Industrial IoT Gateway module section

Quantity = 2

No 1:
IoT Gateway Specification

Below is a **brand-neutral procurement specification** for the listed equipment. It avoids mentioning specific manufacturers while still capturing the required technical capabilities.

Specification: Industrial IoT Remote Connectivity Gateway and Accessories

1. Industrial IoT Remote Connectivity Gateway

Description
An industrial Internet of Things (IoT) gateway designed to enable secure remote access, monitoring, and data exchange between industrial equipment and remote management platforms.

Minimum Technical Requirements

General

- Industrial-grade IoT gateway suitable for machine connectivity and remote maintenance.
- Modular architecture allowing expansion through communication extension cards.
- DIN-rail mountable enclosure suitable for industrial environments.
- Operating temperature suitable for industrial use (minimum range: **-20°C to +60°C** or better).
- Power supply: **12–24 VDC**.

Networking & Connectivity

- Minimum **2 × Ethernet LAN ports (10/100 Mbps or higher)**.
- Support for **LAN, WAN, and VPN connectivity**.
- Integrated firewall and secure communication protocols.

Supported Protocols

- Must support common industrial protocols including:
  - **Modbus TCP/RTU**
  - **OPC UA or equivalent industrial data interface**
  - **MQTT or similar IoT messaging protocol**
  - **HTTPS/SSL secure communication**

Remote Access & Security

- Secure VPN connectivity for remote device access.
- User authentication and role-based access control.
- Encryption compliant with modern cybersecurity standards (TLS 1.2 or higher).

Industrial Interfaces

- Minimum **1 × serial communication port (RS-232/RS-485)**.
- Expandable I/O capability via modular extension cards.

Management & Configuration

- Web-based configuration interface.
- Support for remote firmware updates.
- Capability for data logging and alarm notifications.

Compliance

- CE or equivalent international certification.
- Industrial EMC compliance.

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2. Cellular Communication Extension Card (4G or 5G LTE)

Description
A modular cellular communication interface card compatible with the supplied industrial IoT gateway, enabling wide-area connectivity through cellular networks.

Minimum Technical Requirements

- Compatible with the proposed IoT gateway modular platform.
- Support for **4G or 5G LTE connectivity**, with fallback to **3G/2G where available**.
- Support for **single SIM or dual SIM** operation.
- External antenna connector(s).
- Data throughput consistent with LTE standards.
- Integrated status indicators for connectivity and signal strength.
- Must support networks used within the **South African LTE bands** (or equivalent international bands if applicable).

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3. Cellular Antenna

Description
External antenna designed to support reliable cellular connectivity for the IoT gateway's 4G or 5G LTE communication module.

Minimum Technical Requirements

- Compatible with the proposed cellular extension card.
- **Single-input single-output (SISO)** antenna configuration.
- Medium gain antenna suitable for industrial environments.
- Frequency support covering **4G or 5G LTE cellular bands**.
- Weather-resistant enclosure for indoor or outdoor installation.
- Connector compatible with the cellular module (e.g., **SMA or equivalent**).
- Minimum cable length: **5 meters** or suitable for cabinet installation.

Deliverables

The supplier must provide:

- Industrial IoT gateway unit.
- Compatible 4G LTE cellular extension module.
- Suitable cellular antenna with cable and connectors.
- Power supply and mounting accessories.
- Configuration documentation and user manuals.

If you'd like, I can also help you convert this into a **formal tender specification (RFQ/RFP format)** with sections like **scope, evaluation criteria, compliance table, and pricing schedule** which procurement departments usually require.

Industrial PLC Controller section

Quantity = 1

No 2:
Controller

The controller shall be a **high-performance industrial programmable logic controller (PLC)** designed for automation and process control applications. The PLC shall support modular expansion and communication with industrial networks and field devices.

The controller shall include **integrated digital and analog inputs** and support integration with distributed I/O systems and industrial communication networks.

CPU Performance

Parameter	Requirement
Processor Type	Industrial real-time processor
Program Memory	Minimum 1 MB
Data Memory	Minimum 1 MB
Execution Time	≤ 60 ns per bit instruction (typical)
Program Cycle Time	Deterministic real-time execution
Non-volatile Memory	Integrated flash memory

Digital Inputs Module

Parameter	Specification
Number of Inputs	Minimum 32
Input Type	24 VDC
Input Logic	Sink/Source compatible
Input Current	≤ 7 mA
Isolation	Galvanically isolated
Input Filtering	Programmable debounce

Analog Inputs

Parameter	Specification
Number of Inputs	Minimum 5
Input Signal Types	4–20 mA, 0–10 V
Resolution	Minimum 12-bit
Accuracy	±0.5 % of full scale or better
Isolation	Channel or group isolation
Sampling Rate	Industrial real-time sampling

The PLC CPU shall support the following communication interfaces:

Parameter	Requirement
Ethernet Ports	Minimum 1
Speed	10/100/1000 Mbps

Protocol Support Industrial Ethernet

The controller shall support:

- Modbus TCP
- OPC UA
- MQTT (optional)
- Industrial Ethernet protocols
- TCP/IP and UDP
- SNTP time synchronization

Expansion Capability

The PLC shall support modular expansion including:

- Digital input modules
- Digital output modules
- Analog input/output modules
- Communication modules
- Motion control modules

Minimum expansion capacity:

- **Up to 32 I/O modules or equivalent**

The PLC shall support programming compliant with **IEC 61131-3** standards including:

- Ladder Logic (LD)
- Function Block Diagram (FBD)
- Structured Text (ST)
- Sequential Function Chart (SFC)

Additional requirements:

- Online program editing
- Simulation capability
- Diagnostic tools
- Integrated debugging

Mechanical Specifications

Parameter	**Specification**
Mounting	DIN rail
Enclosure	Industrial grade
Cooling	Passive convection

Compliance and Standards

The equipment shall comply with applicable international standards:

- IEC 61131 (Programmable Controllers)
- IEC 61000 (EMC)
- CE certification
- RoHS compliance
- Industrial safety standards

IOT Advanced Intelligent Gateway section

Quantity = 1

No 3:
Intelligent Gateway

The device shall be an industrial-grade intelligent IoT gateway designed for data acquisition, edge computing, and communication between field devices, control systems, and cloud platforms.

The gateway shall support multiple industrial protocols, enabling integration of PLCs, sensors, and automation systems with supervisory control systems and IoT platforms.

The gateway shall operate reliably in industrial environments such as manufacturing facilities, energy systems, utilities, and infrastructure applications.

The gateway shall provide the following functions:

- Data acquisition from industrial devices and sensors
- Protocol conversion between industrial communication standards
- Edge computing and local data processing
- Secure data transmission to cloud platforms
- Remote device management and diagnostics
- Local buffering and data logging

Processor

Parameter	Requirement
Processor Type	Industrial-grade multi-core processor
Architecture	64-bit or equivalent
Clock Speed	Minimum 1.0 GHz
Hardware Security	Trusted platform module or equivalent (preferred)

Memory

Parameter	Specification
RAM	Minimum 2 GB
Internal Storage	Minimum 8 GB eMMC or equivalent
External Storage	MicroSD or similar expansion support

Communication Interfaces

Parameter	Specification
Ports	Minimum 2
Speed	10/100/1000 Mbps
Connector	RJ45
Function	LAN/WAN connectivity

Serial Interfaces

Parameter	Specification
Serial Ports	Minimum 1
Type	RS232 / RS485
Protocol Support	Modbus RTU and serial device integration

Digital Input / Output (Optional)

Parameter	Specification
Digital Inputs	Minimum 2
Digital Outputs	Minimum 2
Voltage Level	24 VDC industrial level

Industrial Communication Protocols

The gateway shall support the following protocols:

Field Communication

- Modbus RTU
- Modbus TCP
- OPC UA
- Industrial Ethernet protocols

IoT and Cloud Protocols

- MQTT
- HTTPS / REST API
- AMQP (optional)

Edge Computing Capability

The gateway shall support **local application execution**, including:

- Data filtering
- Data aggregation
- Local analytics
- Event detection
- Protocol translation

Support for **containerized applications or runtime environments** is preferred.

