.

Since the PM001 / PM002 does not comply with point 1 in list above, we hereby apply for Limit Module Approval for PM001 and PM002.

Yours sincerely,  
ABB AS



Geir Svoen

**Attachments:**

Compliance list INTEGRATION INSTRUCTIONS for 996369 D03 OEM the and 996369 D03 OEM by Sections 2.2 through 2.10

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**Compliance list INTEGRATION INSTRUCTIONS for 996369 D03 OEM the and 996369 D03 OEM by Sections 2.2 through 2.10.**

Requirement	Yes	No	Comment
<b>2.2 List of applicable FCC rules</b> List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required. <sup>3</sup>	X		From "PART 15—RADIO FREQUENCY DEVICES":  §15.247 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz
<b>2.3 Summarize the specific operational use conditions</b> Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.	X		The PM001 module is restricted to be installed in ABB Ability™ Smart Sensor enclosures as described in the installation manual.  Integration shall be done so that battery cables is below the PBA except the soldering point.
<b>2.4 Limited module procedures</b> If a modular transmitter is approved as a "limited module," then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.  A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module	X		The PM001 /PM002 does not have a screen covering the transmitter, thereby application for Limited Module Approval.  The PM001/ PM002 module is restricted to be installed in ABB Ability™ Smart Sensor enclosures as described in the installation manual.  Integration shall be done so that battery cables is below the PBA except the soldering point.

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<p>manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.</p> <p>This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.</p>			
<p><b>2.5 Trace antenna designs</b></p> <p>For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.<sup>4</sup></p> <p>a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);</p> <p>b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);</p> <p>c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;</p> <p>d) Appropriate parts by manufacturer and specifications;</p> <p>e) Test procedures for design verification; and</p> <p>f) Production test procedures for ensuring compliance.</p> <p>The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take</p>		<p><b>X</b></p>	<p>The PM001 / PM002 does not use Trace antenna designs.</p> <p>The PM001/PM002 has a fixed soldered antenna and the corresponding tuning is reflected in the test reports. There is no flexibility during integration in host, see installation manual.</p>

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responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.			
<b>2.6 RF exposure considerations</b> It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).			The application condition for the PM001 / PM002 is fixed installation more than 20cm from persons body.  <b>The modules shall thus only be integrated in products targeted for fixed installation in industrial environments.</b>  Instructions for end user is included in the ABB Ability™ Smart Sensor user manual, 3BNP102777D017.
<b>2.7 Antennas</b> A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an “omni-directional antenna” is not considered to be a specific “antenna type”)). For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.			Non replaceable antennas is used (soldered on) in the PM001 / PM002 modules.
<b>2.8 Label and compliance information</b> Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating “Contains FCC ID” with their finished product. See <a href="#">Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748</a> .	X		See “3BNP102777D045_PM001 and PM002 Installation Manual” and specification for host label “4JNO000026D007_en Smart sensor xxxC Label drawing”  As PM001/PM002 only will be integrated in host modules from ABB, full control of the assembly is achieved.

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<p><b>2.9 Information on test modes and additional testing requirements</b></p> <p>Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.</p> <p>The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host. Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer's determination that a module as installed in a host complies with FCC requirements.</p>	<p>X</p>	<p>As PM001/PM002 is integrated in ABB hosts only, ABB has already full control of all components in design, including test modes. Additional documentation for this purpose is therefore not necessary.</p> <p>The PM001 has already optimized tuning (by fixed tuning capacitors and inductors) from the manufacturing line and have no means for further tuning during integration in host product.</p> <p>In integration test line transmit power and frequency is tested.</p> <p>Maximum Tune Up Tolerance: +-1dB</p>
<p><b>2.10 Additional testing, Part 15 Subpart B disclaimer</b></p> <p>The grantee should include a statement that the modular transmitter is <b>only</b> FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.<sup>6</sup></p>	<p>X</p>	<p>PM001 will be used internally in ABB for one product family.</p>