ESPIONAGE SYSTEM
User Manual

Ultra-Low Power
Pressure / Temperature wireless system

FC Ex CE 0081

Table of Content

1. SYMBOLS

|			
	Manufacturer name and address		Warning, see user's manual
REF	Reference name of the device		Electronic equipment subject to a selective collection
LOT	Batch number		Device conform to ROHS directive
S/N	Serial number	CE 0081	CE-marked device assessed by notified body n°0081
Ex	Can be used in ATEX Zone	FCC	FCC Authorized

2. ESPIONAGE SYSTEM DESCRIPTION

Espionage is a wireless system for pressure and temperature monitoring from a downhole well. A typical architecture of an Espionage system is illustrated below.
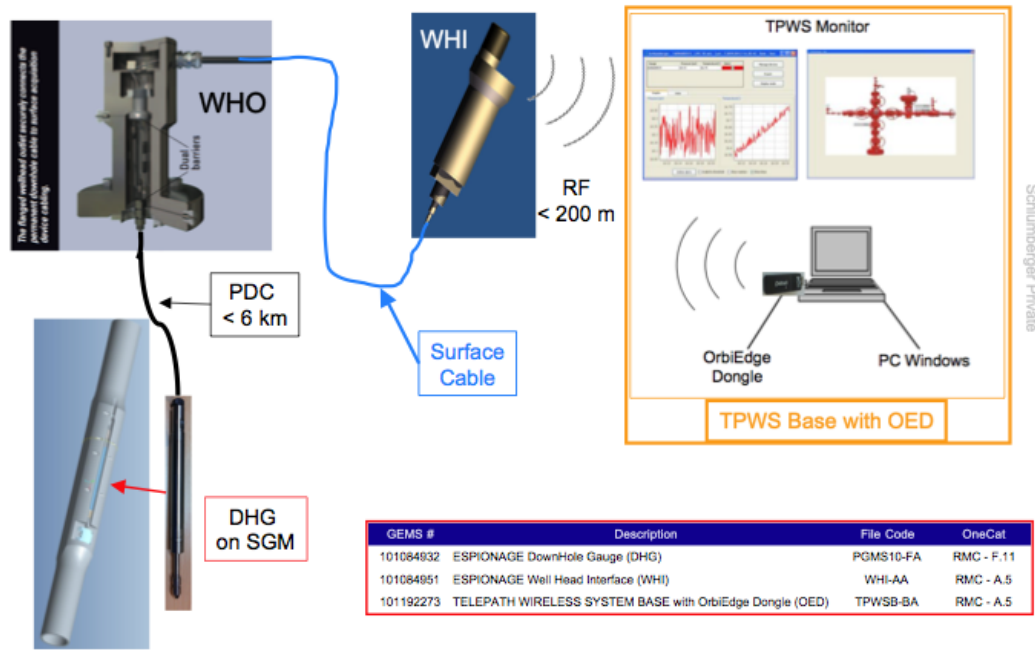
It is composed of a set of DownHole Gauges (DHG) for pressure and temperature measurement, a surface module called Well Head Interface (WHI) which receives data from gauges and transmits them by radio to a TelePath base station.

DownHole Gauge (DHG) (GEMS # 101084932)

Well Head Interface (WHI) (GEMS # 101084951)

Main features:

- Autonomy in excess of 5 years for 3 gauges and with 30 s of monitoring period.

- Automatic multi-drop configuration up to 16 gauges

- Settable data rate:

    ➢ up to 1 Hz with up to 8 gauges

    ➢ up to 0.5 Hz with more than 8 gauges

- Historical last data record, 2 Mo on board memory

    (411 hours or 17 days for 3 gauges @ 30 s period)

- A cellular radio architecture allows remote management of a fleet of sensors, 100 m range

- ATEX category I compliance for WHI
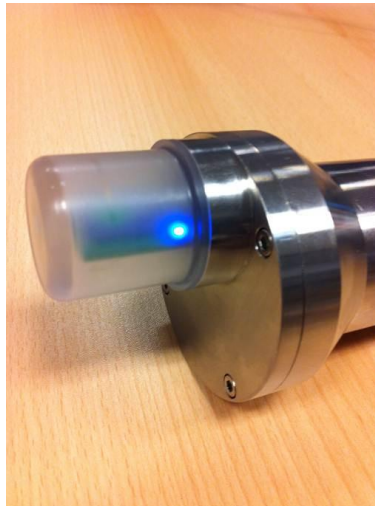
- Pressure range: 10 kpsi

- Pessure Accuracy: < 0.05% FS

3. ESPIONAGE USAGE

3.1 Functioning modes

Blue LED functioning:
To indicate the startup, the LED blinks twice.

