



Project no. **E!4315**
 Project acronym: **Proactive Cold Chain**
 Project title: **Proactive RFID and wireless-based technologies for cold-chain management**



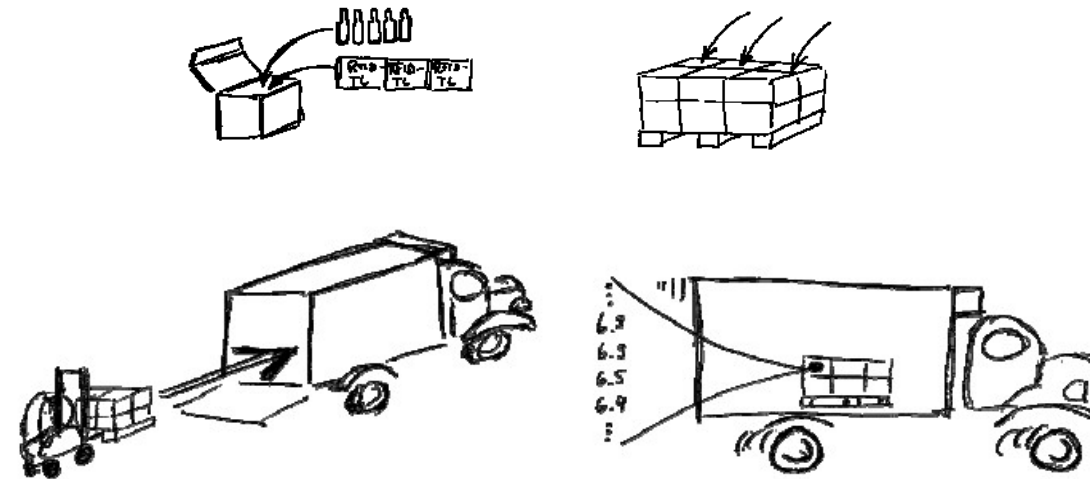
<p>EASYTECH, S.L. – Jardín de los Faisanes 5 , 28412 Cerceda (Madrid) Spain www.easytech.cc</p> <p>INMARK Estudios y Estrategias, S.A. - Avda. Del Llano Castellano, 43 28034 Madrid. Spain www.inmark.es</p> <p>AECOC – Asociación Española de Codificación Comercial Ronda del General Mitre, 10, 08017 Barcelona Spain www.aecoc.es</p> <p>Datatronics S.A.– Gabriela Mistral, 2 28035 Madrid Spain www.datatronics.es</p> <p>Fraunhofer IITB – Fraunhoferstrasse 1, 76131 Karlsruhe, Germany http://www.iitb.fraunhofer.de</p>	<p>Fraunhofer IPM - Heidenhofstrasse 8, 79110 Freiburg, Germany www.ipm.fraunhofer.de</p> <p>Scemtec Transponder Technology GmbH – Gewerbeparkstr. 20, 51580 Reichshof-Wehnrath, Germany www.scemtec.com</p> <p>RFID Proactive Cold Chain is a Eurostars project co-funded by the Spanish and German Governments</p> <div style="display: flex; justify-content: space-around; align-items: center;">    </div>
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Proactive Cold Chain tries to develop a system RFID in order to control of the chain of cold in the distribution sector with the following components:

- Low Cost Sensor-Tag RFID in the UHF Band
- Low Power Consumption
- RFID Reader with communication GPRS/UMTS communication capability.

It shall be able to register the temperature of the product, coming from the, and sending the information to a server every 10 minutes. This system would have to trigger alarm if it detects abnormal situations, making arrive these alarms at all the intervening agents in the distribution chain so that the opportune solutions are taken.

With this system it is tried to control the chain of cold from the manufacturer to the point of sale, including warehouses of manufacturer, logistic operator and the warehouse of the last member of the chain that receives the merchandise.

