RECOMMENDED GUIDELINES FOR DEPLOYMENT OF RFID ON THE NORWEGIAN CONTINENTAL SHELF

- Drill string components -

THE NORWEGIAN OIL INDUSTRY ASSOCIATION (OLF)
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1 Introduction
This guideline for deployment of Radio Frequency Identification (RFID) on the Norwegian Continental Shelf (NCS) addresses the main needs and requirements of the offshore industry for operational information in the area of locating and tracking drill string components.

2 Domain

2.1 Drill string components
Defining the guidelines, requirements and needs for using RFID tags to track the multiple drill string components e.g. drilling pipes that are joined together in long vertical strings for drilling wells, considering the harsh environments conditions. The RFID tags need to perform reliably after exposure to heat, vibration, physical acceleration, pressure and chemical exposures generated in the drilling process, get knocked or are covered by heavy coatings of mud.

The RFID tags, are attached or embedded into the drill pipe and tubing in locations where they have less chance to be damaged and are used for tracking the drilling pipes of different sizes and shapes on the oil field.

RFID systems in the deployment area of drill string components are used to identify and locate items efficiently to avoid delays in production or, even total work stoppages. The general requirements for the RFID systems used in drilling strings are:

- Unambiguously identify the item.
- Locate a particular item when is required.
- Track the movement of the item within a platform offshore or on a base onshore and at entry and exit points.
- Automatically transmit the movements of the items to the enterprise system and to a repository for record.
- Record the item has been issued to or is in the custody of a particular operator/company employee.

The requirements presented in these guide line will be applied to different implementation solutions and different approaches to fulfilling these requirements are considered. The guidelines consider that there will be different right solutions and implementations to fulfil the requirements.

3 Business objectives
Drill string components are subjected to high loads and heavy wear under harsh conditions. Analysis shows that significant costs are related to drill pipe failures in drilling operations, thus there is a great cost saving potential through proactive maintenance, optimized operations and improved logistics.

The use of RFID technology will improve the efficiency and help to find automatically the right piece for the drill string that is necessary for a specific operation by selecting the right component(s) from racks similar looking pipe.

Using attached or embedded RFID tags allows operators, drilling companies, and drilling equipment leasing companies to track equipment locations and to know how it has been used. This is done by keeping an electronic record of where each piece of equipment has been including the temperature, chemicals, pressure and depth which it has been exposed to, and for
how long. This kind of tracking helps equipment users to avoid accidents, such as a catastrophic drill string failure or breakage underground, or injuries to drilling employees. The figure below illustrates the life cycle of drill pipes through onshore and offshore operations, but can be transferred to the other drill string components also.

![Fig. 1: Drill pipe information flow during the life cycle.](image)

Utilization of RFID for drill string components applies to the whole value chain, and great benefits are expected in all parts of the industry. However, the offshore operation is believed to have the greatest potential due to the high rig rates and the consequences of failure in drilling operations. A list of potential benefits is shown below:

- **Offshore Operation.**
  - Drill pipe failure prevention.
  - Reduced non productive time and increased efficiency.
    - Automatic drill pipe tally.
    - Improved depth control.
    - Enabler for scientific applications and automation.
  - Reduced operator errors.
- **Logistics.**
  - Improved equipment utilization.
  - Improved supplier / customer relation.
  - Reduced stock.
- **Quality.**
  - Improved data quality.
  - Reduced and improved inspection & maintenance.
  - Available equipment history.
- **Improved integrated operations.**
- **Improved HSE through safer operations.**

While utilization of RFID in other applications often relates to logistics, electronic identification of drill pipes and other drill string components is more driven by prevention of failures and an introduction of automation. The volume of drill pipes is relatively small and the environment is extremely harsh. These characteristics indicate that application of RFID for drill string components requires special solutions.
3.1 Safety
Safety specifications may require the use of multiple RFID tags encoded with the same ID number specific to that specific drill string component (e.g. drilling pipe) or with multiple identifiers with fixed identities associated with a single specific component (e.g. drill pipe). The data related to the pipes (where and how they have been used), needs to be stored locally on a local server and can then be backed up to a server that can be hosted by the drilling company or operator company.