Operating System

The gateway shall support an **industrial Linux-based operating system** or equivalent embedded OS with the following features:

- Secure boot capability
- Package management
- Remote update capability
- Application runtime environment

- Developer access for customization

Cybersecurity Features

The gateway shall provide built-in security features including:

- Secure boot
- User authentication
- Role-based access control
- VPN capability
- TLS/SSL encryption
- Firewall capability

Compliance and Standards

The gateway shall comply with applicable international standards including:

- IEC 61000 (Electromagnetic Compatibility)
- CE certification
- RoHS compliance
- Industrial automation standards

Software and Integration

The gateway shall support integration with:

- SCADA systems
- Industrial PLCs
- Energy management systems
- Cloud platforms

Integration shall be possible using **standard APIs and industrial protocols**.

Diagnostics and Management

The device shall support:

- Web-based configuration interface
- Remote monitoring
- System diagnostics
- Firmware updates
- System logging

Mechanical Requirements

Parameter	**Specification**
Mounting	DIN rail mounting
Enclosure	Industrial rugged enclosure

Cooling	Passive cooling (fanless preferred)

Environmental Conditions

Parameter	Specification
Operating Temperature	-20°C to +60°C
Storage Temperature	-40°C to +70°C
Humidity	5 – 95 % non-condensing
Protection Class	Minimum IP20

Power Supply

Parameter	Specification
Supply Voltage	24 VDC or 220Vac 50Hz
Voltage Range	19.2 – 28.8 VDC

Network Firewall

Quantity = 1

No 4:

Network Firewall

The device shall be an **enterprise-grade next-generation firewall (NGFW)** designed to provide integrated network security, threat protection, and secure connectivity for branch offices, industrial networks, or distributed enterprise environments.

The appliance shall combine **firewall, intrusion prevention, VPN, SD-WAN, and advanced threat protection** functions in a single hardware platform.

The system shall support **secure connectivity between local networks, remote sites, and cloud services**, while providing centralized management and monitoring.

The firewall appliance shall provide the following capabilities:

- Stateful packet inspection firewall
- Intrusion prevention system (IPS)
- Application-aware traffic inspection
- Secure VPN connectivity
- Secure SD-WAN capability
- Malware protection
- Web and URL filtering
- DNS security
- Data loss prevention
- Network segmentation and access control
- Secure remote access

The appliance shall support **integration with centralized network security management platforms**.

Hardware Specifications

Parameter	Requirement
Processor Type	Multi-core network security processor
Hardware Acceleration	Dedicated security processing hardware preferred
Architecture	64-bit system architecture
Embedded Security Module	Trusted platform module or equivalent

Memory

Parameter	Specification
RAM	Minimum 4 GB
Internal Storage	Minimum 8 GB flash storage
Firmware Storage	Non-volatile storage

Network Interfaces

Parameter	Specification
Ethernet Ports	Minimum 5
Port Type	Gigabit Ethernet (RJ45)
WAN Ports	Minimum 1
LAN Ports	Minimum 3
Management Interface	Dedicated console port

Typical interfaces shall include:

- 1 × WAN interface
- 3 × LAN interfaces
- 1 × management or dedicated security interface

Some models may support additional:

- SFP interface
- Wireless interface
- Cellular interface

Additional Interfaces

Parameter	Specification
USB Port	Minimum 1
Console Port	RJ45 or USB console
Wireless Management	Optional low-power wireless interface

Firewall Performance

Parameter	Requirement
Firewall Throughput	≥ 5 Gbps
Threat Protection Throughput	≥ 1 Gbps
NGFW Throughput	≥ 1 Gbps
VPN Throughput	≥ 4 Gbps
SSL Inspection Throughput	≥ 1 Gbps

The appliance shall support high-performance encrypted traffic inspection**.**

Session Capacity

Parameter	Requirement
Concurrent Sessions	≥ 700,000
New Sessions per Second	≥ 80,000
Firewall Policies	≥ 2,000

VPN Capabilities

The device shall support secure VPN technologies including:

IPSec VPN

Parameter	Requirement
Site-to-Site VPN Tunnels	≥ 200
Client VPN Tunnels	≥ 250

SSL VPN

The system shall support:

- Secure remote access
- Multi-factor authentication
- User-based access control

Security Functions

The firewall appliance shall provide integrated security services including:

Network Protection

- Stateful firewall
- Intrusion prevention system (IPS)
- DDoS protection
- Network access control

Threat Protection

- Anti-malware
- Sandboxing (optional)
- Botnet detection
- Zero-day threat protection

Web and Application Security

- URL filtering
- Application control
- DNS filtering
- Content filtering

Data Protection

- Data loss prevention
- SSL/TLS inspection
- Secure file transfer inspection

SD-WAN Capability

The appliance shall support **integrated SD-WAN functionality** including:

- WAN link monitoring
- Traffic steering
- Application-aware routing
- WAN load balancing
- WAN failover

Integrated SD-WAN allows **optimized connectivity across multiple network links**.

Network Management

The system shall provide:

- **Web-based management interface**
- Command-line interface (CLI)
- Centralized management capability
- Network analytics and reporting
- Log monitoring
- Automated alerts

High Availability

The firewall shall support high availability configurations including:

- Active-Passive mode
- Session synchronization
- Automatic failover
- Link monitoring

Integration Capabilities

The firewall shall support integration with:

- Enterprise authentication services (LDAP / RADIUS / Active Directory)
- SIEM platforms
- Network monitoring tools
- Security orchestration platforms
- Cloud security services

Power Requirements

Parameter	Specification
Power Supply	External power adapter
Input Voltage	100–240 VAC
Frequency	50/60 Hz
Power Consumption	≤ 10 W

Environmental Conditions

Parameter	Specification
Operating Temperature	0°C to +40°C
Storage Temperature	-20°C to +70°C
Humidity	10 – 90 % non-condensing

Mechanical Specifications

Parameter	Specification
Form Factor	Desktop or rack-mountable appliance
Cooling	Fanless or low-noise cooling
Enclosure	Industrial metal enclosure

Typical dimensions:

- Width ≈ 20 – 22 cm
- Height ≈ 4 – 5 cm
- Depth ≈ 15 – 16 cm
- Weight ≈ 1 kg

Communication Module RTU-TCP

Quantity = 2

No 5:

Communication Module RTU-TCP

The device shall be an **industrial communication gateway module** designed to enable communication between **serial Modbus RTU devices and Ethernet-based Modbus TCP networks**.

The module shall function as a **protocol converter**, allowing integration of legacy serial field devices (e.g., sensors, meters, PLCs) into modern Ethernet-based industrial automation networks.

The device shall be suitable for **industrial automation, energy monitoring, building automation, and process control systems**.

Functional Requirements

The communication module shall provide the following functionality:

- Conversion between **Modbus RTU and Modbus TCP protocols**
- Integration of serial field devices into Ethernet networks
- Operation as **Modbus TCP server or client**
- Support for **multiple Modbus RTU slave devices**
- Transparent data mapping between serial and Ethernet networks
- Reliable communication for industrial environments

The device shall support **continuous operation in industrial automation systems**.