Then, the LED blinks at each radio transmission of data.

Blue LED indicating a transmission

Nominal mode:
Pressure / Temperature monitoring.

At a defined monitoring rate, the Espionage system acquires Pressure and Temperature values, saves them in an internal memory, and transmits them wirelessly to a TelePath base station.
Every time a radio message is sent, the blue LED blinks.

Build-up mode:
In this mode, the Espionage system acquires a defined number of data at a specific frequency. The frequency gradually changes after a number of data has been reached.

The table below details the sequence of data acquisition:

Timeline	Number of data acquisition	Period of sampling (sec)
2 min (build up catch)	120	1
0 to 36 s	36	1
36 s to 360 s	108	3
360 s to 1 h	101	32
1 h to 10 h	100	324
10 h to 100 h	100	3240
100 h to 500 h	50	28800
Total	20 days	615	/

To start the build-up mode, use TPWS Monitor software: select the WHI and launch the action "Trigger build-up".
Like in nominal mode, the blue LED blinks at each radio message sent.

To Exit the build-up mode, use TPWS Monitor software: select the WHI, and launch the action "Trigger build-up stop".

At the end of the Build-Up, the Espionage system resumes normal data acquisition at the previously defined monitoring rate.

SCAN function:
This function is used to identify all connected DHG's and to set-up the multi-drop configuration automatically.

A scan is automatically done when starting the WHI, i.e. plugging the battery.

In nominal mode, it is possible to launch this function wirelessly, via TPWS Monitor, for system maintenance.
For more information, please refer to TPWS Monitor User Manual.

3.2 Wireless control of the system

It is possible to perform via radio-frequency the following actions:

- Trigger scan

- Set measurement period

- Synchronize remote system time

- Synchronize data

- Trigger build-up and Build-up stop

*For more information, please refer to **TPWS Monitor user manual** (GEMS # 101203319).*

4. INSTALLING AN ESPIONAGE WHI

4.1 Cable installation

The Well Head Interface (WHI) needs an armoured instrumentation cable which is connected on the surface firstly to the chassis (Ground) and to the male connector H701353.

4.1.1 Cable characteristics

|	
Cable type	armoured instrumentation cable
Cable Reference	Anixter A10FK-01015-D-02
Length	Total length of PDC and surface cable < 6 km
External Diameter	12.7mm - 14.3 mm Max
Number of pairs	1 p
Internal diameter	2 mm
Conductor diameter	1 mm

4.1.2 Equipment needed

- Crimp tool 1.5 mm

- Silicone Grease (RS 494-124)

- Stripper

- Soldering iron

- Solder must be ROHS Compliant

- Supplied with Espionage WHI

    - Allen key size 2.5

    - Hex screw

    - +3V6 SAFT Battery

    - Boot P274562

    - PTFE washer MS405917

    - Battery shim MS405915-AA

    - O-ring B013120

    - PARKER O-ring 2-207 13,87-3,53

    - Ground terminal (Farnell 2060289)
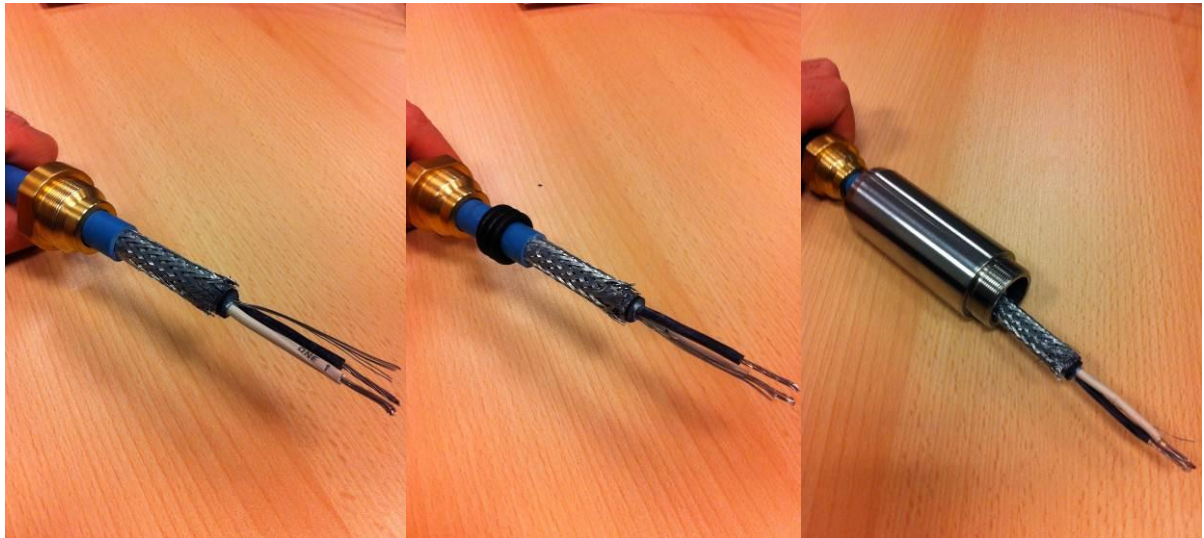
    - Female connector H115576