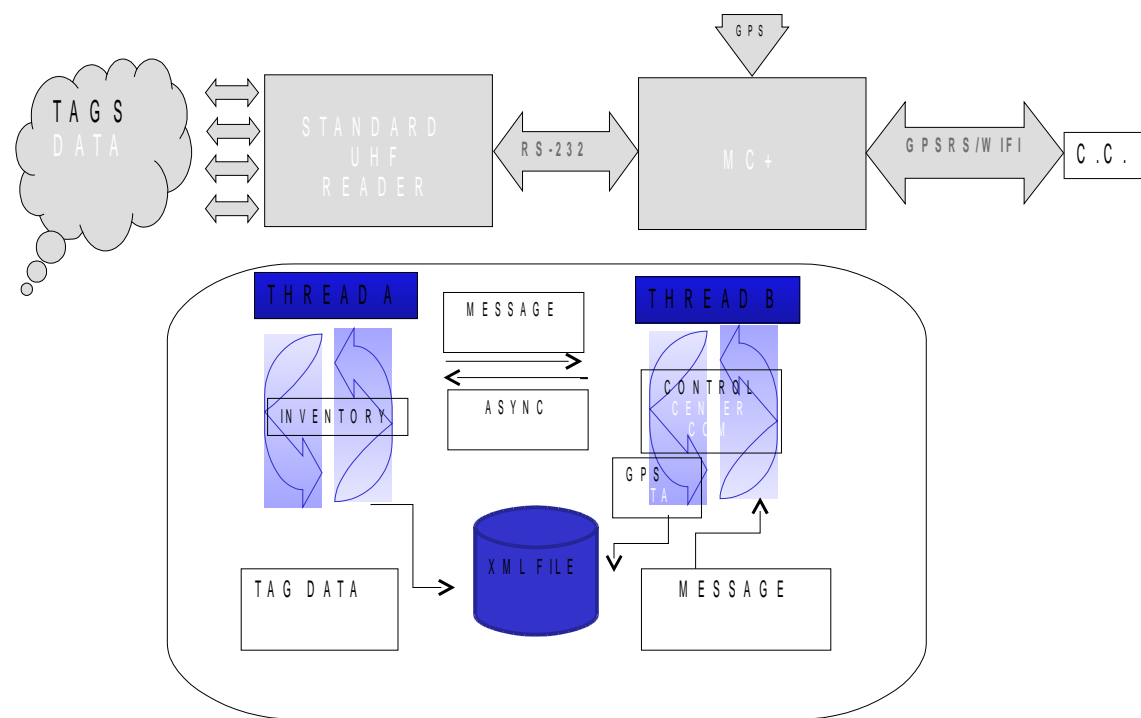


Tracking of Temperature at Pallets

RFID READER for Cold Chain means not only a RFID Reader for passive or active RFID Transponder, it's a complete system for collecting all necessary data in a truck as well as sending it to a server.

Main functions:

- Connectivity GPRS/UMTS, with capability of “roaming”.
- Capability to send the registered information to a fixed direction IP of Internet.
- Connectivity to a local area network.
- Minimum control of 40 tags in the environment of the truck.
- Control of 5000 Tags in logistic platform.
- Capability of compression and encryption before leaving to the air by section GPRS/UMTS.
- Capability of storage of at least 10000 registries, in the environment of trucks, guaranteeing therefore the conservation of the information in zones without cover GPRS/UMTS.
- Inclusion of a module GPS that it be able to obtain the geographic position, adding this information at specifics events, temperature and identification of Tag, mainly in the environment of trucks.
- Capability to add to the messages sent information other specific events from de environment (e.g.: temperature measurement from truck freezer, opening of truck container doors, etc...).



Antenna, Reader and Movilcom Plus



Cold Chain Reader Prin-

ciple

Features:

Communication link:

Uplink from reader to tag:

- OOK or 100% modulated DSB-ASK with PIE encoding
- symbols length shall only be 1 or 2 Tari (2 or 4 PW) long with a fix Tari of 25 μs.

Downlink from tag to reader:

- Backscattered reader signal
- data rate is 40 kbits/s
- FM0 encoding

Usable EPCglobal commands:

All mandatory commands as specified in the EPCglobal standard except Kill command for disabling tags.

Data logging:

Memory:

8 kBytes for measurement data, configuration data and calibration data. Memory is divided into 512 words with a length of 16 bits as specified in the EPCglobal standard.

Measurement configuration:

Intervals programmable between 0.1 minute and 1 hour.

Sensor calibration:

Calibration data storable in USER data per sensor, different calibration modes shall be possible.