Communication Interfaces

Parameter	Requirement
Ethernet Ports	Minimum 1
Speed	10/100 Mbps
Connector Type	RJ45
Protocol	TCP/IP
Auto Negotiation	Supported
Auto MDI/MDIX	Supported

Serial Communication Interface

Parameter	Specification
Serial Type	RS485
Communication Mode	Half duplex
Protocol	Modbus RTU
Baud Rate	1.2 kbps to 115.2 kbps
Data Bits	7 or 8
Stop Bits	1 or 2
Parity	None / Even / Odd
Isolation	Galvanic isolation preferred

Protocol Support

The gateway shall support the following protocols:

Industrial Protocols

- Modbus RTU (Master / Slave)
- Modbus TCP (Client / Server)

Network Protocols

- TCP/IP
- DHCP
- SNMP (optional)
- HTTP / HTTPS for configuration

Data Handling Capabilities

The communication module shall support:

- Mapping of **Modbus RTU registers to Modbus TCP registers**
- Support for **multiple RTU slave devices**
- Data polling and buffering
- Configurable timeouts and retry mechanisms
- Register mapping configuration

Configuration and Management

The device shall support configuration through one or more of the following:

- Web-based configuration interface
- Configuration software utility
- Command-line interface (optional)

Configuration parameters shall include:

- Network settings (IP address, gateway, subnet mask)
- Serial communication parameters
- Modbus register mapping
- Device diagnostics

Diagnostics and Status Monitoring

The module shall provide:

- Status LED indicators
- Communication status monitoring
- Error detection and reporting
- Network activity indication
- Device health diagnostics

Power Supply

Parameter	Specification
Supply Voltage	24 VDC
Operating Voltage Range	19.2 – 28.8 VDC
Power Consumption	≤ 5 W

Environmental Conditions

Parameter	Specification
Operating Temperature	-20°C to +60°C
Storage Temperature	-40°C to +70°C
Relative Humidity	5 – 95 % non-condensing
Vibration Resistance	Industrial standard compliance

Mechanical Specifications

Parameter	Specification
Mounting	DIN rail
Enclosure	Industrial grade
Protection Rating	Minimum IP20
Cooling	Passive convection

Compliance and Standards

The equipment shall comply with applicable standards including:

- IEC 61131 (Industrial automation equipment)
- IEC 61000 (Electromagnetic compatibility)
- CE certification
- RoHS compliance
- Industrial networking standards

Terminal Blocks

Quantity = 30

No 6:

Terminal Blocks

Specification Requirements

- DIN rail mounted terminal blocks
- Rated current: minimum 5 A
- Rated voltage: minimum 250 V
- Compatible with industrial control panel wiring
- Fuse or disconnect type preferred
- Wire size compatibility: 0.5 mm^2 – 4 mm^2

Controller

Quantity = 1

No 7: **Controller**
The device shall be an **industrial programmable field controller (PFC)** designed for **automation, control, and data communication in distributed industrial systems**. The controller shall support **modular I/O expansion**, allowing connection to digital, analog, and communication modules within a distributed I/O system. The controller shall provide **real-time control capability**, communication with industrial networks, and integration with supervisory systems such as **SCADA, IoT gateways, and building management systems**. The device shall be suitable for **industrial automation, energy management systems, utilities, infrastructure monitoring, and manufacturing processes**.

Controller Hardware Specifications

Processor

Parameter	Requirement
Processor Type	Industrial real-time processor
Architecture	32-bit or 64-bit embedded processor
Clock Speed	≥ 500 MHz
Real-time Execution	Deterministic control cycle capability

Integrated Communication Interfaces

Ethernet

Parameter	Specification
Ethernet Ports	Minimum 2
Speed	10/100 Mbps
Connector	RJ45
Protocol	Industrial Ethernet
Switch Capability	Internal Ethernet switch preferred

Serial Communication

Parameter	Specification
Serial Interface	RS232 or RS485
Protocol Support	Modbus RTU
Configurable Communication	Supported

Supported Communication Protocols

The controller shall support industrial communication protocols including:

Field Communication

- Modbus RTU
- Modbus TCP
- Industrial Ethernet protocols

Network and IoT Communication

- TCP/IP
- UDP
- HTTP / HTTPS
- MQTT (optional)

These protocols shall allow integration with **SCADA systems, PLCs, sensors, and IoT platforms**.

Modular I/O Expansion

The controller shall support connection to **modular I/O systems**, including:

- Digital input modules
- Digital output modules
- Analog input modules
- Analog output modules
- Communication interface modules
- Fieldbus modules

Minimum expansion capability:

Parameter	**Requirement**
Supported I/O Modules	≥ 50 modules
I/O System Type	Modular bus-based system

Programming Environment

The controller shall support programming according to **IEC 61131-3 standards**, including:

Programming Language	Supported
Ladder Diagram (LD)	Yes
Function Block Diagram (FBD)	Yes
Structured Text (ST)	Yes
Sequential Function Chart (SFC)	Optional

Additional programming capabilities:

- Online program editing
- Debugging tools
- Simulation capability
- Integrated diagnostics

Power Supply

Parameter	Specification
Supply Voltage	24 VDC
Voltage Range	19.2 – 28.8 VDC
Power Consumption	≤ 8 W

Environmental Conditions

Parameter	Specification
Operating Temperature	-20°C to +60°C
Storage Temperature	-40°C to +70°C
Humidity	5 – 95 % non-condensing
Vibration Resistance	Industrial standard compliance

Integration Requirements

The controller shall support integration with:

- PLC systems
- SCADA systems
- Energy monitoring systems
- Industrial IoT gateways
- Building automation systems

Integration shall use **standard industrial communication protocols**.

DC/DC Power Converter

Quantity = 2

No 8:

DC/DC Converter

- **DC/DC Converter**; **24 VDC input** voltage; 5 VDC output voltage; 0.5 A output current; DC OK contact (4055143407052)
- Din rail mount

Wireless Industrial 4–20 mA Analog Interface Module

Quantity = 1

No 9: **Long-range wireless interface analogue** **Wireless Industrial 4–20 mA Analog Interface Module (LPWAN / LoRaWAN Compatible)** equivalent to the referenced device
The device shall be an **industrial wireless analog interface module** designed to connect **4–20 mA analog sensors** to a **long-range wireless communication network**. The module shall allow integration of **industrial field instruments (such as pressure, flow, temperature, or level transmitters)** into an **industrial IoT monitoring system** without requiring wired communication infrastructure. The interface shall transmit measured analog values via **low-power wide-area network (LPWAN) technology**, suitable for long-range industrial monitoring applications. The device shall be suitable for **industrial automation, energy monitoring, environmental monitoring, and smart infrastructure systems**.

Functional Requirements

The wireless interface module shall provide the following capabilities:

- Acquisition of **analog signals from 4–20 mA industrial sensors**
- Conversion of analog signals into digital data
- Transmission of sensor data over **long-range wireless network**
- Low power operation for long battery life
- Integration with **industrial IoT gateways**
- Reliable wireless communication for industrial monitoring applications

Analog Input Specifications

Parameter	Specification
Input Type	4–20 mA current loop
Number of Inputs	Minimum 1
Measurement Range	0–20 mA
Resolution	Minimum 12-bit
Measurement Accuracy	±1 % of full scale or better
Input Isolation	Electrical isolation preferred
Input Protection	Overcurrent protection

The module shall support **standard industrial transmitters using 4–20 mA signaling**.

Wireless Communication

The device shall support **low-power wide-area wireless communication** suitable for industrial IoT applications.

Communication Technology

Parameter	Specification
Wireless Technology	LPWAN / LoRaWAN compatible
Frequency Bands	Regional ISM bands
Network Topology	Star network via gateway
Communication Range	Up to several kilometers (depending on environment)
Data Transmission	Periodic or event-based transmission

Data Transmission

The device shall support configurable data transmission modes including:

- Periodic reporting
- Event-triggered transmission
- Threshold-based alerts
- Configurable transmission intervals

The module shall support **data encryption and secure wireless communication**.