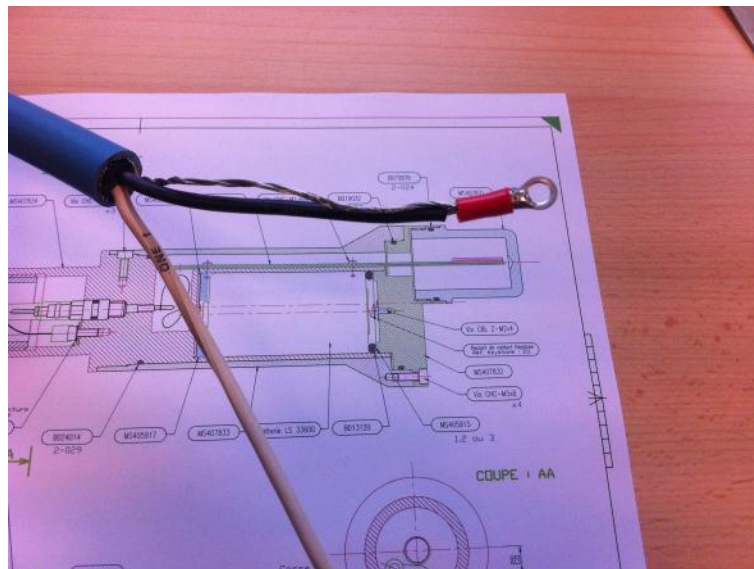### 4.1.3 Cable procedure assembly

- Strip 80 mm of blue cable and 20 mm of both black and white wires as shown in the pictures below:
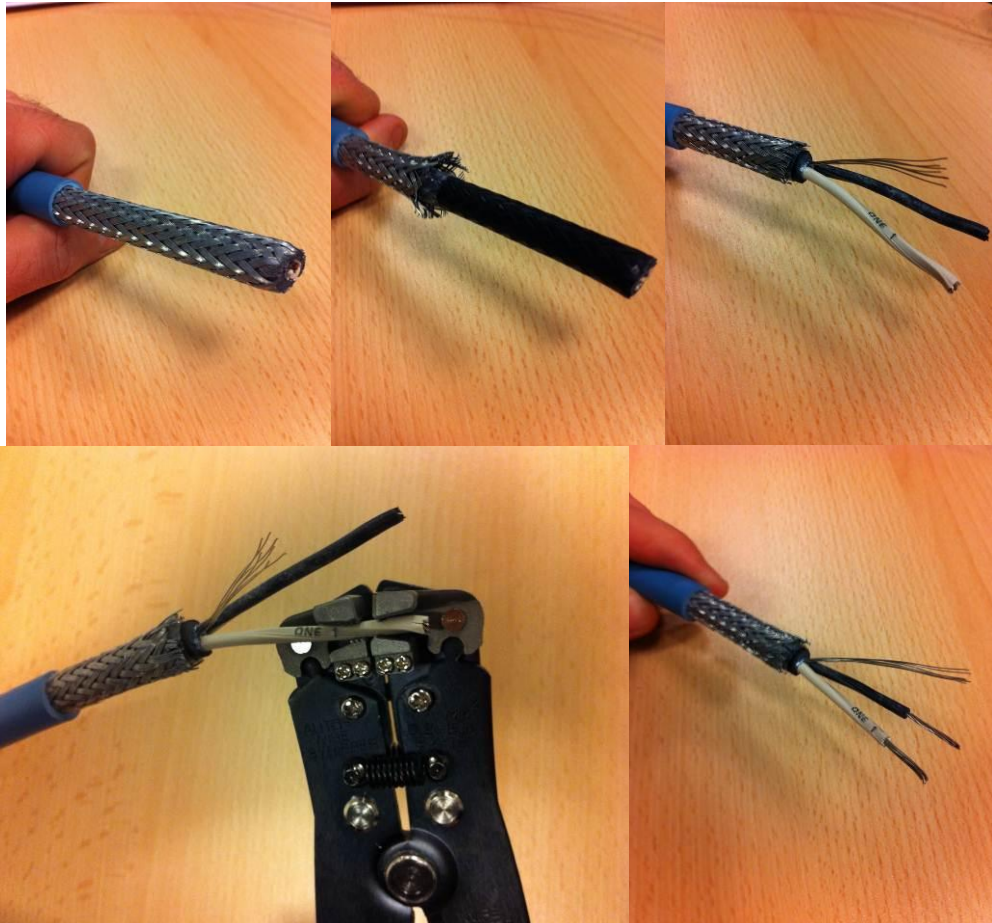
- Put the cable through the different part:
    - Cable gland
    - O rings
    - Upper sleeve