3.2 Quality
The quality of identification has to consider the operating environment and the effect of chemicals inserted into the drill pipe on readability and survivability of a tag. In addition, fluid flow past the tag on the outside of the drill pipe is a factor. Factors that determine how RFID technology can be used and how an RFID system needs to be designed and developed to work effectively have to be considered (e.g. hydrochloric acid for acid fracturing, hydrogen sulphide from down hole corrosive gases, barite in the drilling mud). Determining the environmental factors is a part of the requirements and to support the RFID system integrators to interpret critical components of system development and thereby successfully build RFID technologies for the drill string application area.

4 Cost and benefits
Drill pipe failures like washout and twist-off, illustrated in the figure below can result in expensive non-productive time (NPT) and loss of equipment. One operator has performed analysis suggesting economic losses exceeding 150 million USD in a 10-year period, distributed over 187 incidents. Electronic identification will enable tracking and condition based inspection and maintenance of each individual drill pipe, reducing cost related to drill pipe failure.
In addition to reduction of NPT related to drill pipe fatigue failures, several other benefits are revealed throughout the project:

- **Automatic drill string tally** will aid the driller and act as a secondary barrier against costly tally errors, to the benefit of both drilling contractors and field operators. The drill string tally can be used to optimize order of pipes in the drill string, improved depth control and for automation purposes.

- **Improved logistical control on-site** allows for back loading of used pipe only, when inspection is required. A great reduction in rig time spent on breaking and making up drill pipes is achieved, by only taking out pipe that needs inspection. Pipe that has not been used or has had a limited downhole exposure may still be good for extensive use before inspection is required. Cost is saved for the field operator on rig time and for the drilling contractor on inspection and logistics.

- **For asset management in stock yards** owned or administrated by drilling contractors and rental companies, utilization of RFID technology has the potential to save man-hours and increase equipment turnaround.

Investments related to utilization of RFID in Oil & Gas may be challenging to estimate but are expected to be low compared with the potential benefits. The list below highlights some areas where investments will be needed:

- Organizational changes and new work processes.
- Data and system integration.
- Onshore and offshore RFID reader (interrogator) systems.
- RFID tags (transponders) and mounting.

**5 Antenna, tags and sensors**

RFID tags usable for drill string components i.e. drill pipes, tools, and all associated surface equipment are within this application area. The operating conditions for the tagged drill string components (e.g. drilling pipes) requires RFID tags that are designed to withstand the harsh conditions in oil and gas operational environments to allow both onshore and offshore asset tracking during down hole and sub sea drilling operations.
The RFID tags need to meet and exceed extreme pressures and temperatures typical experienced in oil and gas exploration environments in order to reliable track the drilling components, drilling tools, and all other associated surface equipment.

The RFID tags must be attached or embedded to/into the drill pipes and are used for determining in real time, the drill pipe location, usage history and archival inspection information.

Tags intended for installation into the tool joint of drill pipe should be no larger then 26 mm in diameter.

No more then two RFID tags should be placed within four centimetres of each other on the long axis of a pipe and if so placed, they should be opposite each other (180 degrees apart +/- 5 degrees) on the circumference of the pipe. This is to ensure that passive tags without anti collision capability will not cause interference with each other when passing through a read zone. Passive RFID tags are recommended.

The RFID tag and the automated process for data acquisition has to minimize data entry delays and errors, increasing the accuracy and reliability of the information and has the ability to plug and play with the existing ERP systems that are in used by the operators.

5.1 Frequency
Taken into consideration that reliable reading of tags must be performed in an extremely harsh environment it is recommended to make use of an ISM frequency below 135kHz (e.g. 125kHz) for use of RFID for the oil and gas drilling applications. HF RFID tags (13.56MHz) may also be an option. The low frequency technology offers a good selection in tag sizes and ATEX certified products.

The choice of technology (frequency) must be based on the following criteria:

- Performance with water, steel, drilling fluids, pipe dope (thread lubricant), and Immunity to Electro Magnetic Interferences. It is the nature of drilling operations to have foreign substances adhering to the drill string components (e.g. drill pipe) and the tags must be able to perform reliably in the presence of such substances.