Power Supply

The module shall support **low-power operation** suitable for remote installations.

Parameter	Specification
Power Supply Type	Battery powered
Battery Type	Industrial lithium battery
Battery Life	Minimum 5 years under typical transmission intervals
Low Battery Detection	Supported

Optional external power capability may also be supported.

Configuration and Management

The device shall support configuration through:

- Wireless network configuration
- Gateway-based configuration tools
- Dedicated configuration software
- Secure device provisioning

Configurable parameters shall include:

- Measurement interval
- Transmission frequency
- Sensor scaling
- Alarm thresholds

Mechanical Specifications

Parameter	Specification
Enclosure	Industrial rugged enclosure
Protection Rating	Minimum IP65
Mounting	Wall mount or DIN rail mount
Antenna	Integrated or external antenna

Compliance and Standards

The equipment shall comply with the following standards:

- CE certification
- RoHS compliance
- Radio equipment regulations
- Industrial EMC standards (IEC 61000 series)

Integration Requirements

The wireless interface module shall support integration with:

- Industrial IoT gateways
- SCADA systems
- Energy monitoring systems
- Industrial cloud platforms

Integration shall occur via **standard wireless network infrastructure and IoT protocols**.

Wireless Industrial

Modbus Master Interface – LPWAN / LoRaWAN Compatible

Quantity = 1

No 10:

Modbus Master Interface – LPWAN / LoRaWAN Compatible

Wireless Modbus Master Sensor Interface (LPWAN / LoRaWAN Compatible) with External Antenna, equivalent to the referenced device.

The device shall be an **industrial wireless Modbus master interface module** designed to collect data from **Modbus RTU slave devices** and transmit the data through a **long-range wireless network** to a central IoT gateway or monitoring system.

The module shall allow integration of **industrial Modbus sensors, meters, and field devices** into a **wireless industrial monitoring system** without requiring wired communication infrastructure.

The device shall include or support an **external antenna** to improve wireless communication range and signal reliability.

The interface shall be suitable for **industrial automation, energy monitoring, environmental monitoring, infrastructure systems, and remote telemetry applications**.

Functional Requirements

The wireless interface module shall provide the following capabilities:

- Communication with **Modbus RTU slave devices**
- Operation as a **Modbus RTU master**
- Data acquisition from multiple Modbus registers
- Wireless transmission of collected data to an IoT gateway
- Configurable polling intervals for connected devices
- Long-range wireless communication suitable for industrial deployments

The module shall support **reliable operation in distributed industrial monitoring systems**.

Modbus Communication Interface

Serial Communication

Parameter	Specification
Interface Type	RS485
Communication Protocol	Modbus RTU
Device Role	Modbus Master
Maximum Connected Devices	Minimum 10 Modbus slaves
Baud Rate	1.2 kbps to 115.2 kbps
Data Bits	7 or 8
Stop Bits	1 or 2
Parity	None / Even / Odd
Bus Type	Half-duplex

Modbus Data Acquisition

The device shall support:

- Polling of Modbus registers from slave devices
- Reading of input registers and holding registers
- Configurable polling frequency
- Register mapping for wireless data transmission
- Support for multiple Modbus devices on a single bus

The device shall support **efficient data aggregation before transmission**.

Wireless Communication

The module shall support **low-power wide-area wireless communication technology** suitable for long-distance industrial IoT deployments.

Wireless Technology

Parameter	Specification
Communication Type	LPWAN / LoRaWAN compatible
Frequency Bands	Regional ISM bands
Transmission Range	Up to several kilometers depending on environment
Network Topology	Star topology via gateway
Communication Mode	Uplink data transmission

Antenna

Parameter	Specification
Antenna Type	External antenna
Antenna Connector	Industrial RF connector
Antenna Gain	Suitable for long-range communication
Mounting	Panel or external mounting
Weather Resistance	Outdoor compatible antenna preferred

The antenna shall improve **communication reliability and network coverage**.

Data Transmission

The device shall support configurable data transmission methods including:

- Periodic data transmission
- Event-based transmission
- Alarm or threshold-based alerts
- Aggregated Modbus data transmission

Transmission intervals shall be **configurable to optimize battery life**.

Power Supply

The module shall support **low-power operation suitable for remote installations**.

Parameter	Specification
Power Supply	Battery powered
Battery Type	Industrial lithium battery
Battery Life	Minimum 5 years typical operation
Battery Monitoring	Low battery detection and reporting

Optional external power supply may also be supported.

Configuration and Management

The device shall support configuration through:

- Wireless gateway configuration tools
- Local configuration interface
- Dedicated configuration software

Configurable parameters shall include:

- Modbus device addresses
- Register polling configuration
- Data transmission intervals
- Alarm thresholds
- Wireless network parameters

Environmental Conditions

Parameter	Specification
Operating Temperature	-20°C to +60°C
Storage Temperature	-40°C to +85°C
Relative Humidity	5 – 95 % non-condensing

The device shall be suitable for **industrial and outdoor monitoring environments**.

Mechanical Specifications

Parameter	Specification
Enclosure	Industrial rugged enclosure
Protection Rating	Minimum IP65
Mounting	Wall mount or DIN rail mount
Antenna Connection	External antenna connector

Compliance and Standards

The equipment shall comply with the following standards:

- CE certification
- RoHS compliance
- Radio equipment directive
- Industrial EMC standards (IEC 61000 series)

Wireless Industrial

Industrial Wireless Serial Interface (RS485 / RS232) supporting Modbus RTU and PLC Communication over LPWAN / LoRaWAN**, equivalent to the referenced device**

Quantity = 1

No 11: **Modbus RTU and PLC Communication over LPWAN / LoRaWAN** Industrial Wireless Serial Interface (RS485 / RS232) supporting Modbus RTU and PLC Communication over LPWAN / LoRaWAN, equivalent to the referenced device
The device shall be an **industrial wireless Modbus master interface module** designed to collect data from **Modbus RTU slave devices** and transmit the data through a **long-range wireless network** to a central IoT gateway or monitoring system. The module shall allow integration of **industrial Modbus sensors, meters, and field devices** into a **wireless industrial monitoring system** without requiring wired communication infrastructure. The device shall include or support an **external antenna** to improve wireless communication range and signal reliability. The interface shall be suitable for **industrial automation, energy monitoring, environmental monitoring, infrastructure systems, and remote telemetry applications**.

Functional Requirements

The device shall provide the following capabilities:

- Wireless communication interface for **serial industrial devices**
- Support for **RS485 and RS232 serial communication**
- Communication with **Modbus RTU devices**
- Integration with **PLC serial communication protocols**
- Wireless transmission of device data to an IoT gateway
- Long-range industrial wireless communication
- Configurable data transmission intervals and polling mechanisms

Serial Communication Interfaces

RS485 Interface

Parameter	Specification
Interface Type	RS485
Communication Mode	Half duplex
Protocol Support	Modbus RTU
Maximum Devices	Minimum 10 devices on bus
Baud Rate	1.2 kbps to 115.2 kbps
Data Bits	7 or 8
Stop Bits	1 or 2
Parity	None / Even / Odd
Isolation	Electrical isolation preferred

RS232 Interface

Parameter	Specification
Interface Type	RS232
Protocol Support	PLC serial communication / Modbus RTU
Baud Rate	1.2 kbps to 115.2 kbps
Connector Type	Industrial serial connector
Configuration	Configurable communication parameters

Supported Communication Protocols

The module shall support the following communication protocols:

Industrial Protocols

- Modbus RTU
- PLC serial communication protocols
- Serial device communication protocols

Wireless Network Protocol

- LPWAN / LoRaWAN compatible communication
- Secure data transmission to wireless gateway

Wireless Communication

The device shall support low-power long-range wireless communication **suitable for industrial IoT networks.**

Parameter	Specification
Wireless Technology	LPWAN / LoRaWAN compatible
Frequency Band	Regional ISM band
Communication Range	Several kilometers depending on environment
Network Topology	Star network through gateway
Transmission Mode	Periodic or event-based

Data Handling and Transmission

The device shall support:

- Polling of connected serial devices
- Data buffering and aggregation
- Register mapping for wireless transmission
- Configurable transmission intervals
- Alarm and threshold-based data reporting
- Data encryption for secure communication

Antenna

Parameter	Specification
Antenna Type	External antenna
Connector	Industrial RF connector
Antenna Gain	Suitable for long-range communication
Mounting	Panel or external mounting

The antenna shall improve **communication range and signal reliability**.

Power Supply

The device shall support **low power operation suitable for remote deployments**.

Parameter	Specification
Power Supply	Battery powered or external supply
Battery Type	Industrial lithium battery
Battery Life	Minimum 5 years typical operation
Battery Monitoring	Low battery detection and reporting

External **24 VDC power input** may also be supported.

Configuration and Management

The device shall support configuration through:

- Wireless gateway configuration tools
- Local configuration interface
- Configuration software utility

Configurable parameters shall include:

- Serial communication parameters
- Modbus device addressing
- Polling intervals
- Data transmission intervals
- Alarm thresholds
- Wireless network configuration

Diagnostics and Monitoring

The device shall provide:

- LED status indicators
- Communication activity indicators
- Battery status monitoring
- Network communication diagnostics
- Fault detection and reporting

Environmental Conditions

Parameter	Specification
Operating Temperature	-20°C to +60°C
Storage Temperature	-40°C to +85°C
Relative Humidity	5 – 95 % non-condensing

The device shall be suitable for **industrial and outdoor installations**.

Mechanical Specifications

Parameter	Specification
Enclosure	Industrial rugged enclosure

Protection Rating	Minimum IP65
Mounting	Wall mount or DIN rail mount
Antenna Connection	External antenna connector

Compliance and Standards

The equipment shall comply with the following standards:

- CE certification
- RoHS compliance
- Radio equipment directive
- Industrial EMC standards (IEC 61000 series)

Integration Requirements

The device shall support integration with:

- Industrial IoT gateways
- SCADA systems
- PLC control systems
- Energy monitoring systems
- Industrial cloud platforms

Integration shall occur via **standard wireless IoT network infrastructure and industrial communication protocols**.

Wireless Industrial

Outdoor Long-Range LPWAN / LoRaWAN Antenna equivalent to the referenced device.

Quantity = 1

No 12: **Outdoor Long-Range LPWAN / LoRaWAN Antenna**
The device shall be an **industrial outdoor long-range wireless antenna** designed to provide reliable communication for **low-power wide-area networks (LPWAN)** used in industrial IoT systems. The antenna shall support **long-range wireless communication between field devices and IoT gateways**, improving signal strength, network coverage, and reliability in industrial environments. The antenna shall be suitable for **outdoor installation** in industrial sites, utility infrastructure, smart cities, environmental monitoring systems, and remote telemetry applications.

Functional Requirements

The antenna shall provide the following capabilities:

- Support for **long-range LPWAN / LoRaWAN wireless communication**
- Improved wireless coverage for industrial IoT networks
- Reliable signal transmission for outdoor installations
- Compatibility with industrial IoT gateways and wireless sensor devices
- Stable performance in harsh environmental conditions

Electrical Specifications

Parameter	Specification
Frequency Band	Regional ISM bands (e.g., 863–870 MHz or 902–928 MHz depending on region)
Antenna Gain	Minimum 2–5 dBi
Polarization	Vertical polarization
Impedance	50 Ω
VSWR	≤ 2.0
Maximum Input Power	≥ 10 W

The antenna shall be optimized for **low-power long-range wireless communication** used in industrial IoT networks.

Communication Compatibility

The antenna shall be compatible with wireless systems supporting:

- LPWAN communication technologies
- LoRaWAN networks
- Industrial IoT gateways
- Wireless sensor networks

The antenna shall support integration with **industrial wireless monitoring and telemetry systems**.

Connector Interface

Parameter	Specification
Connector Type	Standard RF connector (e.g., SMA, N-type, or equivalent)

Cable Compatibility	Coaxial RF cable
Connector Gender	Compatible with gateway RF interface

The antenna shall allow **easy installation and connection to industrial IoT gateways**.

Mechanical Specifications

Parameter	Specification
Antenna Type	Omni-directional
Mounting	Pole, mast, or wall mounting
Height	Typical 150 – 300 mm
Weight	Lightweight outdoor antenna

The antenna shall provide **360-degree signal coverage** suitable for wide-area monitoring systems.

Environmental Specifications

Parameter	Specification
Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C
Protection Rating	Minimum IP65
Wind Resistance	Suitable for outdoor installations

The antenna shall be designed for **long-term outdoor operation in harsh environmental conditions**.

Enclosure and Materials

Parameter	Specification
Housing Material	UV-resistant industrial polymer or fiberglass
Corrosion Resistance	Outdoor corrosion-resistant materials
Weather Protection	Waterproof and dustproof design

The antenna housing shall protect internal components from **rain, dust, and UV exposure**.

Installation Requirements

The antenna shall support installation using:

- Wall mount brackets
- Pole or mast mounting kits
- Industrial mounting hardware

The antenna shall support **simple installation and alignment** for optimal signal performance.

Compliance and Standards

The antenna shall comply with applicable standards including:

- CE certification
- RoHS compliance
- Radio equipment regulations
- Industrial EMC standards

Integration Requirements

The antenna shall support integration with:

- Industrial IoT gateways
- LPWAN / LoRaWAN wireless networks
- Industrial sensor networks
- Remote telemetry systems

The antenna shall support **long-range communication between field devices and gateway infrastructure**.

Wireless Industrial

Embedded Temperature and Humidity Sensor – LPWAN Compatible

Quantity = 1

No 13:

Embedded Temperature and Humidity Sensor – LPWAN Compatible

The device shall be an **industrial outdoor long-range wireless antenna** designed to provide reliable communication for **low-power wide-area networks (LPWAN)** used in industrial IoT systems.

The antenna shall support **long-range wireless communication between field devices and IoT gateways**, improving signal strength, network coverage, and reliability in industrial environments.

The antenna shall be suitable for **outdoor installation** in industrial sites, utility infrastructure, smart cities, environmental monitoring systems, and remote telemetry applications.

Functional Requirements

The sensor shall provide the following capabilities:

- Measurement of **ambient temperature**
- Measurement of **relative humidity**
- Wireless transmission of environmental data
- Configurable data reporting intervals
- Long-range wireless communication with IoT gateways
- Low-power operation for long battery life

The sensor shall operate as part of a **wireless industrial monitoring network**.

Temperature Measurement Specifications

Parameter	Specification
Measurement Range	-20°C to +60°C
Resolution	≤ 0.1°C
Accuracy	±0.5°C or better
Sensor Type	Digital temperature sensor

Response Time	≤ 10 seconds typical

Humidity Measurement Specifications

Parameter	Specification
Measurement Range	0 – 100 % Relative Humidity
Resolution	≤ 0.1 % RH
Accuracy	±3 % RH typical
Sensor Type	Capacitive humidity sensor
Long-Term Stability	≤ ±1 % RH per year

Wireless Communication

The device shall support **long-range wireless communication technology** suitable for industrial IoT deployments.

Parameter	Specification
Wireless Technology	LPWAN / LoRaWAN compatible
Frequency Band	Regional ISM bands
Communication Range	Up to several kilometers depending on environment
Network Topology	Star topology via gateway
Transmission Mode	Periodic or event-based

The device shall support **secure wireless communication**.