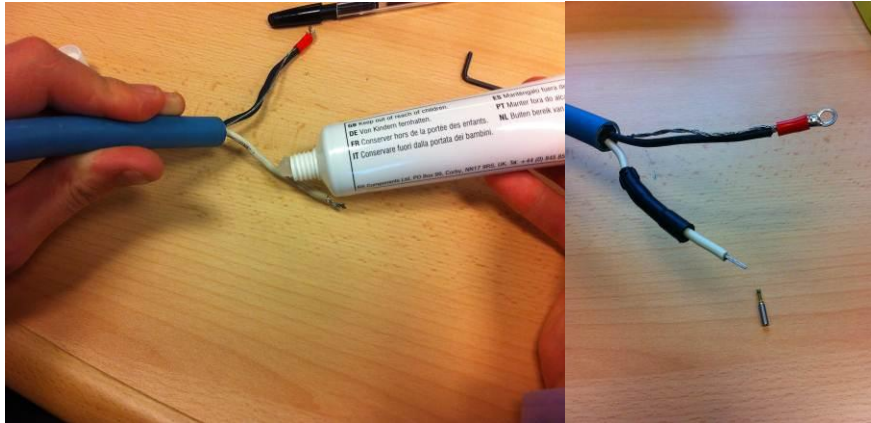- Connect the ground wire (black) to the shield wire (silver).

- Crimp the cables around the terminal.

- Solder the cables to the terminal.

- Insert the boot (GEMS PN P274562) around the cable, using silicone grease.

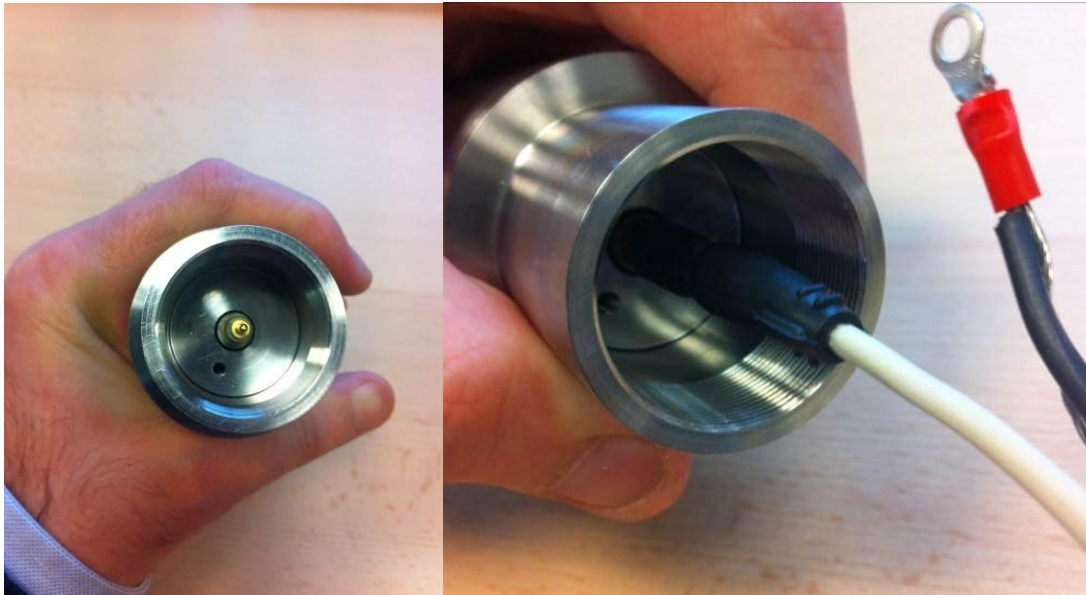- Insert the female connector H115576 on the wire.