- Read reliability guidelines include:
  - Tags shall be readable with a coating of up to 15mm thickness of thread lubricant (pipe dope) which meets or exceeds Meets or exceeds the requirements of API recommended practice 7A1 for Rotary Shouldered Connection Threads, for example, Z-50™ Anti-Seize compound.
  - Electro Magnetic Interference Immunity from sources reasonably expected to be found in an active drilling environment including from top drives, rotary table and drawworks prime movers. More specific specifications, referring to amplitude and frequency range could be required by the oil and gas operators for specific implementations.
  - Wet tags, or tags coated with diesel based, water based or polymer based drilling fluids including thick coatings (15mm thickness of minimum 13PPG (1.56kg/L) of clay based fluids and polymer based fluids.).

- Read Properties:
  - Distance: The tags must be reliably read by their respective readers during routine manual or automated operations. Tag read distances for various systems are a function of the tag frequency, tag type, tag installation method, antenna type and power and implementation design/operational requirements.
  - Read Distance of the tags shall be addressed at the system level appropriate of the intended system operation. Systems which require unique component
identification of one selected component among many tagged components shall be designed such that one or more of the following criteria are met:

- The read distance capabilities of the system are fundamentally designed and implemented to prevent identification issues
- The components read are controlled past the reader in such a manner as to reliably prevent erroneous reads of nearby tagged equipment
- On systems implementations that have no need to differentiate unique components for a particular operation, many tags may be ‘simultaneously’ read. Also, if more then one tag passes through the read zone at a time, the reader or tags must be able to manage the possibility of multiple simultaneous reads.
- A combination of the above

When a fixed reader near the rotary table is considered, drill pipe tags must be readable by the fixed reader system when the tagged section of pipe passes by or through the read zone, where the pipe may be anywhere in the rotary table ‘hole’ and the tag may be facing in any direction on the pipe (360 degree read angle in rotary table reader implementation) and where the distance from the tag to the inside edge of the rotary table may be up to 35cm. Note that this guideline does NOT necessarily mean that the tags must be readable by a reader at a distance of 35cm.

- Motion: Tags shall be readable when moved past the reader within its rated distance criteria at a rate of 2m/s or less.
- Angle of Read: The angle of the read is a function of the tag and reader system as well as the tag installation and the material it is installed into. Actual requirements will vary depending on the implementation. Tag angle readability is recommended and may vary depending on the implementation specifications.

- Reader interface. Depends on the requirements on the rig, technology, hardware implementation types and rig/client needs. The possible options are RS-432, RS-232, etc, but systems may also use LAN connections, WLAN, fiber optic, etc.
- Anti collision, (efficiency to manage, in a short time window, the detection of many tags present within the read range area of the reader).
  - Where tags, in their planned implementation, are expected to be used to identify groups of materials ‘at once’ rather then uniquely identify single components, they shall possess anti-collision capability. This feature could not be necessary in drill pipe tags intended for tracking into and out of wells or in the derrick setting or in other systems where positive unique equipment use is tracked rather then group or set identification is performed.

5.2 EX/ATEX

Ignition protection in explosive atmosphere is required. When a tag is being activated by a reader it is regarded as part of the system. Thus, even passive tags are subject to certification. For use of electronic equipment in the drilling area, including the well centre, the following requirements are applicable for tags: Hazardous area Zone 1, Gas group IIC, and temperature class T4.

5.3 Environment

The drilling environment is regarded as a harsh environment including 100% humidity and aggressive gases and liquids, with high temperature, pressure, vibration levels, shock and physical strain exposure. Note that temperature ratings of RFID tags listed are “sustained” values where the tag can demonstrate its ability to withstand the temperature in a wet environment for minimum of 500 hours. Peak temperature ratings of tags are typically higher however with only brief exposure allowances that is not meaningful for downhole use. Pressure and temperature combinations in drilling operations:
- Up to 690bar, -40°C to +180°C (standard).
- Up to 1034bar, -40°C to +200°C (high).
- Up to 1379bar, -40°C to +230°C (ultra).

The tags must also withstand shock exposure, vibration levels (typical 30-50Grms), and tool joint abrasion (e.g. minimum 5mm). In addition the presence of water, mud, steel and electromagnetic interferences must be considered, which makes this a very difficult and demanding environment for applying RFID technologies.

5.4 ID numbering

One of the most important premises for industry wide communication, information sharing and tracking is unique identification. Every object regarded as atomic or as a serialized assembly within a domain, e.g. the worldwide Oil and Gas industry, must be associated with a unique identifier. Other important aspects of ID numbering are that it is well defined, usable in the real world, robust and auditable (i.e. valid and reliable).

One applicable solution is that the RFID numbering schemas could be consistent with WITSML standards established within version 1.3.1 in January 2006 (please see section 7 for more information on WITSML).

Another solution could be that the ID numbering scheme is based on ISO standard and allow as well the use of PETRO-UNIQUE to be used as ID for items covered by this guideline. PETRO-UNIQUE is a 40-bits ID code which is controlled by a central body to assure uniqueness within the Oil and Gas industry.

5.5 Semantics

The use of an unique standard numbering system (UII-unique identifier) and industry adoption procedures will imply specific standardized meanings which will be the basis for issuance, use and communication of the unique ID based information.

5.6 Security

The tag can contain information about the object or an object ID only. By using the tag as a marker, the information accessibility increases and the security challenges are reduced. Some of the relevant issues are listed below:
- Destroyed identity.
- Changed/Stolen identity.
- Unauthorized allocation of identity.
- Unauthorized reading of identity.

Security issues are substantially reduced when tags contain only an identifier, rather then information about the component they are attached to.

6 Antenna and readers

The RFID readers used in a rig environment or offshore and onshore should be ATEX certified readers that are both usable in the asset management and in the industrial environments. The readers should be designed to withstand harsh and hazardous environments. Readers intended for non-hazardous use in pipe yards, vendor sites, transportation and handling areas or any location where asset management or verification operation may occur should be available as well, preferably at competitive prices.
The RFID tag and the automated process for data acquisition has to minimize data entry delays and errors, increasing the accuracy and reliability of the information and has the ability to plug and play with the existing ERP systems that are in used by the operators.

6.1 frequency
The readers must be tag compatible, ref. chapter 5.1.

6.2 EX/ATEX
Ignition protection in explosive atmosphere is required. For use of electronic equipment in the drilling area, including the well centre, the following requirements are applicable for handheld readers: Hazardous area Zone 1, Gas group IIB, and temperature class T4. The requirements applicable for portal readers are mainly the same as for handheld readers, but depend on the localization of the portal. Onshore readers may not need this kind of certification.

6.3 Environment
As mentioned in chapter 5.3 the drilling environment is regarded as a harsh environment including 100% humidity and aggressive gases and liquids. On the offshore installations the presence of water, mud, steel and electro magnetic interference makes this a very difficult and demanding environment for applying RFID technologies. The handheld readers must also withstand shock exposure (typical up to 5G, multiple drops to concrete from 1.5m) and the portal readers vibration levels (typical up to 3G sine cycles, 5Hz-150Hz; Noise 5Hz-1000Hz, 30min.).

Onshore the logistics may be performed in a friendlier environment, but still the RFID system must be operable in humid and industrial surroundings, which demand a high level of robustness for the readers and tag solutions.

6.4 Security
Ref. chapter 5.6.

7 Application integration
One common RFID technology may not apply to all applications within oil and gas industry because of the variety of functional requirements and operational environments. However, the industry can agree upon a set of reader-tag air interf aces that will be used within the oil and gas industry.

Missed and unreliable readings could be a problem for RFID drilling string applications. Since tags have to withstand harsh environment conditions it is required that they are functioning even there are low power constraints and not totally reliable wireless communication. These unreliable readings can be categorized in three scenarios that have to be avoided: false negative readings, false positive readings and duplicate readings. In the case of false negative readings RFID tags, which are in the vicinity of a reader, might not be detected by the reader at all (due to the chemicals, mud, etc.). The situation can be caused by different reasons such as; RF collisions and signal interferences (multiple tags reading); metal shielding, and other physical obstructions like water or RF interference. False positive readings (or noise), extra RFID readings are generated (i.e. RFID readers that send wrong tag IDs). Duplicate readings due to tags in multiple reading frames; tags in the overlapped areas are read by multiple readers because these readers are installed to cover larger area or distance, etc.

The RFID deployment has to consider the emergence of a Semantic Web and Internet of Things, where machines and applications can to talk to each other. Using the possibility of extended use of URIs, as a fundamental element of the World Wide Web combined with unique identification
and Internet of Things and Semantic Web to serve alongside digital resource IDs and as semantically enriched keys and pointers to data discovery has to be considered in the RFID deployment for oil and gas industry. Standardizing resource identifiers as unique identifiers with standard URI syntax to ensure interoperability and support the Semantic Web and Internet of Things is important requirement for the RFID implementation.