Data Transmission

The device shall support configurable reporting mechanisms including:

- Periodic data transmission
- Event-based transmission
- Threshold-based alerts
- Configurable transmission intervals

Transmission intervals shall be configurable to **optimize battery life and network bandwidth**.

Power Supply

The sensor shall support **low-power operation for long-term remote deployment**.

Parameter	Specification
Power Supply	Internal battery
Battery Type	Industrial lithium battery
Battery Life	Minimum 5 years typical operation
Battery Monitoring	Low battery reporting

Diagnostics and Monitoring

The device shall provide:

- Device status monitoring
- Communication activity indication
- Battery level monitoring
- Fault detection and reporting
- Network communication diagnostics

Environmental Conditions

Parameter	Specification
Operating Temperature	-20°C to +60°C
Storage Temperature	-40°C to +85°C
Relative Humidity	5 – 95 % non-condensing

The device shall be suitable for **industrial and indoor monitoring environments**.

Mechanical Specifications

Parameter	Specification
Enclosure	Industrial rugged enclosure
Protection Rating	Minimum IP65
Mounting	Wall mount or surface mount

Antenna	Integrated wireless antenna

Compliance and Standards

The device shall comply with the following standards:

- CE certification
- RoHS compliance
- Radio equipment directive
- Industrial EMC standards (IEC 61000 series)

Integration Requirements

The sensor shall support integration with:

- Industrial IoT gateways
- Building management systems
- SCADA systems
- Environmental monitoring platforms
- Industrial cloud platforms

Integration shall occur via **LPWAN wireless network infrastructure**.

Wireless Industrial

Wireless Environmental Sensors measuring CO_2, VOC, Temperature and Humidity (LPWAN / LoRaWAN compatible)

Quantity = 1

No 14:

CO_2, VOC, Temperature and Humidity Sensor – LPWAN Compatible

The device shall be a **wireless multi-parameter environmental monitoring sensor** designed to measure **carbon dioxide (CO_2), volatile organic compounds (VOC), temperature, and relative humidity**.

The sensor shall transmit measured environmental data through a **low-power wide-area wireless network (LPWAN)** to a central gateway or industrial IoT platform.

The device shall be suitable for **industrial buildings, indoor air quality monitoring, manufacturing facilities, smart buildings, laboratories, warehouses, and infrastructure monitoring systems**.

The sensor shall feature **integrated sensing elements, wireless communication capability, and long-life battery operation for remote deployment**.

Functional Requirements

The sensor shall provide the following capabilities:

- Measurement of **carbon dioxide concentration (CO_2)**
- Measurement of **volatile organic compounds (VOC)**
- Measurement of **ambient temperature**
- Measurement of **relative humidity**
- Wireless transmission of environmental data
- Configurable data reporting intervals
- Long-range wireless communication with industrial IoT gateways
- Low power consumption for long battery life

The device shall operate as part of a **wireless industrial environmental monitoring network**.

CO_2 Measurement Specifications

Parameter	Specification
Measurement Range	400 – 5000 ppm
Sensor Technology	Non-dispersive infrared (NDIR) or equivalent
Resolution	≤ 1 ppm
Accuracy	±(50 ppm + 3% of reading) typical
Response Time	≤ 60 seconds

The sensor shall support **indoor air quality monitoring applications**.

VOC Measurement Specifications

Parameter	Specification
Measurement Range	0 – 1000 ppb (typical)
Sensor Type	Metal oxide semiconductor (MOS) or equivalent
Resolution	≤ 1 ppb
Response Time	≤ 30 seconds
Long-Term Stability	Industrial-grade sensing element

The device shall detect **airborne organic compounds affecting air quality**.

Temperature Measurement Specifications

Parameter	Specification
Measurement Range	-20°C to +60°C
Resolution	≤ 0.1°C
Accuracy	±0.5°C or better
Sensor Type	Digital temperature sensor

Humidity Measurement Specifications

Parameter	Specification
Measurement Range	0 – 100 % Relative Humidity
Resolution	≤ 0.1 % RH
Accuracy	±3 % RH typical
Sensor Type	Capacitive humidity sensor
Long-Term Stability	≤ ±1 % RH per year

Wireless Communication

The device shall support **long-range wireless communication technology** suitable for industrial IoT networks.

Parameter	Specification
Wireless Technology	LPWAN / LoRaWAN compatible
Frequency Band	Regional ISM band
Communication Range	Up to several kilometers depending on environment
Network Topology	Star topology via gateway
Transmission Mode	Periodic or event-based

The device shall support **secure wireless communication**.

Data Transmission

The sensor shall support configurable transmission methods including:

- Periodic data reporting
- Event-triggered transmission
- Alarm or threshold-based alerts
- Configurable measurement intervals

Transmission intervals shall be configurable to **optimize network bandwidth and battery life**.

Power Supply

The device shall support **low-power operation suitable for remote deployment**.

Parameter	Specification
Power Supply	Internal battery
Battery Type	Industrial lithium battery
Battery Life	Minimum 5 years typical operation
Battery Monitoring	Low battery detection and reporting

Diagnostics and Monitoring

The device shall provide:

- Status indicators
- Battery level monitoring
- Communication diagnostics
- Sensor status monitoring
- Fault detection and reporting

Environmental Conditions

Parameter	Specification
Operating Temperature	-20°C to +60°C
Storage Temperature	-40°C to +85°C
Relative Humidity	5 – 95 % non-condensing

The device shall be suitable for **industrial indoor environments and monitoring applications**.

Mechanical Specifications

Parameter	Specification
Enclosure	Industrial rugged enclosure
Protection Rating	Minimum IP40 – IP65 depending on installation
Mounting	Wall mount or surface mount
Antenna	Integrated wireless antenna

Wireless Industrial

Wireless Network Repeater / Signal Amplifier for LPWAN / LoRaWAN networks

Quantity = 1

No 15:

Wireless Network Repeater / Signal Amplifier for LPWAN / LoRaWAN networks

The device shall be an **industrial wireless signal repeater** designed to extend the coverage range of **low-power wide-area wireless networks (LPWAN)** used in industrial IoT systems.

The repeater shall receive wireless signals from **field sensors or communication modules**, amplify and retransmit them to extend communication range and improve network reliability.

The device shall operate as a **transparent signal relay** requiring **minimal or no configuration**, enabling quick deployment in industrial environments.

The repeater shall be suitable for **industrial automation systems, environmental monitoring networks, energy monitoring infrastructure, smart buildings, utilities, and remote telemetry systems**.

Functional Requirements

The repeater shall provide the following capabilities:

- Reception of wireless signals from field devices
- Signal amplification and retransmission
- Extension of wireless network coverage
- Improvement of signal reliability in difficult environments
- Transparent operation without complex configuration
- Automatic network integration

The device shall support **automatic relay of wireless data packets between sensors and gateways**.

Wireless Communication Specifications

Parameter	Specification
Wireless Technology	LPWAN / LoRaWAN compatible
Frequency Band	Regional ISM bands
Communication Mode	Receive and retransmit
Transmission Range	Several kilometers depending on environment
Network Topology	Star topology with repeater support

The repeater shall support **long-range wireless communication suitable for industrial monitoring networks**.

Signal Performance

Parameter	Specification
Output Power	High-power transmission capability
Receiver Sensitivity	High sensitivity suitable for long-range communication
Signal Amplification	Automatic signal relay
Network Capacity	Support multiple wireless sensor devices

The repeater shall improve **network coverage in large facilities or obstructed environments**.

Configuration Requirements

The repeater shall support **automatic operation** with minimal configuration.

Capabilities shall include:

- Automatic device detection
- Automatic network integration
- Plug-and-play operation
- No manual network configuration required
- Automatic forwarding of wireless messages

Power Supply

The device shall support reliable power for continuous operation.

Parameter	Specification
Power Supply	External DC power
Supply Voltage	24 VDC typical
Power Consumption	≤ 5 W

Optional battery backup may be supported.

Antenna

Parameter	Specification
Antenna Type	External antenna
Antenna Connector	Standard RF connector
Antenna Gain	Suitable for long-range communication
Mounting	External or panel mounted antenna

The antenna shall ensure **optimal signal coverage and network reliability**.

Diagnostics and Monitoring

The device shall provide:

- Power status indication
- Communication activity indication
- Network signal status

- Fault indication
- Device health monitoring

Environmental Conditions

Parameter	Specification
Operating Temperature	-20°C to +60°C
Storage Temperature	-40°C to +85°C
Relative Humidity	5 – 95 % non-condensing

The repeater shall be suitable for **industrial indoor or outdoor installations**.

Mechanical Specifications

Parameter	Specification
Enclosure	Industrial rugged enclosure
Protection Rating	Minimum IP65
Mounting	Wall mount or pole mount
Antenna Connection	External antenna connector

The enclosure shall protect internal electronics from **dust, moisture, and environmental exposure**.

Compliance and Standards

The equipment shall comply with applicable standards including:

- CE certification
- RoHS compliance
- Radio equipment directive
- Industrial EMC standards (IEC 61000 series)

Integration Requirements

The repeater shall support integration with:

- Industrial IoT gateways
- Wireless sensor networks
- LPWAN / LoRaWAN infrastructure
- SCADA monitoring systems
- Industrial cloud platforms

The repeater shall enable **extended communication between remote sensors and gateway infrastructure**.

Wireless Industrial

Industrial Lithium Battery Pack – 3.6 V C-Type 9000 mAh with industrial connector

Quantity = 1

No 16:

Industrial Lithium Battery Pack – 3.6 V C-Type 9000 mAh with industrial connector

3.6 V Primary Lithium Battery – C Type (Approx. 9000 mAh)

General Description

Parameter	Specification
Device Type	Industrial lithium primary battery pack
Application	Power supply for wireless IoT sensors, industrial monitoring devices, and communication modules
Installation	Designed for integration into wireless industrial sensors and monitoring equipment
Output Type	Stable DC voltage supply
Battery Format	Cylindrical C-type lithium cell
Connector	Pre-terminated industrial connector interface

Electrical Specifications

Parameter	Specification
Nominal Voltage	3.6 V DC
Battery Chemistry	Lithium Thionyl Chloride (Li-$SOCl_2$) or equivalent
Nominal Capacity	Approx. 9000 mAh
Energy Capacity	Approx. 32 Wh
Maximum Continuous Current	As per manufacturer rating
Pulse Current Capability	Suitable for wireless transmission bursts
Self-Discharge Rate	≤ 1 % per year typical
Shelf Life	Minimum 10 years under recommended storage conditions

Connector Interface

Parameter	Specification
Connector Type	Industrial two-pin connector
Connector Standard	Molex type or equivalent
Wiring	Factory pre-wired battery connector
Polarity	Clearly defined positive and negative terminals
Connector Protection	Reverse polarity protection preferred

Mechanical Specifications

Parameter	Specification
Battery Size	C-type cylindrical cell
Diameter	Approx. 26 mm
Length	Approx. 50 mm
Housing Material	Industrial grade metal casing
Mounting	Internal installation within device enclosure
Weight	Approx. 50 – 70 g

Environmental Specifications

Parameter	Specification
Operating Temperature	−40°C to +85°C
Storage Temperature	−55°C to +85°C
Humidity	5 – 95 % non-condensing
Application Environment	Industrial indoor and outdoor installations

Safety and Protection

Parameter	Specification
Safety Design	Leak-resistant lithium cell
Short Circuit Protection	System-level protection recommended
Chemical Stability	High stability lithium chemistry
Transport Safety	Compliant with international transport regulations

Compliance and Standards

Parameter	Specification
Safety Certification	IEC battery safety standards
Transport Certification	UN38.3 compliant
Environmental Compliance	RoHS compliant

Quality Standards	Industrial electronics battery standards

Wireless Industrial

No 17:
3.6 V Primary Lithium Battery – D Type (~19 000 mAh)

Quantity = 1

Category	*Parameter*	*Specification*
General	Device Type	Industrial primary lithium battery
	Application	Power supply for wireless industrial sensors, IoT devices, and remote monitoring equipment
	Battery Format	Cylindrical D-type cell
	Installation	Internal installation within wireless sensor or monitoring device
Electrical Characteristics	Nominal Voltage	3.6 V DC
	Battery Chemistry	Lithium Thionyl Chloride (Li-$SOCl_2$) or equivalent
	Nominal Capacity	Approx. 19 000 mAh
	Energy Capacity	Approx. 68 Wh
	Continuous Current	As per manufacturer specification
	Pulse Current Capability	Suitable for wireless transmission bursts
Performance Characteristics	Self-Discharge Rate	≤ 1 % per year typical
	Shelf Life	Minimum 10 years under recommended storage conditions
	Operating Profile	Designed for low-power IoT and remote sensing devices
Mechanical Characteristics	Battery Size	D-type cylindrical cell
	Diameter	Approx. 34 mm
	Length	Approx. 61 mm
	Housing	Industrial grade metal casing
	Weight	Approx. 100–120 g
Environmental Conditions	Operating Temperature	−40 °C to +85 °C
	Storage Temperature	−55 °C to +85 °C
	Humidity	5–95 % non-condensing
	Application Environment	Industrial indoor and outdoor installations

Safety and Protection	Safety Design	Hermetically sealed lithium cell
	Transport Safety	Compliant with lithium battery transport regulations
	Short Circuit Protection	Device-level protection recommended
Compliance	Safety Standards	IEC battery safety standards
	Transport Certification	UN 38.3 compliant
	Environmental Compliance	RoHS compliant
Documentation	Supplier Documentation	Datasheet, Safety Data Sheet (SDS), installation guidance
Warranty	Warranty Period	Minimum 12 months from delivery under recommended storage conditions

Wireless Industrial

Industrial Lithium Battery Pack – 3.6 V D-Type (~19000 mAh) with Molex-type Connector and Supercapacitor Backup

Quantity = 1

No 18:

3.6 V Primary Lithium Battery – D Type (~19000 mAh) with Connector and Supercapacitor Backup

General Description

Parameter	Specification
Device Type	Industrial lithium battery pack with supercapacitor support
Application	Power supply for wireless industrial sensors, IoT communication modules, and remote monitoring devices
Battery Format	Cylindrical D-type lithium primary cell
Output Voltage	Nominal 3.6 V DC
Connector	Pre-terminated industrial connector
Backup Feature	Integrated supercapacitor to support high current transmission bursts
Installation	Internal installation within wireless sensor or communication device

Electrical Specifications

Parameter	Specification
Nominal Voltage	3.6 V DC
Battery Chemistry	Lithium Thionyl Chloride (Li-$SOCl_2$) or equivalent
Nominal Capacity	Approx. 19000 mAh
Energy Capacity	Approx. 68 Wh
Continuous Current	As per manufacturer specification
Pulse Current	Supported through integrated supercapacitor
Self-Discharge Rate	≤ 1 % per year typical
Shelf Life	Minimum 10 years under recommended storage conditions

Supercapacitor Characteristics

Parameter	Specification
Function	Supports high current pulses during wireless transmission
Capacitor Type	Industrial supercapacitor
Purpose	Stabilizes voltage during communication bursts

Protection	Integrated over-voltage protection preferred
Lifetime	Designed for long-term industrial use