- Solder the connector then pull the boot around the connector for a tight fit

- Plug the connector to the WHI male connector.

- Screw the ground terminal to the WHI with the ALEN key size 2.5 and the hex screw.

- Screw the handle
- Screw the gland (To hold the cable)

Mounted WHI

5. INSTALLING AND CHANGING THE BATTERY

⚠ Potential Electrostatic Charging Hazard, follow given instructions.

5.1 Installing the battery

The WHI is shipped without the battery installed.
The battery of the WHI must be installed on site.
It is recommended to change the battery of the WHI in a workshop.

Material needed:

- BTR or Allen key size 2.5 (provided with a new WHI)
- New battery: SAFT LS33600 (provided with a new WHI) GEMS # 101115472
- A piece of cloth, slightly damp
- Insulating washers
- O-ring

Procedure:

- Remove the WHI from its packaging box
- With the Allen key, remove the 3 screws of the WHI external casing

⚠ Be careful not to impact the PCB while removing the casing

- Install the plastic insulating washer GEMS # 101115223 at the bottom of the battery housing.

- Place the new battery in the housing, with the + side towards the housing bottom

- Insert the O-ring GEMS # B013120 on top of the - side of the battery

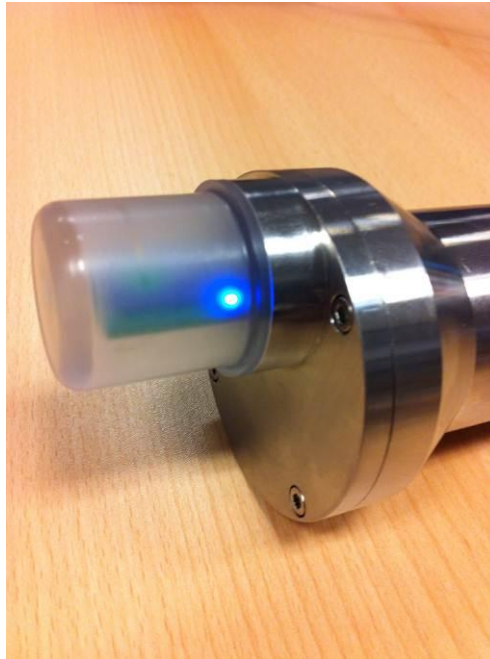- Insert 3 insulating washer gems # 101115224 on top of the insulation washers
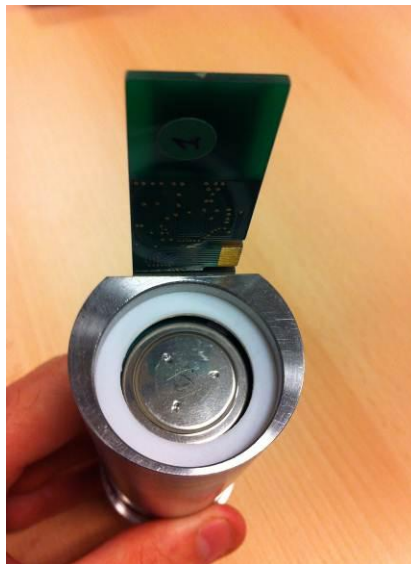
- Slide the WHI external casing in its place and screw back on the 3 screws

o Hold the casing with the slightly damp piece of cloth to avoid any Electro-Static Discharge (ESD)

o ⚠Take care not to touch the PCB to avoid any damage

o Note that the WHI LED must blink, indicating the WHI is starting

- The WHI is now ready to be used.

5.2 Changing the battery

It is possible to change the battery of the WHI.

It is recommended to change the battery of the WHI in a workshop.

