

## Appendix A

### IoT Hardware Specification for Monitoring of PSA Oxygen plant

#### 1. Scope

This document describes the specifications of IoT Hardware implementation for Real time monitoring of PSA Oxygen Plant.

#### 2. Introduction

IoT Controller shall connect to the PLC's of PSA Medical Oxygen Plant over Modbus TCP/IP (or) Modbus RTU to transmit the data via GPRS to a cloud server. IIoT devices shall do this function automatically when powered up and the internet connection provided. IIoT controller shall be capable of Configuration that can be done using a web browser. The overall IoT communication architecture shall be as per Figure 1.

PLC of Oxy plant is connected through IoT device to NIC cloud server. The overall architecture is shown in Figure 2.

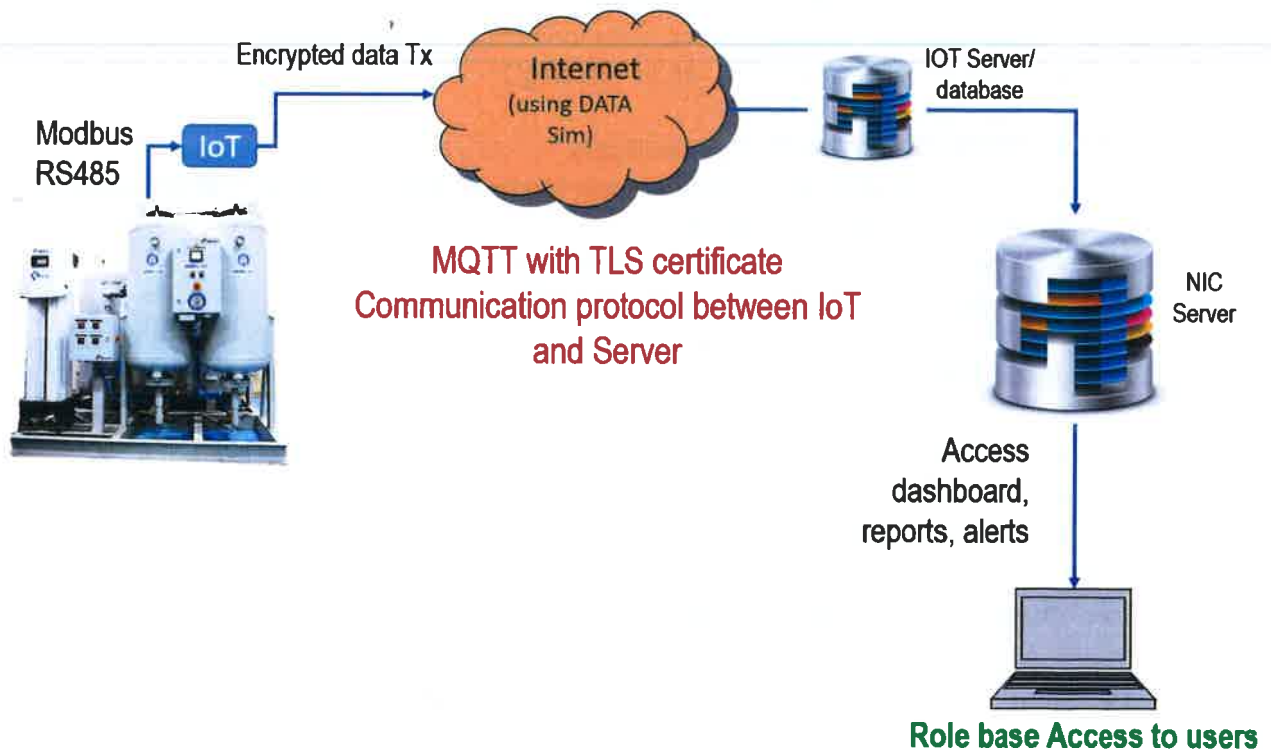


Figure 1: IoT Communication Architecture

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Figure 2: IoT Interface

### 3. Hardware Technical Specifications

#### 3.1 IoT Device General Features:

- 4G SIM
- ARM-Based Processor (32 –bit)
- DATA Communication - 4G LTE/UMTS/EDGE/GSM/GPRS
- Web browser application
- DHCP /Static enabled
- Configurable data sending interval
- Modbus TCP Master / Slave communication
- Operating Temperature: -45 to +60 degC
- Humidity: 20% to 85%
- Protocol: MQTT with TLS certificate
- Communication with other Devices: Modbus (RTU), Modbus TCP/IP (optional)
- Antenna: Internal /External
- Data sending Interval: Configurable 0 to 1000 sec
- Power: Input Voltage range 9 – 30 V DC

#### 3.2 Physical Specification

- Dimension: NMT 120x120x60mm
- Mounting: DIN Rail or equivalent
- Casing / Housing

