Appendix: Checkmate sensor device

This case has been prepared by the Interdisciplinary Centre for Digital Business Development (DBD), Aarhus University. The case is based on the DIATOMIC project 'Industry 4.0 Living Lab for Acoustic Panel Production' led by Tom Collins. Case authors are Emilie Mathilde Jakobsen and Anita Krogsøe Skou at DBD.

PULSE CHECKMATE

A smart sensor to monitor vibration, temperature humidity and more

Checkmate is a simple to install sensor that connects automatically to Pulse Online, providing real-time visibility, automated alerting, scheduled reports and the ability to review and analyze past data.

It is constructed from a wireless micro-controller with integrated sensors, GSM connectivity, dynamic data protocols and a range of apps that can be installed like on a smartphone.

Motors - Electrical motors literally drive industry, using a combination of vibration and temperature checkmate sends alerts based on manufacturer guidelines, helping identify faulty, bearings, cooling issues or alignment.

Pumps - Checkmate helps identify faulty pumps using vibration readings to infer pressure issues, excessive usage and temperature spikes.

General machinery - Install in difficult to reach places, moving operations or dangerous spots and safely monitor from anywhere. Checkmate can use an accelerator to detect motion and easily by report abnormal movements.

Environmental - Using ambient temperature and humidity, Checkmate can be used in substations, electric boxes and controlled rooms to prevent overheating, identify poor ventilation and many other factors.

Extending Checkmate features - Checkmate is a reference design Smart device and extension to the Pulse Online Cloud. It can be extended with new sensors, processing logic or radio modules. Our software can also be used in other PLC devices and microcontrollers, connecting to a network or running independently.

Icons: excess vibration indicator · abnormal temp & humidity · counter & session usage · ready to connect · easy attach · remote control & update

TECHNICAL SPECIFICATIONS

I/O Instrumentation:
Vibration detection using 9 axis MPU accelerometer at ±2 ±4 ±8 ±16
Temperature range -40°C – 125°C
Humidity range 0 – 100%RH

Measurements:
g, mm/s, ° degrees, °C, °F, Kelvin, % RH

Microprocessor:
Ultra-low power ARM Cortex-M4F

Operating System:
Real-time Operating System

Local storage: microSD
Default power: 9V~32V

Mount:
Epoxy, magnet, steel banding, custom mounting eyes, threaded mounts.

Regulatory compliance:
CE Components - application specific needs on case by case basis

Dimensions (LxWxD): 95 × 57 × 28 mm
Weight: 283g

CLOUD & CONNECTIVITY

Cloud technologies :
Microsoft Azure Compute server running Docker
RabbitMQ
.NET, Node.js
MongoDB, MSSQL

Messaging & Interfaces:
Near real-time: MQTT, AMQP, STOMP
Microsoft Azure Service Bus
REST Historical data endpoints
REST Management endpoints
REST User endpoints

Basic connectivity:
GPRS downlink: 85.6 kbps, uplink: 42.8 kbps
Modular add-on board provide network connectivity with alternative connections possible such as LPWAN and WiFi

Operators:
Existing operators with international support, Orange (Belgium), TDC, Vodafone (Denmark)

Security, Privacy and GDPR:
Encrypted dedicated platforms ensure client security using SSL certificates Data stored in EU data centres hosted by Microsoft. Personal data relating to user accounts require https secure connections and encrypted passwords.

- WAN Radio connection
- Magnet attachment
- Power supply
- Status indicator for uptime activity
- Push button for manual event logs

Origin: www.dbd.au.dk