Connector Interface

Parameter	Specification
Connector Type	Industrial two-pin connector
Connector Standard	Molex type or equivalent
Wiring	Pre-wired cable harness
Polarity	Clearly identified positive and negative terminals
Connection Method	Plug-in connector interface

Mechanical Specifications

Parameter	Specification
Battery Size	D-type cylindrical cell
Diameter	Approx. 34 mm
Length	Approx. 61 mm
Housing	Industrial grade metal casing
Weight	Approx. 100 – 120 g
Mounting	Internal device installation

Environmental Specifications

Parameter	Specification
Operating Temperature	−40°C to +85°C
Storage Temperature	−55°C to +85°C
Humidity	5 – 95 % non-condensing
Application Environment	Industrial indoor and outdoor installations

Safety and Protection

Parameter	Specification
Leak Protection	Hermetically sealed lithium cell
Short Circuit Protection	Device-level protection recommended
Chemical Stability	High stability lithium chemistry
Transport Safety	Compliant with lithium battery transport regulations

Compliance and Standards

Parameter	Specification
Safety Standards	IEC battery safety standards
Transport Certification	UN38.3 compliant
Environmental Compliance	RoHS compliant
Industrial Use	Suitable for industrial electronic equipment

Energy Metering - Meter

Industrial Energy Meter for Current Transformer (CT) Measurement – Two Pulse Outputs, equivalent to the referenced device

Quantity = 3

No 20:

Industrial Energy Meter for Current Transformer (CT) Measurement

CT-Based Energy Meter with Dual Pulse Outputs

Technical Specification Summary

CATEGORY	PARAMETER	SPECIFICATION
GENERAL	Device Type	Industrial electrical energy meter
	Measurement Type	Current transformer (CT) based measurement
	Application	Energy monitoring for industrial power distribution systems
	Installation	Electrical distribution panels or automation cabinets
ELECTRICAL MEASUREMENT	Voltage Measurement	Suitable for single-phase or three-phase systems depending on configuration
	Current Measurement	Via external current transformers (CT input)
	Nominal Current Input	Compatible with standard CT secondary (1 A or 5 A typical)
	Frequency Range	45 – 65 Hz
ENERGY MEASUREMENT	Active Energy	Measurement of total active energy consumption
	Reactive Energy	Reactive energy measurement supported
	Apparent Energy	Apparent power measurement capability
	Energy Accuracy	Class 1 accuracy or better
CATEGORY	**PARAMETER**	**SPECIFICATION**
POWER MEASUREMENT	Active Power	Real-time measurement
	Reactive Power	Supported
	Apparent Power	Supported
	Power Factor	Measurement supported
PULSE OUTPUTS	Number of Pulse Outputs	Two (2) pulse outputs
	Pulse Type	Programmable energy pulse output
	Pulse Function	Energy consumption reporting
	Output Interface	Opto-isolated digital output
COMMUNICATION	Communication Interface	Industrial communication interface (optional depending on configuration)
	Protocol Support	Compatible with industrial energy monitoring systems

DISPLAY AND INDICATORS	Display	Integrated digital display for energy values
	Status Indicators	LED indicators for power and pulse outputs
POWER SUPPLY	Supply Voltage	Suitable for industrial AC supply systems
	Power Consumption	Low power consumption typical for panel meters
MECHANICAL	Mounting Type	DIN rail mounting
	Enclosure	Industrial panel-mounted housing
	Protection Rating	Minimum IP20
ENVIRONMENTAL	Operating Temperature	−20°C to +60°C
	Storage Temperature	−40°C to +70°C
	Humidity	5 – 95 % non-condensing
COMPLIANCE	Measurement Standard	IEC energy metering standards
	EMC Compliance	IEC 61000 series
	Environmental Compliance	RoHS compliant
DOCUMENTATION	Supplier Documentation	Datasheet, installation manual, wiring diagram, calibration information
WARRANTY	Warranty Period	Minimum 12 months from commissioning or 18 months from delivery

Energy Metering - CT

Industrial Current Transformer (CT) Sensor 5:40A
Quantity = 3

No 21:

Industrial Current Transformer (CT) Sensor

Category	*Parameter*	*Specification*
General	Device Type	Flexible Rogowski coil current transformer
	Measurement Method	Non-intrusive current measurement
	Application	Electrical energy monitoring and power measurement systems
	Installation	Installed around conductor or busbar without disconnecting circuit
Measurement Characteristics	Current Measurement Range	Suitable for low to medium current monitoring (e.g., approx. 5 A to 40 A typical measurement range depending on integrator configuration)
	Measurement Principle	Rogowski coil based current sensing
	Output Signal	Compatible with energy meters or current measurement modules
	Accuracy Class	Suitable for energy monitoring applications
	Frequency Range	45 – 65 Hz typical for power systems
Electrical Characteristics	Secondary Output	Low voltage signal proportional to primary current
	Insulation Voltage	Suitable for industrial electrical installations
	Phase Error	Low phase shift suitable for power measurement
Mechanical Characteristics	Sensor Type	Flexible coil construction
	Coil Material	Insulated flexible conductor coil
	Opening Mechanism	Clip or connector type closing system

	Coil Diameter	Suitable for installation around cable or busbar conductors
	Cable Length	Pre-wired signal cable suitable for panel installation
Installation	Mounting Method	Wrap-around installation on conductor
	Installation Environment	Electrical distribution panels, switchboards, and energy monitoring systems
Environmental Conditions	Operating Tempe	

Energy Metering - CT

Industrial Current Transformer (CT) Sensor 5:10A
Quantity = 4

No 22:

Industrial Current Transformer (CT) Sensor

CATEGORY	PARAMETER	SPECIFICATION
GENERAL	Device Type	Flexible Rogowski coil current transformer
	Measurement Method	Non-intrusive AC current sensing
	Application	Electrical energy monitoring and power measurement systems
	Installation	Wrap-around installation around conductor without circuit interruption
MEASUREMENT CHARACTERISTICS	Current Measurement Range	Suitable for low-range current monitoring (e.g., approx. 5 A to 10 A measurement range depending on integrator configuration)

	Measurement Principle	Rogowski coil current sensing technology
	Output Signal	Low-voltage signal proportional to primary current
	Accuracy Class	Suitable for energy monitoring and power measurement applications
	Frequency Range	45 – 65 Hz typical for power systems
ELECTRICAL CHARACTERISTICS	Secondary Output Type	Voltage output compatible with energy meters or integrator modules
	Insulation Voltage	Suitable for industrial electrical measurement systems
	Phase Accuracy	Low phase shift suitable for power measurement
MECHANICAL CHARACTERISTICS	Sensor Type	Flexible current sensing coil
	Coil Construction	Flexible insulated conductor coil
	Coil Opening	Clip or snap-fit closure mechanism
	Coil Diameter	Suitable for installation around insulated cables or busbars
	Signal Cable	Pre-wired connection cable for panel installation
INSTALLATION	Mounting Method	Flexible wrap-around installation
	Installation Location	Electrical panels, switchboards, distribution boards
ENVIRONMENTAL CONDITIONS	Operating Temperature	−20°C to +60°C
	Storage Temperature	−40°C to +70°C
	Humidity	5 – 95 % non-condensing
SAFETY AND COMPLIANCE	Insulation Class	Industrial electrical measurement standard
	EMC Compliance	IEC 61000 series
	Environmental Compliance	RoHS compliant
INTEGRATION	Compatible Equipment	Energy meters, power analyzers, and monitoring systems
	Monitoring Systems	Industrial energy management systems, SCADA platforms
DOCUMENTATION	Supplier Documentation	Datasheet, installation manual, wiring diagram, calibration information
WARRANTY	Warranty Period	Minimum 12 months from commissioning or 18 months from delivery