5.2.1 Material needed

- BTR or Allen key size 2.5 (provided with a new WHI)
- New battery: SAFT LS33600 (GEMS # 101115472)
- A piece of cloth, slightly damp

Procedure:

- Remove the WHI from the well head, if possible.
- With the Allen key, remove the 3 screws of the WHI external casing

   ⚠ Be careful not to impact the PCB while removing the external casing

- Remove the o-ring and the insulating washers and keep them in a clean area.
- Remove the battery and put it in an suitable battery garbage
- Keep the plastic insulating washer at the bottom of the battery housing.

- Place a new battery in the housing (+ side towards the housing bottom)
- Put back in place the o-ring and the insulating washers on the battery

- Slide the external casing back in its place
  - o Hold the WHI with the slightly damp piece of cloth to avoid any ElectroStatic Discharge (ESD)
  - o ⚠Take care not to touch the PCB to avoid any damage
  - o Note that the WHI LED must blink, indicating the WHI is starting
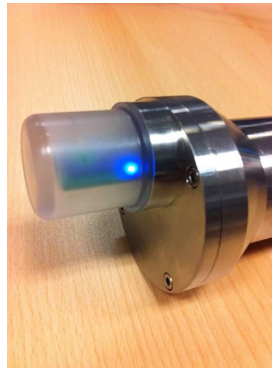
- Screw back on the 3 screws

The WHI is now ready to be used.

6. TECHNICAL CHARACTERISTICS

General	Operating temperature	WHI: -40 °C / +55 °C DHG: +20 °C / +110 °C
	Replaceable battery	SAFT LS 33600 Lithium-Thyonile Chloride 17Ah – 3.6V
	Battery autonomy	Refer to table 186.010.013.AE
	ATEX temperature classification	T3
	Memory autonomy	2 Mb Refer to table 186.010.013.AE
Radio	Operating RF Frequency	869 MHz ETSI EN 300-220 915 MHz FCC CRF part 15.249
	Communication Protocol	SRETT Proprietary CSMA-CA with frequency hoping
	Data Rate Transfer	16 kbits/s
	Maximum range	100 m in open space
Networking capability	Topology	Cellular
	Number of devices per Telepath base	<100, depending on the transmission periods
Measurement Specifications	Pressure range (FS)	10 kpsi
	Temperature accuracy	0.5 °C
	Pressure Accuracy	< 0.05 % FS
	Real time accuracy	40 ppm drift
	Sensor wetted parts	Stainless steel 316L
Compatible equipment	OrbiEgde Dongle, OrbiEgde Station, TPWS Monitor	

Espionage Technical characteristics

7. TROUBLESHOOTING

Symptoms	Potential causes	Potential remedial actions
WHI LED do not blink	- No OrbiEgde Dongle is plugged <u>or</u> no OES is started.	- Plug the OrbiEdge Dongle to a computer and launch TPWS Monitor - Plug and start the OES, and launch TPWS Monitor
	- No more battery on the device	- Change the battery
No data received in the program	- WHI out of range	- Bring the WHI and the OES / OED closer together
	- No more battery	- Change the battery
Data Download Stopped in the program	- Radio Communication is interrupted	- Cancel and restart the process on the program

Troubleshooting Guide

If a reboot occurs during the build-up, the Espionage will resume the build-up acquisition.

If a problem persists, contact SLB MEMS-TC Customer Service (mems-cs@slb.com).

8. CERTIFICATION

Espionage System is compliant to the essential requirements of the European directive and its revisions in effect.

This product can be used safely, in potentially explosive atmosphere (Directive 94/4/EC).

A copy of the declaration of CE conformity for this product is available on demand by mail at:
85 avenue Pierre Grenier - 92100 BOULOGNE BILLANCOURT – France
or contact@srett.com.

CE 0081   CE-marked device assessed by notified body n°0081

(Ex)   Can be used in potentially explosive atmosphere (Directive 94/4/EC)

FC   FCC Authorized. FCC ID: RDT-1000579

EC Type Examination Certification number: ZZZZZZ

ATEX classification:
To be defined

Note: Waiting for LCIE Certification

9. STANDARDS AND REGULATIONS

European directives	1999/5/EC, 2002/95/EC, 2002/96/EC, 2004/108/CE, 1994/9/CE
FCC	FCC PART 15 FCC PART 18
Quality System and Design Process	NF EN ISO 9001 : 2008
Electrics and Electronics Design	NF EN 50371 :2002 EN 300 220-1 : 2006 300-220-2 : 2006 EN 60 950-1 : 2006
ATEX	EN 60079-0 :2009 EN 60079-11 :2007

Applicable standards

This device complies with PART 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: The grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

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