The RFID deployment has to consider the security framework and must address the issues related to:

- **Authentication** - Authentication is critical for the security framework. This requires that sending sensitive information across a network knowing who the receiver is and who has access to a certain type of data in repository. This is necessary to avoid serious risks, including exposure of sensitive supply and demand information to unwanted companies and the risk of regulatory liabilities arising from improper disclosure of information.

- **Data protection** - Data protection is critical to ensure that information cannot be intercepted or modified by unauthorized parties while it is in transmitted across networks or resident on storage media. This is realized by encrypting/decrypting the information. Data integrity ensures data has not been changed, destroyed, or lost in an unauthorized or accidental manner. RFID data integrity must be ensured at least at two levels that are the confidentiality and integrity.

- **Access control** - Access control ensures that security sensitive tasks are performed only by authenticated persons who are authorized to perform them. The access control mechanisms have different functions such as using credentials accessing an identity management service, determining the sensitivity of the operation requested and consulting an access management service.

The drill string component tracking system relies on all pipes etc. are provided with a tag, readers distributed at selected locations and an adjusted data capturing system. In addition there will always be a data communication requirement to direct data collected to the correct central unit or decision-maker. To gain efficiency, seamless integration is essential and that a reliable data network exists both on and off the installation. Well defined semantics and interface syntax for electronic product code specific information and drill string component information in general are needed.

Integrated operations (IO) denotes the kind of operation where use is made of the opportunities which new and improved information technology provide by utilizing approximate real-time data to achieve better and quicker decisions. To achieve full benefit of integrated operations, the oil and gas industry needs to cooperate on data integration across disciplines and organizational boundaries. The semantic web, based on ISO and W3C standards facilitate this strategy. Fig. 4 illustrates the information integration strategy based on common extensible mark-up language (XML) schemas and the semantic web.
Fig. 4: Information integration strategy using the Semantic Web and common XML schemas.

WITSML (Well Information Transfer Mark-up Language) is an open standard used in the drilling industry for various application and data exchange systems. It offers a standard for the drilling industry to allow multiple unique identifiers of various types and standards to be associated with a single specific component or assembly. The WITSML standard is inclusive of oil industry low frequency RFID, EPC codes, various bar code systems, and numerous other identification schemes currently in use or potentially used in oilfield operations. It continues to be extensible to include emerging new standards. Version 1.3.1 was ratified in January 2006 following the standards meeting in Stavanger in November 2005 and includes the XML extensions for ‘TagId’ to define various identification scenarios for oilfield equipment. WITSML is managed by Energistics.org (www.witsml.org). RFID tags used for drilling operations should comply with WITSML standards to ensure that identified components can be shared across various software integration platforms and between software applications.

The semantic web is an infrastructure for web services. It is a web of data that provides a common framework that allows data to be shared and reused across application, enterprise, and community boundaries. It is a collaborative effort led by World Wide Web Consortium (W3C) with participation from a large number of research and industrial partners.

Ontology in the semantic web is a hierarchal data structure containing the concepts, properties, rules, and relationships used to describe and represent a specific domain. It is possible classify the terms used in a particular application, characterize possible relationships, and define possible constraints on using those relationships.

The extensible mark-up language (XML) is a general purpose specification for creating custom mark-up languages. It allows user defined mark-up elements and the purpose is to aid information systems in sharing structures data, especially via the internet. XML is an open standard and is recommended by the W3C organization.

The Oil and Gas industry should first of all explore the existing standards, and preferable adapt these if possible or eventually develop a new appropriate standard which is not recommended. The ISO15926 standard defines a model and the library which are suitable for representing
lifecycle information about technical installations and their components. A suggested standard for drill pipe inspection semantics, based on ISO 15926 is developed. To enable data integration, standardization of semantics and integration syntax for drill pipes must proceed.

Data access security methods have to be implemented to assess potential risks and effective countermeasures to prevent unauthorized access to RFID data.

Electronic product codes for drill pipes will give new opportunities for more efficient and accurate operations through the whole value chain. However, for full utilization, organizational changes and new work processes are needed for all companies involved, such as:

- Drill pipe manufacturers; Mounting RFID tags, and pairing ID.
- Rental; Electronic warehousing.
- Inspection; Automatic identification and new electronic inspection methods.
- Maintenance; Automation of maintenance for each individual drill pipe.
- Drill pipe manager; Electronic and automatic purchasing and supply chain.
- Drilling Contractor; Operation planning, condition based inspection, automatic tally and automated operations.
- Customer Relations; New opportunities to closer integration between suppliers and customers.

The core application for RFID in drill pipes is believed to be in specialized offshore solutions for downhole tracking, failure prevention and automation. However, to fully utilize electronic identification of drill pipes, integration of enterprise business application is crucial. To avoid overflow of information exchange, filtering and consolidated of data is needed before events are sent to enterprise systems.

The roles and interfaces for communication between RFID reader and the enterprise application are defined by the standard used.

Drill pipe is just one of the many types of oilfield equipment to identify. Electronic identification of other oilfield equipment offers similar benefits. Standards and systems for drill pipe should be extendible to other equipment which will encounter similar operational use.

Information services, semantics and data exchange syntax are important to enable integration between enterprises in the Oil and Gas industry. Mechanisms for administration of objects and electronic identifiers must be established and in the future functionality for discovery services may be needed.
8 Appendices
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<td>Overall infrastructure</td>
<td>See Additional information.</td>
<td>See Additional information.</td>
<td>Semantic web; “Internet of Things”; ISO/W3C standards; XML schemas/WITSML standard; Oil and Gas ontology; SOIL network (optional).</td>
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<td>Data integration</td>
<td>See Readers.</td>
<td></td>
<td>Seamless integration with the ERP system.</td>
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<td>ID-numbering:</td>
<td>See Tags.</td>
<td></td>
<td>ISO 15459-1-8; ISO/IEC 15417.</td>
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<td>Memory/ buffer</td>
<td>User definable (9-4kbytes, e.g. EEPROM).</td>
<td>Up to 400 tags, extension 2000 tags.</td>
<td>ISO 15459-1-8; ISO/IEC 15417.</td>
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<td>Programmable</td>
<td>Wireless activation/reprogrammable by proximity device (max. 5cm).</td>
<td>Program updates via host computer interface.</td>
<td>ISO 15459-1-8; ISO/IEC 15417.</td>
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| Air interface and related properties: | | | |
| General annotations           | Passive tags are recommended; Embedded into or attached to the drill pipe; Tag diameter max. 26mm. | Handheld readers are less challenging than portals due to the short reading distance. | |
| Transmission Power            | Depending on energy from reader. | Depending on frequency band, application and human exposure limits (passive tag applications). | |
| Read range                    | See Readers.    | Max. 35cm.                     | Dependent on application. |
| Detection accuracy            | See Readers.    | 100% (manage velocity up to 2m/s and read angle of 360°). | The presence of water, mud, steel and electromagnetic interference must be considered. The requirement of 360° readability may involve more than one tag per item. |

| Power:                        | | | |
| Power source                  | No battery, induced by the reader. | - | Rechargeable battery. | 10V-30V DC (offshore). |
| Battery indicator and backup  | - | - | Low battery indication. | Backup battery required, 30min. operation/5 years. Low battery indication. |

| Environmental properties, incl. ignition protection in explosive atmosphere: | | | |
| EX/ATEX                       | EX Zone 1. | EX Zone 1. | Depending on the localization of the portal. | Onshore readers do not need EX/ATEX certification normally. |
| Gas certification/ detector   | Certification group IIC. | Certification group IIb. | Certification group IIb. Gas detector, trip level 60% LEL (only EX Zone 2). | Onshore readers do not need Gas certification or detectors normally. |
| Pressure/ Temperature         | -40°C to +85°C; (Sustained values: Up to 690 bar / -40°C to +180°C ; Up to 1034 bar / -40°C to +200°C; Up to 1379 bar / -40°C to +230°C). | -40°C to +85°C | -40°C to +135°C. | Offshore readers: Class T6 (85°C); Class T4 (135°C), Class T3A (180°C), Class T3 (200°C), Class T2C (230°C). Depending on application. |
| Humidity                      | 100% RH and be non-condensing. | See Tags. | Corrosion resistant, fire resistant, low smoke, halogen free, withstand aggressive gases/liquids and physical strain. | IP ? |

Note! All prevailing regulations given by the authoritative body within the application must be followed, (Petroleum Safety Authority Norway, Norwegian Post and Telecommunication Authority, The Data Inspectorate in Norway, and Norwegian Radiation Protection Authority etc.).