#### 3.3 Configuration using Web Browser

Device Id	Unique Id / Device Serial No
IoT Server IP (DNS)	Configurable - IP/Domain Address
Communication	MQTT
Security	TLS 1.2 & above

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### 3.4 PLC Communication Interface

Modbus RTU	RS485(2 Wire) / RS232
Modbus TCP / IP	Ethernet (Optional)

### 3.5 IoT Device to Server communication Specifications

Without adequate security, the device or its data can be hijacked and stolen or altered in ways that could be potentially dangerous. It is needed to create secure communication with end-to-end encryption that ensures only those with secret decryption keys can access transmitted data. A unique identity should be assigned to a particular device to interact with the server, and this identity must be authenticated. The identity facilitates trusted interaction with the device in terms of management and the exchange of data.

### 3.6 Security Features for Server Communication

- a. MQTT with TLS based secured communication
- b. AES 256-bit Encryption of data
- c. The authenticity of data through
  - Controller Sr No.
  - MAC address,
  - Mob Number
  - SIM number
- d. GPS enabled device

### 3.7 Physical Interfaces

- Input: Ethernet, RS485, power connector
- Output: Mobile SIM Slot
- External Antenna: For Mobile Signal

### 3.8 Power

- Input voltage range: 9 – 30 VDC (4 pin industrial socket)

### 3.9 Data Transfer from IoT Device

Vendor shall comply to IoT device registration and communication of data. The IoT device shall transmit the required data from the plant as per table 1.

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**Table 1: Data required to be transmitted from IIoT device to cloud**

SNO	Field Name	Description
1.	Controller_id	Unique Controller id to identify the PSA Controller
2.	oxygen_pressure	Oxygen plant pressure measured by the controller in real-time
3.	oxygen_purity	Oxygen plant purity measured by the controller in real-time
4	machine_runtime	Medical Oxygen Plant uptime in hours
5.	oxygen_flow	Oxygen plant flow measured by the controller in real-time
6.	updt	Timestamp of the capture of Monitoring attributes
7.	status_code	Plant Status

### 3.10 Documents

The following documents shall be issued along with the equipment

- a. User Manual
- b. Technical Design Document
- c. Maintenance Manual
- d. Illustrated parts catalogue
- e. Repair and Overhaul Manual
- f. Acceptance Test Report

## **Software Specification for Monitoring of PSA Oxygen plant**

### **Software Development**

- **IoT embedded software shall have the following functionality**
  - Software shall provide Unique Id / Device Serial No to IoT device
  - Software shall provide feature for Configurable - IP/Domain Address.
  - Software shall use MQTT protocol for communication.
  - Software shall use TLS 1.2 & above for security.
  - Software shall support AES 256-bit Encryption for data security
  - Software shall use Modbus RTU to communication with PLC(RS485(2 Wire) / RS232)
  - Software shall process the raw data from PLC and convert it into standard protocol format to transfer over internet.
  - Software shall push the data using MQTT protocol at specified time interval in to the cloud server.
- **IoT Device to Server Communication**
  - Software shall authenticate the device identity.
  - Software shall support MQTT protocol and TLS certificate.
  - Software shall be always ready for data collection from the remote IoT device.
  - Software shall provide feature for end user to access the stored data via a HTTP webserver to view the recorded data
  - Software shall manage only two level of users such as Admin user and General user.
  - Software shall provide the feature to configure the IoT device remotely besides viewing the users and error logs to Admin user.
  - Software shall provide the feature to General Users to view the data.
  - Software shall provide feature for general user and their password management.
  - Software shall provide data security with TLS 1.2 certificate configured on the deployment server.
  - Software shall support AES 256-bit Encryption of data.

### **Documents**

- **Following documents shall be issued along with the software**
  - Software Requirement Document
  - Software Design Document
  - Software Test Document
  - User Manual

## Appendix C

### **Comprehensive AMC Specification for IOT Hardware and Software**

1. Maximum repair turnaround time for equipment/system would be 48 hours
2. Required spares that may be stored at the site by the seller at their own cost to avoid complete breakdown of the equipment/system and to ensure serviceability.
3. Service Provider shall provide back to back support for all device under CAMC.
4. SP shall maintain the equipment's as per the manufacture's guidelines and shall use standard and genuine components for replacements

SI.No	Items covered under CAMC	Remarks
1.	IOT Hardware	1222 Nos
2	SIM Card charge	1222 Nos
3	Tele support	For 2 Years after 1-year Warranty
4	Repair /Replace of IOT Hardware and Software updates	For 2 Years after 1-year Warranty
5	Server-Side Software Support	For 2 Years after 1-year Warranty
6	Site Visit	2 site visit per year