Commercial and Industrial Metering System

Metering Solution

HEXING

Foreword

According to historical data, more than 50% of utilities revenue around the world comes from large consumers those usually called Commercial and Industrial consumers. In this case by considering meter tampering, theft and inaccurate metering which it caused for different reasons like wrong installation, mistakes reading and delivering metered data to utility back office, utilities suffer from large amount of losses in their revenue.

Hexing developed a solution to block these leakage points and increase utilities revenue. This solution comprises C&I Metering System, three phase meters and communication modules. This solution helps utilities to:

- **Measure consumed and generated energy flow (Active, Reactive, in four quadrant) of each big consumer (industrial and commercial);**
- **Monitor all electricity parameters of network such as harmonics, three phase unbalance, load profile and etc.;**
- **Block possible ways of theft and tampering;**
- **On-Line meter reading;**

Hexing C&I metering system is designed according to smart metering concept with high accuracy measurement and high quality of design and manufacturing; all meters can work in both postpaid and prepaid methods.

Solution Overview

Hexing C&I metering system is designed based on AMI and smart metering concepts, but it has more added value in commercial and industrial sector. Hexing C&I metering system has already deployed in different countries; results show great difference between utilities revenue before and after the deployment. This system is developed according to requirements of utilities to minimize possibility of losing revenue with any type of possible theft and tamper.

With consideration of different types of the consumers as well as different installation situations, six different C&I metering products are developed by Hexing.

Hexing C&I Metering Solution Highlight:

Ultimately Tamper proof:

In Hexing's proposed C&I architecture System, meters are usually installed on MV lines or primary side of transformers it minimizes possibility of illegal access to meter, in case of installation of meters in secondary Side of the transformers the design of meters' enclosure blocks illegal access to meters.

Post Payment and Prepayment Mode

Hexing C&I metering system is designed to work both in pre paid and post paid modes, it means depending on utility policy, this system can work in any of these modes and easily change to another mode by remote command.

Compatibility with AMI System

C&I system is designed according to AMI (smart metering) concept; this system fulfills all smart metering requirements and some more.

C&I Metering Scenarios

C&I metering system of Hexing is designed to fulfill different requirements of utilities. Hexing offers six different products matching all kind of possible installation and business case.

First Scenario: LV C&I customer (3P Direct Connected Meter);

It is suitable when customer is supplied through public transformer and the demand of the customer low. In this architecture usually several customers are fed by one transformer. in this case meter and enclosure are installed in secondary side of the transformer and are directly connected to customer's grid. Enclosures is equipped with sensors to protect illegal access to meter, it equipped with circuit breaker to control the load. This breaker enables utility to control load; they also can disconnect customer from the network whenever they want.

First Scenario: LV C&I customer (3P Direct Connected Meter)

Second Scenario: LV CT connected C&I customer;

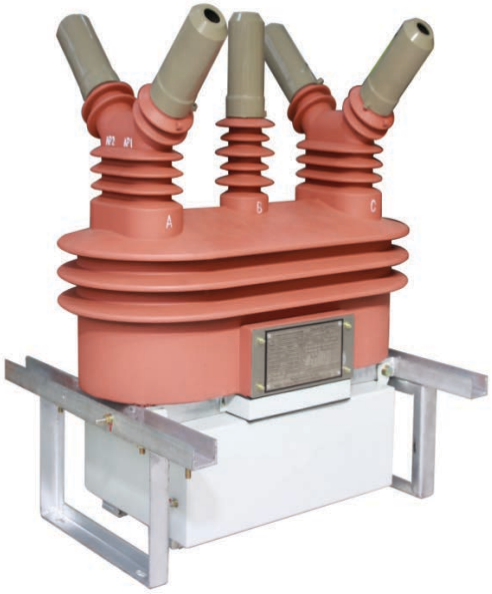
It is suitable when consumer is connected to public transformer, but because of consumption level, the meter should sense and measure the electrical current through CTs (Current Transformer). Like scenario one all the equipment (meter, CT, Breaker) are installed in the enclosure which also equipped with door opening sensor to protect illegal access to meter.

Second Scenario: LV CT connected C&I customer

Third Scenario: CT-PT connected consumers to over head lines;

When consumers have a high demand, utility usually supplies energy to them directly from Medium Voltage grid. In other words, they are directly connected to MV lines. In this case Hexing

introduces state-of-the-art specially designed single metering package with direct connection to MV line. In this scenario all equipment including meters, CT, PT and sensors are assembled in one package that directly installs on MV line. It dramatically decreases the possibility of tampering and theft via manipulation of CT-PT. Also Since this meter is connected directly to MV line all types of theft and tampering are eliminated.



Third Scenario: 11kV metering for overhead cables

Forth Scenario: CT-PT Connected Consumers to Underground Cables;

This scenario is suitable for high demand consumers who are fed by MV underground cables. This Scenario is similar to scenario number three concepts that here MV feeder is underground cable (instead of overhead line).

Forth Scenario: 11kV metering for underground cables

Fifth Scenario: 33/66/132kV Substation metering;

Very high demand consumers, such as steel or cement factories, are usually connected to HV grid. Hexing offers a metering package suitable for such customers. This package is usually installed in substations and is connected to existing CTs and PTs.

Fifth Scenario: 33/66/132kV Substation metering

Sixth Scenario; Circuit Breaker for MV Customer Load Control

For CT or CT-PT connected consumers, if utility wants to them consumer from network, due to any reason such as over loading, they can use MV circuit breaker to do it. This breaker directly communicates with meter and utility can control it via meter. It can operate in automatic or in manual mode.

Functionalities

The main advantage of Hexing C&I Metering system is that it can work in both post-payment and prepayment modes. It means utilities can deploy this system according to their existing situation and policy. Another important advantage of this system is its anti-tamper design.

Functional Specification

- Detect and Calculate exact amount and location of technical and non-technical losses;
- Fully support both STS type and CTS type tokens (value of token can be based on active energy or money);
- Alarm and Event management; C&I meters can send alarms to master station automatically, also system can get alarms & events directly from the meter in real time manner;
- Token management;
- Support all token types: charge tokens, logoff tokens, test tokens, key changing tokens, configuration tokens, …
- Full consumer, agent and 3rd party vending accounting for energy, demand and service cost, penalty, debt, commission and VAT;
- Management of friendly mode and emergency mode in meters;
- Powerful tariff management engine for single tariff, step tariff and TOU;
- Anti-hoarding mechanism;

Functional Specification and Features

- Enhanced Data Collection
  - Scheduled/On demand Data Collection;
  - Scheduled Missing Data Re-reading;
  - Missing Data Re-reading when meter/terminal goes online;
  - Local Data Collection via HHU;
  - Data Push to System (Only for GPRS/3G Meter comply with DLSM/COSEM);
- Head-end
  - Multi communication technology: Ethernet, GPRS, 3G, Fiber, PLC, RF, RS485 and etc.
  - Standard communication protocol: DLMS/COSEM;
- Device Management
  - Multi device type;
  - Adding New Device;
- Smart Operation
  - Load Control;
  - Alarm & Event subscription;
  - Communication Diagnostic;
- End User Portal
  - Web-based user-friendly application which can display customer consumption online;
  - An effective way to help utility to promote demand response;
- Report
  - Accumulative Energy reports;
  - Consumption Energy reports;
  - Load Profile;

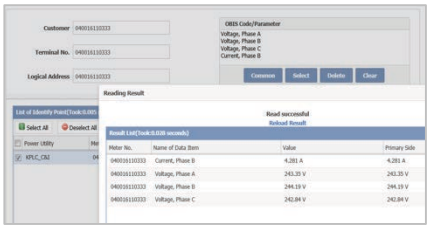
Features

- Future Proof Technology
  - Modular design;
  - Fully web-based User Interface with all browsers compatibility;
- Adopt to scale up from pilot to small scale and large scale projects continuously
- Integration with other systems via CIM based interface;
- Complying international standards;
- Security:
  - Enhanced login authentication;
  - Access control;
  - Security audit;
  - SSL high security encryption;
  - AES/DES and RSA encryption;

Main Functionalities

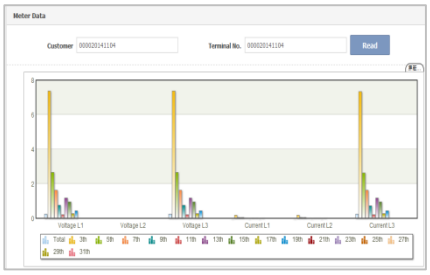
Scheduled and On-Demand Reading

System supports reading and monitoring of all electrical parameters on demand or in configurable period. Detailed information of consumption (including date, time, duration, etc.) are recorded in the system. It is convenient for operator to get a list of required data and relative statistics.



Power Quality

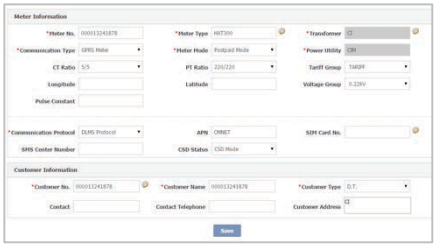
Power quality parameters for all three phases (harmonics, sags and swells and PF) are monitored and recorded by the system.



Asset Management

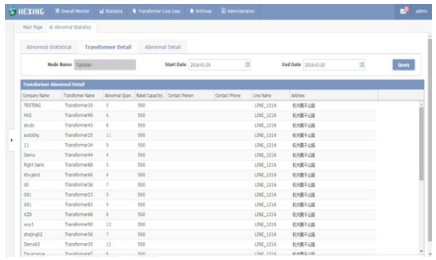
Support all utilities' metering devices, network structure and grid topology.

- Flexible device library based on grid structure and topology,
- Meter life time management;
- SIM card management;
- Archives import/export: Excel or CSV file format are supported;
- Archive statistics and reports;



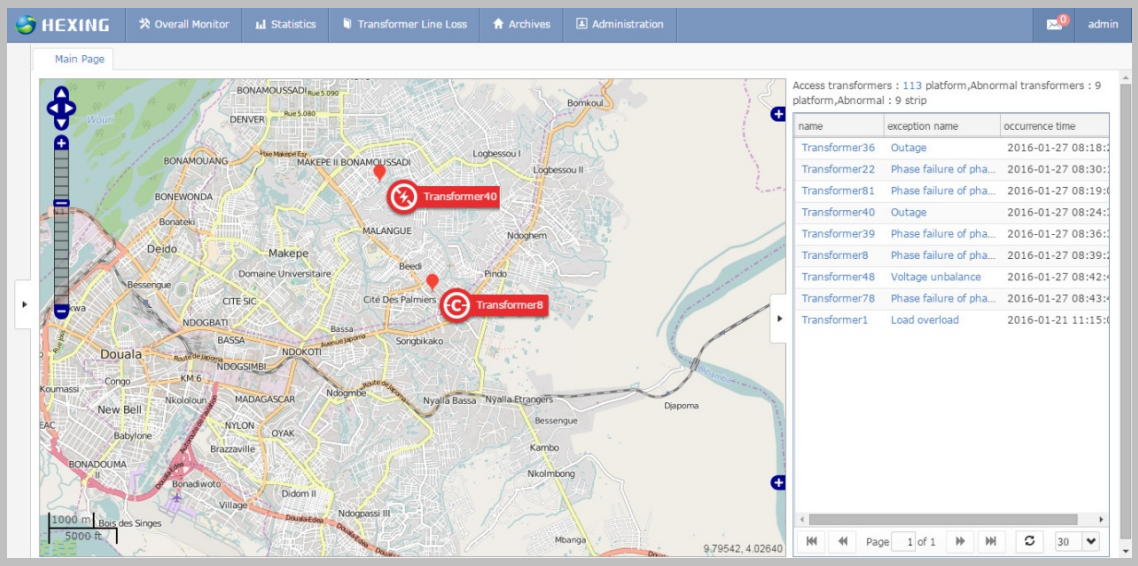
Load Control

According to utility policy, system administrator can configure and activate load control. It can be done automatically or manually. The whole process is managed remotely and operator can set power threshold on meter, then if consumer exceed that threshold; meter automatically disconnect it or send the alarm to central station and operator makes decision to disconnect consumer or not.

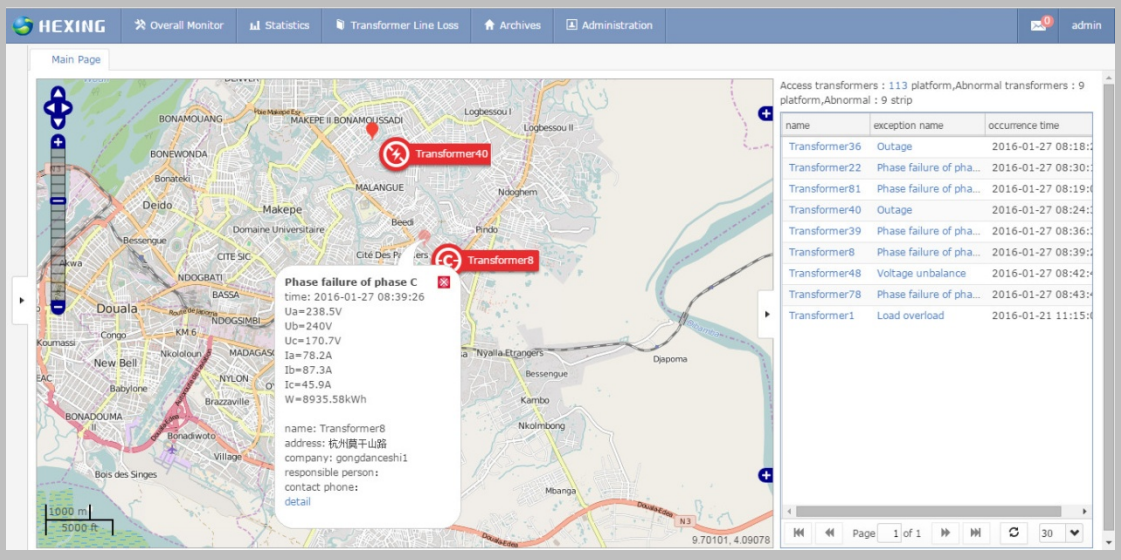


GIS

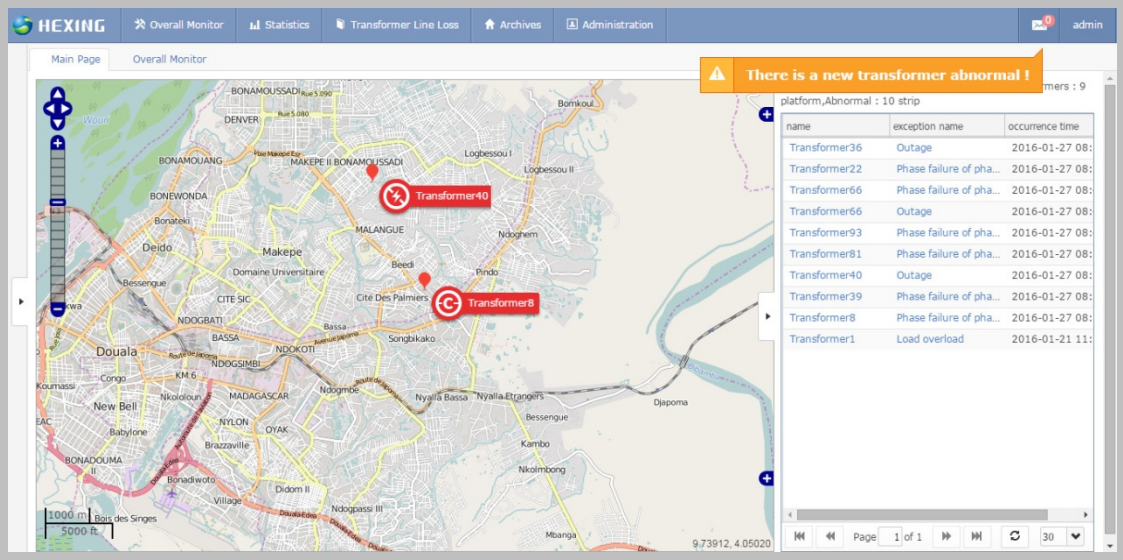
Based on the Google / open street map, meters location and status can be demonstrated on the map; it makes network management far easier for operator. Each meter is displayed as an icon on the GIS map while different colors represent different status.



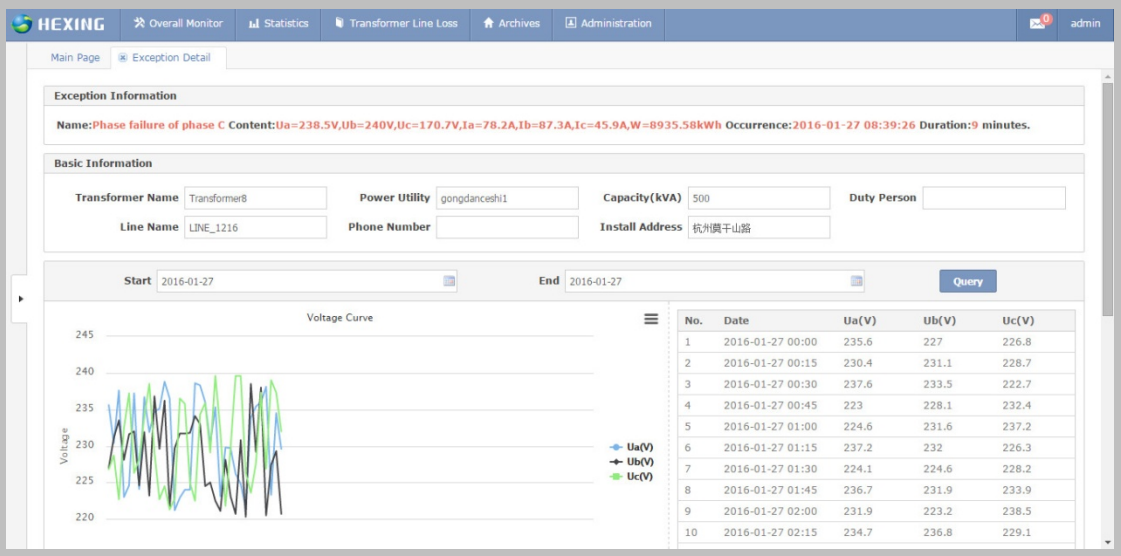
GIS Home Page, show all meters and their status



By clicking on each meter, all related data appear



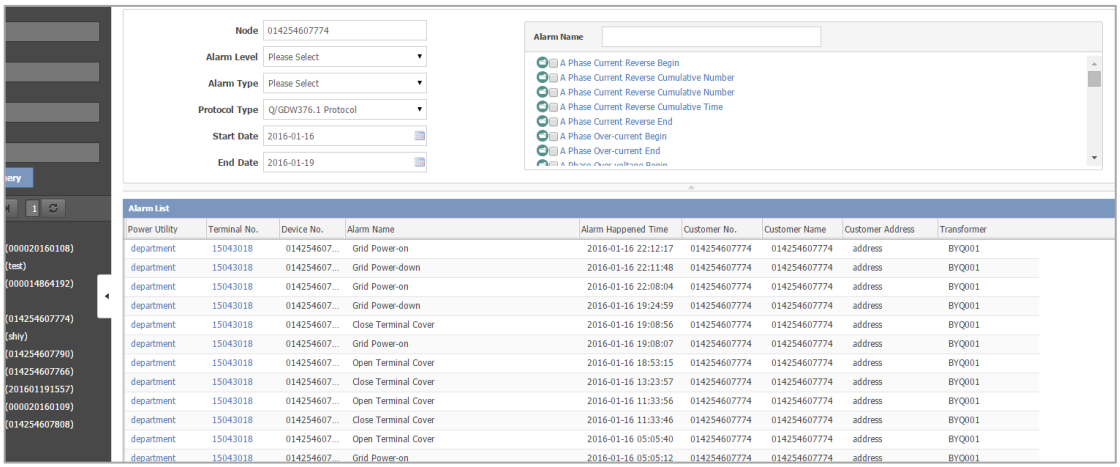
In case of any abnormal event, a message appear on top of the window



By clicking on each event, operator can see detail information about it

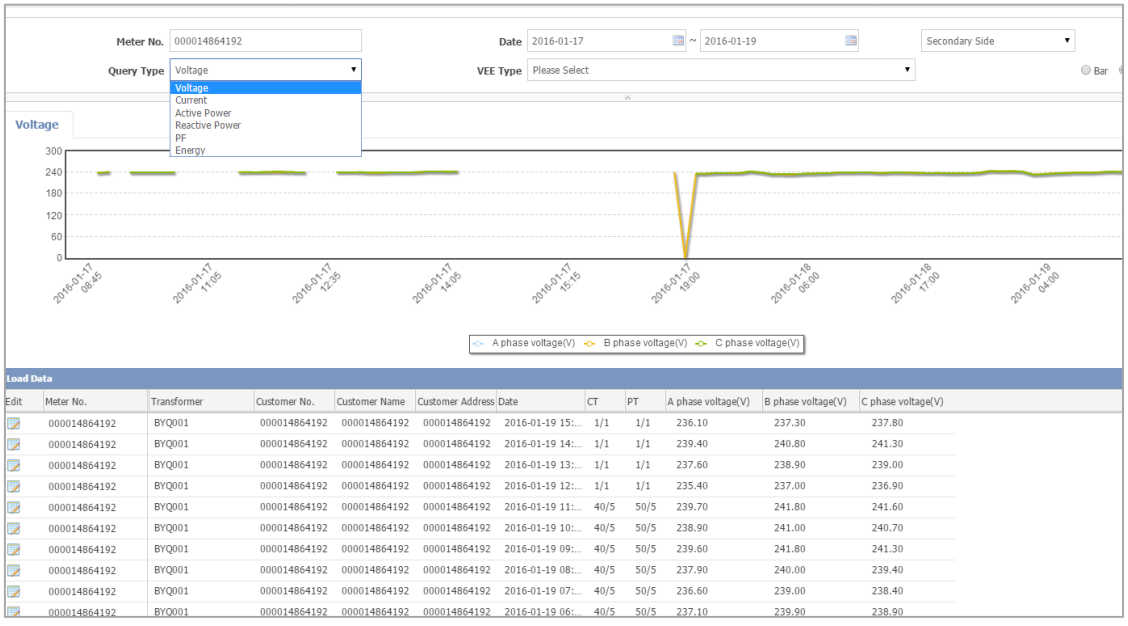
Alarm Statistics and Notification

System provides flexible way to configure alarms and events so administrator can tailor made event management. Alarm/Event types can be sorted by load, power quality and non-electric abnormality and according to different priority of different abnormalities, it can be set as high, medium and low-level-priority event/alarm. Different methods like SMS and email can be used for notifying responsible people when events/alarms happen.



Load Profile

This system also capable to show load profile per each meter customer.



Metering Equipment

Heart of C&I metering system is a high-precision C&I meter. All of Hexing C&I meters are using DLMS for all communications. Prepaid meters are compliant with STS/CTS standards. These meters compliant all related IEC, BS and DIN electrical standards like related parts of IEC62052, IEC62053, IEC 62056, EN 50470, IEC 61000, BS5685, DIN 43856 and DIN 43857. Meters are designed in such a way to work with GPRS, 3G and RF modules for communication.

HXT 300
Three Phase High Accuracy Smart Meter

HXT300 is a high accuracy meter suitable for power plants, transmission substations, distributing substations, transmission lines as well as large and small industries.

HXT300 provides excellent measuring capabilities, exceptional precision, elegant design and reliability.

Highlights

- High accuracy: Class 0.2S;
- Wide range nominal voltage: 3x57.7V - 3 x 240V;
- Wide range auxiliary power supply: 57V - 240VAC/DC;
- Local and remote firmware upgrade;
- Open standard protocol for metering and SCADA: DLMS-COSEM and Modbus;
- Data encryption schemes to ensure data security in communication;
- Up to 32 odd harmonics and THD measurement
- Waveform Capture;
- Flexible Input and Output interface;
- V^2h, I^2h for core (Iron) and copper loss measurement;
- Download data via smart optical interface when power off;

Metering Equipment

HXF 300
Three Phase High Accuracy Smart Meter

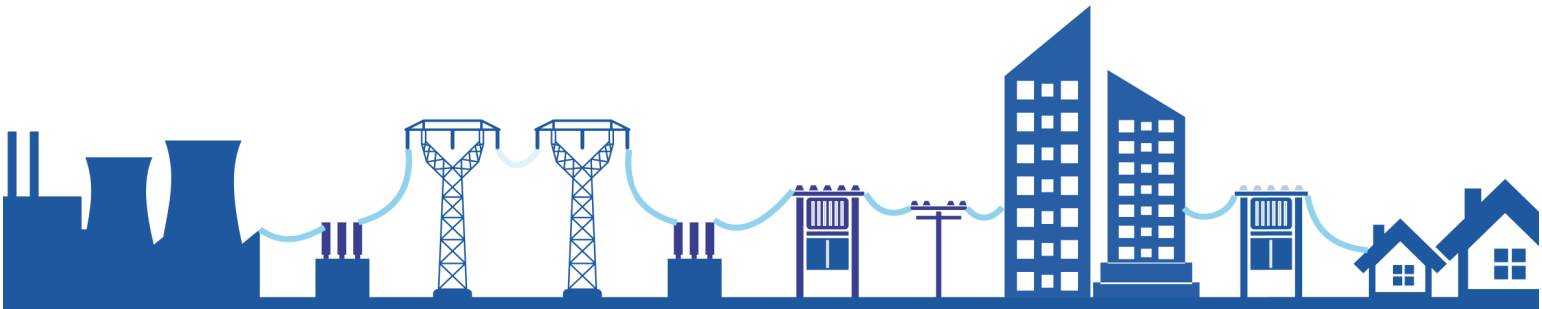
HXF300 is new generation of three phase class 0.5s smart meters with modular design for industrial and commercial applications. With plug and play communication module (GPRS/PLC/RF/ZigBee), the meter is designed to keep it communicating in any conditions by selecting suitable communication module.

- Plug & play communication module;
- Open standard protocol: DLMS-COSEM;
- Local and remote firmware upgrade;
- Data encryption schemes to ensure data security in communication;
- External switch relay for load control by internal logic or remote command;
- Measuring up to 21 voltage and current harmonics;

Experience and References

Kenya Power and Light Company (KPLC) as a client and Hexing as a solution provider, implement total C&I metering solution all over Kenya. This project includes three phase whole current customers, three phase CT connected customers, and High Voltage (11KV, 33KV, 66 KV and 132KV) metered customers. These customers consume more than half of total energy of all KPLC customers.

KPLC smart C&I metering project sites in Kenya



NAFTEX INTERNATIONAL S. R. L.
Erik Ekman #29, Las Villas de Arroyo Hondo
Santo Domingo, Dominican Republic, 10603
+1 (809) 563 4239 info@naftexdr.com
www.naftexdr.com