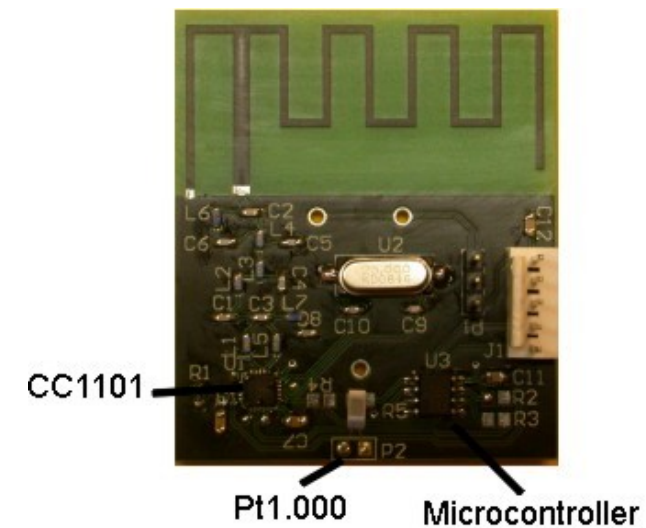
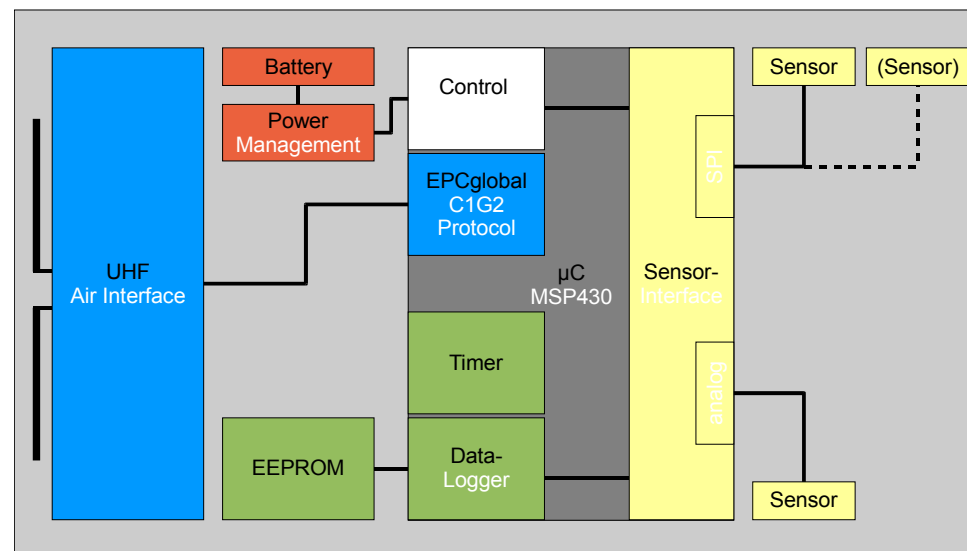
Size:

170 x 110 mm x 30 mm

- Scope of use at box level or pallet.
- Capability to measure temperature at level of pallet or box, because of, it must integrate sensor of temperature accurately of 1°C.
- Temperatures operation range -30° to 30°C.
- Interval for temperature measures user programmable (e.g. every 10 minutes)
- To be recyclable or re-usable to fulfill the European corresponding norm (Waste Electrical and Electronic Equipment).
- EPCglobal Class 1 Generation 2 compatible (ISO-18000-6C). (Only a part frequencies, data rates and modulation types are supported).

This figure shows the first hardware prototype of the UHF-RFID-sensor circuit board. On the top of it you can find the UHF antenna. This PCB antenna is designed for operating in the 868MHz, 915MHz and 955MHz ISM bands. This antenna can be used with all transceivers and transmitters from Texas Instruments which operates in this frequency bands. The overall size requirements for this antenna are 43 x 20 mm. Thus this is a medium size, low cost antenna solution.

Additionally the board is equipped with the CC1101, a microcontroller and a Pt1.000 temperature sensor. Pt-thinfilmm-temperature sensors are high precision temperature sensors, which exploit the predictable change in electrical resistance of platinum with changing temperature. This sensor shall be able to work at least in the range of -30°C to 30°C with a maximum absolute error of 1°C in the range of -20°C to 0°C. This should be sufficient as threshold temperature in the cold chain to avoid critical conditions for chilled goods.



Some Pictures of the development samples:

